

THE EMPIRICAL CASE AGAINST *LARGE CLASS SIZE*: ADVERSE EFFECTS ON THE TEACHING, LEARNING, AND RETENTION OF FIRST-YEAR STUDENTS

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Introduction

In a national report on the status of American higher education issued in 1984, the National Institute of Education warned administrators and state governing boards to resist the “temptation toward generating the maximum number of student credit hours without regard to the quality of learning” (p. 12). This recommendation remains relevant today because current budgetary constraints are creating a climate of cost containment, within which larger class sizes may be seen as an alluringly quick and convenient cost-cutting strategy. As Gillespie (1997) observes, “In these days of increased costs and competition, institutions of higher education are very interested in extending limited resources. Offering more large classes is one way to do so; and classes with 100, 200, 300, or even larger numbers of students, are a common phenomenon in higher education” (p. 1).

This phenomenon is occurring at a time when only 54% all entering college students graduate (in six years) from the postsecondary institution at which they begin higher education (Consortium for Student Retention Data Exchange, 1999). More than half all students who withdraw from college do so during their first year, resulting in a national attrition rate for first-years students of more than 25% at four-year institutions, and almost 50% at two-year institutions (ACT, 2003). One factor that may be contributing to this disturbingly high rate of first-year attrition is the higher education practice of “herding” its first-year students into huge, introductory general-education classes. For instance, at one nationally recognized university, transcript analyses revealed that 55% of general education credit hours were earned in classes of 100 or more students and that first-year students and sophomores were disproportionately represented in classes of this size (Dooris, 2002). As Stanley and Porter (2002) point out, “Large classes are very prevalent in many universities and are often gateway courses to students’ major fields of study” (p. xxii). Twigg (2003) reports that “failure rates in these courses contribute heavily to overall institutional drop-out rates between the first and second years” (p. 24). Learning in large-class settings may be a particularly difficult adjustment for students transitioning from high school to higher education, because more than 80% of college-bound high school seniors graduate from schools with enrollments of less than 500 (The College Board, 1988), yet the majority of these high school graduates begin their college experience at universities with enrollments of over 10,000 students (U.S. Department of Education, 1994).

The negative implications of impersonal, anonymous, “en masse” education for first-year students is well articulated by MacGregor, Cooper, Smith, and Robinson (2000).

A growing body of research points to the value of undergraduate learning environments that set high expectations, promote active and interactive learning, and give students personal validation and frequent feedback on their work. These settings and practices are especially beneficial for beginning learners as they make the transition to college. Yet at most universities, introductory courses or classes that fulfill general education requirements often carry enrollment of hundreds of students. These large-class settings

have historically been heavily lecture-centered, requiring minimal student engagement and expecting little more than memorization of terms and concepts as evidence of student learning. The sheer size and anonymity of large classes seem to militate against the very elements that promote students' involvement and intellectual development, learning, and success. Inattention or absence from class and mediocre student performance seem to be tolerated simply as unfortunate realities" (p. 1).

Placing college neophytes in large, lecture-laden classes that are conducive to passive spectating may initiate maladaptive mental habits or predispositions to learning that linger beyond the first year of college year. In his book, *Rejuvenating Introductory Courses*, Kenneth Spear artfully expresses the potentially dangerous consequence of subjecting new students to large lecture classes: "In these formative experiences, [students] learn what it is to be a student, what is required to get by. If students are taught to be passive seekers and transcribers of information, that is what they become. Further, they set their sights accordingly in subsequent courses, often actively resisting our attempts in upper-division courses to get them to go beyond the information we give them" (1984, pp. 6-7).

These conceptual arguments against large-sized classes are reinforced by empirical evidence, which suggests that there are eight deleterious outcomes associated with large-sized classes: (1) increased faculty reliance on the *lecture* method of instruction, (2) less *active student involvement* in the learning process, (3) reduced frequency of instructor *interaction* with and *feedback* to students, (4) reduced *depth of student thinking* inside the classroom, (5) reduced breadth and depth of *course objectives, course assignments*, and course-related *learning strategies* used by students *outside* the classroom, (6) lower levels of academic *achievement (learning)* and academic *performance (grades)*, (7) reduced overall *course satisfaction* with the learning experience, and (8) *lower student ratings (evaluations)* of course instruction.

This manuscript will attempt to synthesize research relating to these eight consequences of large class size and analyze its implications for the success of undergraduate students in general, and first-year college students in particular. The manuscript will conclude with a discussion of the implications of the reviewed research for (a) effective education of today's undergraduates, (b) identification of optimal class size, (c) administrative decision-making, and (d) institutional mission, priorities, and values.

Finding #1. Larger class size increases faculty reliance on the *lecture* method of instruction.

McKeachie (1986) notes that, "[Class] size and method are almost inextricably intertwined. Thus, the research on class size and that on lecture vs. discussion overlap. Large classes are most likely to use lecture methods and less likely to use discussion than small classes" (p. 181). This naturally leads to the question of how learning outcomes achieved by courses taught with the lecture method—the dominant mode of instruction in large-class settings—compare with outcomes achieved in smaller-sized classes, where the discussion method is more likely to be employed.

Research on the lecture method strongly suggests that student *attention and concentration* tend to drop off dramatically after 10-20 minutes of continuous instructor discourse (Penner, 1984; Verner and Dickinson, 1967). This attention "drift" occurs even among highly motivated postgraduate students (Stuart and Rutheford, 1978) and learning-oriented (versus grade-oriented) undergraduate students (Milton, Pollio, & Eison, 1986). Among undergraduates in general, it has

been found that about half of the time during lectures, they are thinking about things unrelated to the lecture content, with up to 15% of their class time is spent fantasizing (Milton, Polio, & Eison, 1986).

In his review of close to 100 higher education studies over a 50-year period, Bligh (1972) reports that students who become involved in active discussion of their ideas with other students are more likely to stay “on task” in class (i.e., experience fewer irrelevant or distracting thoughts) and spend more time synthesizing and integrating concepts, relative to students who listen to lectures. Bligh also found that students who had the opportunity to interact in class with the instructor, and with other students, reported significantly higher levels of *satisfaction* with their learning experience than students in classes that were taught exclusively by the lecture method. Reinforcing this finding is Costin’s (1972) review of close to 60 studies, spanning a 40-year period, which revealed that students better *like* (i.e., report more positive attitudes toward) the course and its subject matter when they had small-group learning experiences in class. Kulik and Kulik (1979) reached a similar conclusion in their comprehensive literature review, reporting that students involved in classes which made use of discussion groups were more likely to develop positive attitudes toward the course’s subject matter.

These results are consistent with those generated by the Policy Center on the First Year of College, based on survey data collected from more than 60 postsecondary institutions and over 30,000 students. This national survey revealed that use of “engaging pedagogy” (for example, class discussions and group work) was positively associated with student satisfaction and self-reported learning outcomes in first year seminars (Swing, 2002). Similar findings emerge from research conducted by the Higher Education Research Institute on first-year courses in general. Based on data gathered from almost 25,000 students at 110 institutions, it was found that the pedagogical practices most strongly associated with first-year student satisfaction with the overall quality of instruction were those that emphasized involvement with peers, faculty, and the course itself (Keup & Sax, 2002).

Research also indicates that, relative to traditional lecture classes, students are more likely to *take additional courses* in an academic discipline when their prior course in that discipline had either one of the following characteristics: (a) small-group discussions with other students (Buxton & Crull, 1982), or (b) instructors who adopted the role of “facilitator” rather than “expert” or “authority” (McKeachie, Lin, Moffet, & Daugherty, 1978). These results suggest that greater use of student-centered methods of instruction (e.g., class discussions and small-group work) may promote greater student interest in the subject matter of introductory courses and, perhaps, increase the likelihood they will pursue the subject as a potential major. Smaller class size and less lecturing in introductory courses may also increase student appreciation of general education curriculum, for which they typically report less course satisfaction (as evidenced by lower student ratings) than elective courses and courses in their academic major (Braskamp, Bradenburg, & Ory, 1984; Cashin, 1988).

A fitting summary of the outcomes associated with the lecture method is provided by Donald Bligh (2000), based on his extensive review of the research literature: “The balance of evidence favors this conclusion: *Use lectures to teach information. Do not rely on them to promote thought, change attitudes, or behavioral skills if you can help it*” (p. 20). Since the amount of class time that instructors spend lecturing tends to increase with increasing class size (McKeachie, 1986), the foregoing shortcomings of the lecture method may be ascribed to large class size as well.

Finding #2. Larger classes reduce students' level of *active involvement* in the learning process.

After completing their voluminous and meticulous review of the higher education research literature, Pascarella and Terenzini (1991) state: "Perhaps the strongest conclusion that can be made is the least surprising. Simply put, the greater the student's involvement or engagement in academic work or in the academic experience of college, the greater his or her level of knowledge acquisition and general cognitive development" (p. 616). The research support for active involvement (engagement) is so formidable that it has been referred to as the "grand meta-principle" of student learning (Cross, 1998).

Survey research reveals that student participation in the classroom is viewed as important for learning by both faculty and students (Nunn, 1996); however, large class size has been found to reduce the likelihood of classroom participation. For example, Wulff, Nyquist, and Abbott (1987) found that what students report to be *most dissatisfying* about large introductory courses is the lack of instructor-student interaction and the opportunities for questions and discussions. Stones (1970) surveyed over 1,000 college students, and found that 60% of them reported that the presence of a large number of people in class deterred them from asking questions, even if the teacher encouraged them to do so. Using direct classroom observation as their methodological tool, Karp & Yoels (1976) discovered that in classes of less than 40 students, 4-5 students accounted for 75% of all classroom interactions; and in classes with more than 40 students, 2-3 students accounted for over half the exchanges. These observational findings mirror the results of research on students' course perceptions, which indicate that students in large classes report the highest degree of dissatisfaction on course-evaluation questions relating to the quality of student-instructor and student-student *interaction* (Feldman, 1984; Carbone & Greenberg, 1998).

Furthermore, college instructors may have a tendency to overestimate their students' level of involvement in the classroom, as evidenced by the work of Centra (1973), who discovered large discrepancies between college professors' self-perceptions of their degree of "interaction" and "openness" with students compared with student perceptions of their professors, i.e., professors tended to perceive themselves to be more open and interactive than did their students. These findings are reinforced by more recent research conducted by Fassinger (1996), who surveyed more than 1,000 students in over 50 classes from a wide range of disciplines that met at the same time period. She found that students perceive themselves as less involved in the classroom than faculty perceive them to be, and concluded that, "Because students say that they, as a whole, are even less active in classes than do professors, the effects of students' passivity may be felt more strongly by students than by instructors" (p. 30).

The importance of classroom involvement for student *learning* is strongly supported by the results of a longitudinal study of students' intellectual skill development conducted by Terenzini, Theophilides, and Loran (1984), who found classroom participation to be the only course-experience variable that consistently correlated with students' cognitive growth. McKeachie (1986) notes that it is "because active thinking is so important to learning and retention of learning, constraints upon oral participation are likely not only to induce passivity but also to be educationally harmful" (p. 183).

A relationship between student enrollment in *small*-sized classes and active student involvement in the *college experience* in general is suggested by the work of Light (2001). He conducted in-depth interviews with more than 1600 undergraduates, and one of his principal

findings was that students who chose at least one small class each semester were noticeably more engaged in the college experience. Since active involvement in the college experience is strongly correlated with student *retention* (Astin, 1993; Tinto, 1993), the aforementioned findings of reduced levels of active class involvement in large-sized courses may have disturbing implications for student persistence to degree completion. The implications may be particularly disturbing for beginning college students—who are more likely to be housed in large, introductory general-education courses during the critical first year of college—the very year in which they are most vulnerable to attrition (ACT, 2003).

Finding #3. Larger class size reduces the frequency and quality of instructor *interaction* with and *feedback* to students.

Carbone and Greenberg (1998) found that one specific aspect of large-class interaction which students report the *least* satisfaction with is their *interaction* with faculty instructors—both inside and outside the classroom. College faculty see it the same way, as evidenced by the research of Ratcliff (1992) who conducted interviews with more than 300 faculty at five different colleges, and concluded that “the sheer size of lecture classes often militated against direct interaction with most students” (p. 65). Based on multi-campus visitations and on-site observations, Kuh, Schuh, Whitt, & Associates (1991) report that in large-class settings, a “compact of disengagement” exists between faculty members and students, which seems to convey the mutual message: “You leave me alone and I will leave you alone” (p. 362). In very large classes, it is likely that the vast majority of students in class will go through the entire term without experiencing a single interactive episode with the course instructor, whether it be a person-to-person verbal exchange inside the classroom or a written exchange of ideas outside the classroom (e.g., receiving written feedback from the instructor on returned exams). This is especially disturbing, given that student-faculty interaction is a college experience variable which is strongly associated with a host of positive student outcomes, such as: (a) student retention, (b) academic achievement, (c) critical thinking, and (d) educational aspiration (Astin, 1993; Pascarella & Terenzini, 1991; Tinto, 1993). Although this association has been most well documented for faculty-student interaction *outside* the classroom, the likelihood that such out-of-class interaction will take place depends on the quantity and quality of student-faculty interaction *inside* the classroom. As Tinto (1993) notes,

Classes which do not engage students in learning—as is frequently the case in the large lecture classes that dot the first year of college—tend to stifle subsequent contact with faculty. Students who find themselves alienated from learning in the classroom are unlikely to seek out contact with faculty beyond the classroom. By contrast, in those cases where classrooms actively involve student in learning, additional contact with faculty outside of class arises in part because engaged students will seek out that contact. It is ironic that during the first year of college, when contact with faculty is so important to retention, so many institutions structure first-year courses so as to discourage contacts. Freshman classes are frequently the largest on campus and, in university settings, often taught by graduate students rather than by faculty. The short-term economic gains thought to arise from greater efficiency in the allocation of resources (e.g., through large course enrollments) are often achieved at the expense of long-term losses in both retention and student development (p. 119 & pp. 167-168).

Another aspect of the large-class learning experience that students report particularly high levels of dissatisfaction is the *frequency of assessment* (Carbone & Greenberg, 1998). Frequent assessment and feedback is an almost axiomatic principle of effective learning (American College Personnel Association, 1994; Guskey, 1988; Wiggins, 1997). Frequent assessment is also more likely to result in *early* assessment and early feedback to students during the term, which students can use *proactively* to improve their subsequent performance and eventual course grade.

In addition, frequent assessment encourages students to study and practice more *consistently*, thus increasing the likelihood that they will *distribute* their study time more evenly throughout the term, rather than cramming the bulk of their work into two large sessions—one before the midterm and one before the final. This advantage of frequent assessment for *first-year* college students, in particular, is underscored by Erickson and Strommer (1991): “Frequent evaluations provide the structure many freshmen need to keep up with work [and are] more likely to get students to attend class and do their homework” (p. 153). Lastly, students in a variety of academic disciplines and professional programs report lower levels of test anxiety when course exams are given less frequently and carry proportionally less weight in determining their final course grade (Heins, Fahey, & Leiden, 1984).

Given the multiple advantages of frequent feedback for learning and academic performance, it is reasonable to conclude that student reports of insufficiently frequent assessment and feedback in large classes serve not only to decrease course satisfaction, but may serve to decrease the quality of student *learning* as well.

Finding #4. Larger-class settings reduce students’ *depth of thinking* inside the classroom.

In an analysis of audiotapes of 155 class sessions in 40 undergraduate courses at both public and private institutions, Fischer and Grant (1983) found that class size significantly affected the level of cognitive skills used by students in the classroom. In small classes (15 or fewer students), when students spoke in response to instructor-posed questions, the average level of thinking (using Bloom’s Taxonomy) displayed by their discourse was that of *analysis*; in medium-size classes (16-45 students) student discourse was characterized by a lower level of thinking—*comprehension*; and in large classes (46 or more students), the discourse of students who participated in class most often reflected the lowest level of thinking—*factual recall*. These findings become particularly telling when viewed in conjunction with research conducted by Smith (1983), who found that high-level cognitive responses from students in class correlated significantly with positive changes (gains) in their scores on standardized critical-thinking tests administered during the term.

These findings are consistent with those reported in earlier studies that revealed a positive association between small class size and the development of higher-level thinking skills (Dunkin & Barnes, 1985; McKeachie, 1980). In their critical review of over 2500 college-level studies, Pascarella and Terenzini (1991) reached the following conclusion: “Our own synthesis of the existing evidence [indicates] that smaller classes are more effective than larger ones when the goals of instruction are motivational, attitudinal, or higher-level cognitive processes. In fact, it may well be that increased student participation is an important causal mechanism underlying the positive association found between small classes and the development of higher-order cognitive processes” (pp. 87, 147).

Finding #5. Larger class size limits the breadth and depth of *course objectives, course assignments, and course-related learning outside the classroom.*

Hoyt and Perera (2000) report results of a multi-institutional survey of college faculty, which revealed that instructors' educational objectives in courses taught exclusively by the lecture method (more common in courses with large class size) were limited primarily to knowledge acquisition—for example, factual information about concepts, principles and theories. In contrast, faculty who taught classes with instructional methods that placed more emphasis on student involvement—for example, discussion-oriented and seminar-style teaching, were more likely to pursue course objectives that emphasized critical thinking, communication skills, and lifelong learning. Furthermore, classes taught with student-involving methods were more effective in achieving course objectives (as measured by student progress ratings) than were lecture-method courses in achieving their more limited, lower-level objectives.

These findings dovetail with results obtained in a previously cited study by Ratcliff (1992), who conducted interviews with over 300 faculty at five different colleges, and reported that, “Class size is cited frequently as a *major limitation* on what could be accomplished in instruction and in what reasonably could be asked of students in class assignments” (p. 65). One major limitation in the nature of assignments given in courses with large class size is that they are less likely to involve student *writing*. This is evidenced by survey results gleaned from 534 college professors, which demonstrated that test scores in large classes (average size of 45 students) were most often based on multiple-choice tests, whereas test scores in the smallest classes were most often based on tests that required students to write (Cross, cited in Smith, 1992).

Given the importance of writing (across the curriculum) for promoting student learning and depth of thinking (Applebee, 1984; Bean, 2001; Griffin, 1982), the dearth or absence of writing in large classes is an especially disconcerting finding. The legitimacy of this concern is suggested by the research of Scouller (1998), who studied more than 200 Australian second-year students, and found that the instructor's examination format (multiple choice vs. essay assignment) had a significant influence on how students prepared for exams. He reports that students were “more likely to employ surface [memorization] strategies and report surface motives when preparing for multiple-choice question examinations than when preparing for assignment essays. In contrast, when preparing their assignment essays, students were significantly more likely to employ deep [comprehension] strategies and report deep motives than when preparing for their multiple choice question examinations” (pp. 461-462).

Since essay assignments involve writing, they are less likely to be employed by instructors who are teaching large classes; thus, it may be expected that students in large classes will more likely adopt “surface” learning rather than “deep” learning strategies when preparing for course examinations. This suggests that large class size not only reduces the quality of student learning *inside* the classroom, but may also diminish the quality of student studying (and learning) *outside* the classroom.

Finding #6. Students' *academic achievement (learning) and academic performance (grades) are lowered in courses with larger class size.*

The adverse effect of class size on students' self-reported learning is suggested by research conducted at the University of Maryland by Carbone and Greenberg (1998), who found that only 25% of students in large classes agreed with the statement, “The size of the class does not affect my ability to learn.” This finding jibes with those of Wulff, Nyquist, and Abbott (1987), who

surveyed the perceptions 800 college students enrolled in *large*-sized introductory courses at the University of Washington. Students in these courses reported that they: (a) more easily lost attention, (b) more easily became distracted by classroom noise and student conversations, and (c) were less motivated because of the impersonal nature of the class and lack of individual accountability.

Objective evidence for the adverse effect of class size on students' course grades is supplied by a large-scale study conducted in the United Kingdom, where national budget cuts led to rapid increases in class size during the 1980s (Jenkins, 2002). In this major study of the impact of increased class size on students' academic performance, it was discovered that the percentage of A and B+ grades awarded decreased steadily as module (course) enrollments increased (Lindsay & Paton-Saltzberg, 1987). This finding is congruent with research in America conducted by Franklin and Theall (1991), who examined the relationship between class size and course grades in 10,329 undergraduate courses. They discovered significant negative correlations ($p < .001$) between class size, course grades and student ratings of "amount learned" for all course types, course sections, and course instructors. Richard Light (2001) reports a consistent correlation between the number of small classes taken by students and their overall grades (GPA). He concludes that this correlation "sends a clear message—that most of the time smaller is better, with strong[er] student engagement" (p. 45). Light's conclusion is consistent with a previous study of freshman seminars, which indicated that students enrolled in smaller-sized sections of the course achieved higher first-term GPAs (Hopkins & Hahn, cited in Fidler & Hunter, 1989).

Finding #7. Students report *less course satisfaction* in larger-sized classes.

Support for this assertion is provided by an early review of the research literature by McKeachie (1980). He found that, in almost all published studies, both students and faculty expressed a strong preference for small-sized classes. Similarly, Carbone and Greenberg (1998) surveyed students in *large* introductory courses, and discovered that these students reported higher levels of course dissatisfaction than they did for smaller-sized classes.

Anecdotal reports also suggest that higher levels of student dissatisfaction with large-sized classes contribute to lower rates of *class attendance*. As Cooper and Robinson (2000) report, "We often hear that large-lecture attendance dwindles throughout the term and is often down to 30 to 40 percent by the end. And in many larger classes, note-taking services have sprung up as lively businesses through which students buy lecture notes in lieu of attending class. Clearly, students across the nation are sending us signals concerning their disaffection with large classes" (p. 9). Other anecdotal reports suggest that higher levels of student dissatisfaction (and anonymity) in large classes are associated with a higher incidence of *classroom incivility*—such as talking in class, and more frequent *violations of academic integrity*—such as cheating on exams (Carbone, 1999; Sorcinelli, 1994, 2002; Weimer, 1987).

In contrast, Light (2001) reports a "strong relationship" (correlation of .52) between the number of small classes that students take and their satisfaction with the overall academic experience. He reports that, "Nearly without exception, students who are dissatisfied with their academic performance, are taking nothing but large, introductory courses." These findings are particularly significant when juxtaposed with Astin's (1991) finding that college satisfaction is an assessment outcome that is least influenced or confounded by students' college-entry characteristics (for example, academic preparedness, educational aspirations, gender, or socioeconomic status).

Also, Light's (2001) finding of a strong relationship between student enrollment in small classes and overall college satisfaction gains further significance when it is viewed in conjunction with the well-established relationship between students' level of *satisfaction* with the college they are attending and their rate of *retention* at that institution (Noel, Levitz, & Saluri, 1985), i.e., college satisfaction is a "primary predictor" of student persistence (Noel & Levitz, 1995). Indeed in one study of student retention in 25 college courses, it was found that adult learners were more likely to persist to course completion in smaller-sized classes (Ashar & Skeenes in Grayson & Grayson, 2003).

The positive relationship between small-class experience and (a) students' college satisfaction and (b) student persistence to course completion would clearly suggest that increasing the opportunities for undergraduates to experience small-sized classes will serve to elevate their retention rate. This would be especially true if the increased opportunities for small-class learning take place during the *first year* of college, which is the stage of the college experience when class sizes tend to be largest and student attrition tends to be highest.

Finding #8. Students give lower overall ratings (evaluations) for course instruction delivered in larger classes.

Research on student ratings of courses and course instructors suggests that students' overall evaluations of teaching effectiveness decrease with increasing class size. For instance, Franklin and Theall's (1991) study of more than 10,000 undergraduate courses over a six-year period revealed significant negative correlations ($p < .001$) between class size and instructional ratings for all course types and course instructors. Institutional research conducted at Western Washington University, where the course-evaluation system allows faculty to utilize evaluation forms tailored to the size of class taught, demonstrates that course ratings decline systematically with class size in the following manner: Seminars receive higher average ratings than small lecture classes, which in turn are rated higher than large lecture classes (Frye, 2002). Similarly, at North Dakota State University, research on the university's first-year seminar suggests that student evaluations are significantly higher in course sections with class sizes of 15 or fewer students (Schnell, in Barefoot, 1993).

These findings on student evaluations may have implications beyond mere course *satisfaction*, because there is a substantial body of research indicating that students' course evaluations correlate positively with actual *learning*—as measured by student performance on standardized final exams (Cohen, 1981, 1986; d'Apollonia, & Abrami, 1988; McCallum, 1984). In other words, there is evidence that students tend to rate most highly those courses in which they learn the most (Centra, 1977). More recently, Pascarella (2001) reported results that extend these earlier findings, based on the results of the National Study of Study Learning (NSSL)—a three-year longitudinal research program conducted with random samples of students from 23 colleges and universities located in 16 different states. After controlling for potentially confounding variables, this study revealed that students who perceived their overall course instruction to be high in teacher organization and preparation tended to demonstrate significantly larger net gains in standardized measures of learning and cognitive development than did students who judged their course instruction as being less well-organized and prepared. The author concludes that these results suggest that a "positive link between student perceptions of teacher organization and preparation and course-level achievement might extend to more broad-based, general cognitive proficiencies" (p. 25).

Summary & Conclusions

The research reviewed in this manuscript indicates that large class size is a contextual variable that has generally adverse effects on student learning, mediated primarily by *lowering* students' level of *engagement* (active involvement) with the course *instructor*, with *classmates*, and with the *subject matter*. This conclusion is consistent with one reached by McKeachie (1986):

Analysis of research suggests that, in general, large classes are simply not as effective as small classes for retention of knowledge, critical thinking, and attitude change. Few instructors are satisfied with the achievement of knowledge if it is not remembered, if the students are unable to use it in solving problems where the knowledge is relevant, or if the students fail to relate the knowledge to relevant attitudes. If one takes these more basic outcomes of retention [of knowledge], problem solving, and attitude differentiation as criteria of learning, the weight of the evidence clearly favors small classes (pp. 182 & 185).

One would be hard-pressed to find any empirical evidence or conceptually compelling reason to support large class sizes, other than its obvious fiscal advantage, plus some speculation that instructors might be more motivated to teach classes with large audiences (Marsh, 1987; Stupka, 1984). The evidence against large class size is so formidable that it borders on being incontrovertible.

Implications for the Education of Today's Students

The research cited in this manuscript traverses a time span of more than 30 years. However, its implications for contemporary undergraduate education remains strikingly significant, because the characteristics of today's college students may render them particularly vulnerable to the documented disadvantages of large-class learning. For instance, one contemporary trend in American higher education is the increasing number of *academically underprepared* students entering college (Levine & Cureton, 1998), accompanied by a concomitant increase in the number of developmental (basic academic skill-building) courses offered on college campuses (Carnegie Foundation & The American Council on Education, 1997). Smaller class sizes may be particularly important for promoting the success of academically underprepared students in general, and developmental students in particular, because these students need individualized diagnostic attention and detailed prescriptive feedback that are delivered optimally (and realistically) only in small-class settings.

Students are also entering college today with substantially higher self-reported levels of *academic disengagement* in high school, i.e., they more frequently report "feeling bored" in class, missing class, and spending less time on their studies outside of class (Astin, et al., 1997; Sax, et al., 2002). These characteristics apparently carry over to the first year of college, as evidenced by a recent national survey of first-year educators who were asked to rank 18 different factors in terms of their "level of impact" on first-year students' academic performance. These educators ranked "lack of [student] motivation" as the number-one factor (Policy Center on the First Year of College, 2003). Admitting new students with lower levels of academic motivation and higher reported history of academic boredom in high school, then immediately immerse them in large, lecture-driven introductory courses, appears to be the ideal formula for perpetuating or exacerbating their boredom by promoting their passivity, anonymity, and lack of individual accountability. As MacGregor, Cooper, Smith, and Robinson (2000) trenchantly

observe: “The political realities of large universities are structured to have large-enrollment lower-division courses pay for small-enrollment upper-division and graduate classes. It is a sad commentary on our universities that the least engaging class sizes and the least involving pedagogy is foisted upon students at the most pivotal time of their undergraduate careers: when they are beginning college” (pp. 6-7).

Implications for *Optimal* Class Size

While the advantages of small-sized classes are well documented, what remains to be answered is the question: “How small is “small?” Most of the studies conducted on class size have collapsed individual classes of different sizes within a high range (e.g., 50 and higher) and compared them with class sizes within a lower range (e.g., 25 and lower) to demonstrate that the average outcomes of smaller classes are more positive than those associated with larger classes. However, these results do not allow us to conclude that the relationship between class size and positive outcomes is strictly linear, i.e., gains in outcomes may not increase incrementally in equal intervals on a continuum from smaller to larger. Instead, it may be that there is a threshold number, below which the positive benefits of class size increase appreciably or “jump” dramatically. Similarly, there may also be threshold number, above which the liabilities of further increases in class size “level off” or become negligible.

Admittedly, additional research is needed to determine if there is a specific threshold point or absolute number below which the benefits of smaller class size become magnified. However, if one were to extrapolate from existing research and speculate what that magic number might be, it appears that our best current estimate would be a class size of 15. Empirical support for this speculation comes from a variety of different studies cited in this manuscript. For instance, recall that Light (2001) conducted in-depth interviews with more than 1600 undergraduates, and discovered that students who chose at least one small class each semester were noticeably more *engaged* in the college experience. When these undergraduates were asked what they considered to be “small,” the most common answer was “fifteen or fewer people” (p. 45). This finding is consistent with previously cited research conducted by Fischer and Grant (1983), who found that class size significantly affected the level of cognitive skills used by students in the classroom. In small classes—defined as 15 or fewer students—the average level of thinking displayed by students in response to instructor-posed questions was significantly higher than it was in larger-sized classes. These findings are notable in their own right, but become more significant when viewed in conjunction with other research indicating that high-level cognitive responses from students in class correlate significantly with positive changes (gains) in student scores on standardized critical-thinking tests (Smith, 1983).

Also, recall that *seminar*-sized classes were found to receive higher course evaluations (student ratings) than both small-lecture classes and large-lecture classes at Western Washington University (Frye, 2002), and at North Dakota State University, student evaluations of first-year seminars were significantly higher in course sections with class sizes of 15 or fewer students (Schnell, in Barefoot, 1993). These findings dovetail with multi-institutional survey research conducted in England, which demonstrates that students consistently express a desire for more seminar classes and fewer lecture courses (Saunders and others, cited in Bligh, 2000). Similarly, research reviews on the relationship between class size and students’ course evaluations reveal that class sizes of 15 or fewer students receive higher student evaluations than class sizes of 16 and higher (Centra & Creech, 1976; Marsh, 1987).

Lastly, it is noteworthy that the official policy statement issued by the National Council of Teachers of English claims that 15 or fewer students is the optimal class size for courses in college writing, and in remedial or developmental writing courses, maximum class size should be 15 students (NCTE Guideline, 2004). Also, the National Education Association formally endorses a class size of 15 as optimal for students at the pre-college level (NEA, 2003).

Viewed collectively, the foregoing research findings and policy statements make a relatively strong case that 15 or fewer students represents an optimal class size. It may be that when class size becomes this small, a qualitative shift takes place in the behavior of students and/or the instructor that can result in a sharp jump or spike in positive educational outcomes. In the spirit of speculation, a class size of 15 or less may create a social-emotional climate or “psychological space” in which students begin to perceive the learning environment as a “community” rather than a “class.” The professor is more likely to know the names of individual students, and students are more likely to address each other by name. Students have more eye contact with the instructor and other students, and the physical ecology of the room may be rearranged to further increase eye contact and reduce interpersonal distance (e.g., changing linear rows of desks into circular or semi-circular seating). Any or all of these ecological factors should serve to increase student engagement in class by increasing their level of involvement or interaction with the instructor and with classmates, which may also trigger higher levels of such interaction outside the classroom. Students may also develop a heightened sense of personal responsibility or accountability to the class because anonymity is reduced, while individual behavior becomes more noticeable and notable (e.g., the student’s class attendance and class contributions).

A class size of 15 or less may also change the instructor’s course objectives or expectations, such that more may be expected of students inside the classroom (e.g., more participation) and outside the classroom (e.g., more writing). Furthermore, instructor feedback to students may become more detailed and diagnostic, because the manageable class size makes the provision of individualized feedback more feasible and less laborious.

One potentially fruitful direction for future research is to examine what, or whether, specific positive changes occur in student and instructor behavior when classes reach a certain size. Research reviewed in this manuscript suggests that class size of 15 or fewer students may be the threshold point at which more productive student and instructor behaviors begin to emerge, which in turn, may eventuate in multiple positive outcomes.

Implications for *Administrative Decision-Making and Policy Development*

In their highly regarded review and synthesis of more than 2500 studies on how college affects students, Pascarella and Terenzini observe that, “Modern colleges and especially universities seem far better structured to process large numbers of students efficiently than to maximize student learning” (1991, p. 646). If postsecondary institutions are to begin “reorganizing for learning,” as has been recommended by the American Association for Higher Education, then this reorganization should include redesign of the first-year experience to allow entering students the opportunity to experience learning in small-class settings. This would provide first-year students with a learning experience that is more personalized, more amenable to active involvement, and more conducive to the development of personal responsibility. It would also place first-year instructors in a teaching context that would facilitate the use of engaging learner-centered pedagogy, which in turn, should stimulate student interest in learning and student

motivation to learn. Two potentially effective ways in which institutions may reorganize for learning, with respect to class size, are described below.

1. Redirect Administrative Decision-Making Away from a Focus on “Average” Class Size and Student-Faculty Ratio to a Focus on the *Variation* or Range of Class Sizes Available to Students Each Term and at Different Stages of the College Experience

Historically, administrative discussions decisions about class size have focused primarily on measures of *average* class size and student-faculty ratio. However, it may be more productive for administrators to move away from class-size decisions based exclusively on these traditional measures of central tendency, and give greater consideration to measures of *variability*, such the range or distribution of class sizes available to students in a given term and at different stages of the college experience.

The research reviewed herein suggests that a class size of 15 or fewer students may represent a threshold point at which the benefits of smaller class size are most dramatically realized. Administrators could use this as a research-based guideline for decision-making with respect to the range and distribution of class sizes available to students each term. For instance, it might be possible to reduce the size of some moderately sized classes to this 15-student threshold, thus transforming them into classes of *optimal* size in which substantial gains in student satisfaction, involvement, and learning may be realized. This could be accomplished without incurring added institutional cost by increasing the size of some existing large-sized classes, which is not likely to have adverse effects on student learning because their existing size already puts them well beyond the point of optimal returns. For example, some introductory courses with enrollment caps of 40 students might be reduced by 25, thus creating an optimal class size of 15, while concurrently offered courses with enrollment caps of 60 students might be increased by 25, thus preserving the existing average class size for these two courses.

Naturally, implementation of this recommendation calls for a change in course planning and scheduling practices, which would involve more than simply deciding on what courses should be offered during a given term, but also what *range of course sizes* should be available to students each term. It would also call for a change in academic advising practices, whereby advisors would take a more active role in directing students to enroll in at least one seminar-sized course each term, particularly during their first year of college. If left entirely to chance or self-selection, first-year students are unlikely to consider class size in their selection of college courses, focusing instead on the content of courses and whether or not these courses fulfill degree requirements. As Light (2001) observed in his interviews with first-year students:

Nearly without exception, students who are struggling, or who are dissatisfied with their academic performance are taking nothing but large, introductory courses. When asked why they made these choices, nearly every student offers the same response: “to get my requirements out of the way.” Since many of the basic required courses have large enrollments, they make it possible for any student to become distressingly anonymous. Another disadvantage of using freshman year to simply “get the requirements out of the way” is that students may not find courses that truly engage them, that excite them. The result is that by the end of the freshman year (or by sophomore year at many colleges), when it is time to choose a concentration, a student may not yet have been “turned on” by any discipline (pp. 39-40).

By remaining cognizant of class sizes when counseling students, academic advisors could break this self-defeating cycle by intentionally and explicitly encouraging first- and second-year students to enroll in at least one seminar-sized course each term.

If a college or university is successful in reorganizing its distribution of class sizes to increase the number of seminar-sized classes available to lower-division students each term, then it may be able to use this practice as a marketing and recruitment strategy. College-guide books are already alerting prospective students to consider class size as an important factor in their decision making process. For instance, Lauren Pope, founder of The College Placement Bureau (a national organization created to help families make well-informed college choices) writes in a popular college guide: “What are class sizes, really? The institution may advertise a low student-faculty ratio, but don’t buy that. Ask particularly about the courses that all or most freshmen or sophomores have to take” (Pope, 1990, p. 106). Also, the most influential (and controversial) of all college-guide books, *America’s Best Colleges*—published by *U.S. News & World Report*, now includes class size (e.g., proportion of classes with 19 or fewer students) as one factor in its college-ranking criteria. Although the overall validity of this ranking scheme is questionable, its influence is formidable, so institutional attempts to offer a higher proportion of seminar-sized class may not only serve the altruistic purpose of promoting student learning and retention, it may also promote the institutional self-serving purpose of college marketing and student recruitment.

Furthermore, redistributing class sizes could also be done in a fashion that promotes good pedagogy. Rather than generating seminar-sized classes in a random or arbitrary manner, administrators could construct explicit criteria for evaluating the course syllabi of instructors who are interested in having one of their courses reduced to 15 or fewer students. Approval could be contingent on whether the course syllabus demonstrates clearly and specifically how the small class size will be utilized to implement effective teaching practices (e.g., reduced lecture time, increased instructor-student interaction, and more frequent writing assignments).

2. Reorganize the *Process of Instructional Delivery* in Large-Sized Classes

One strategy for minimizing the deleterious effects of large-sized classes, without incurring additional institutional cost, is by redesigning the process used to deliver them. The potential promise of this strategy is suggested by preliminary data collected from 30 postsecondary institutions of various types that are participating in the “Program in Course Redesign,” supported by Pew Charitable Trusts. These institutions are using information technology to infuse effective learning processes into the instructional delivery of introductory courses with large enrollments. Lecture time in these courses is being reduced or replaced by small-group and individualized learning experiences, which are delivered via online course-management systems (instructional software packages) housed in computer labs that are staffed by graduate teaching assistants and/or undergraduate learning assistants. These online programs provide modular (topic-specific) tutorials, which allow students opportunities for online discussions, frequent practice accompanied by automated assessment (online quizzes), automated grading, and immediate feedback—delivered via automated messages that are customized or tailored to specific student answers.

Preliminary results indicate that all 30 of the participating institutions have reduced the costs of course delivery by an average of 40%, while simultaneously generating gains in students outcomes, such as: (a) student satisfaction with course instruction, (b) attitudes toward the

course's subject matter, (c) course completion rates, and (d) college retention. In addition, 13 of these 30 institutions have reported a significant decrease in the number of students repeating the redesigned courses because they received an initial grade of "D," "F," or "W." This has lowered the total number of students enrolled each term, which in turn, has increased institutional savings by reducing the number of course sections that need to be offered. For example, the University of Central Florida calculated the savings stemming from a 7% increase in course retention in one introductory course. When the savings gained from this 7% increase in course retention rate is applied to 25 redesigned course sections, it results in an estimated \$28,064 cost savings each time the course is offered (Twigg, 2003).

Implications for Institutional Mission, Priorities, & Values

The savings generated by the course redesign strategies used by the aforementioned institutions naturally leads to the question: How should those savings be reallocated? For example: Should this money be reinvested in the lower-division undergraduate program to further improve learning—for example, to create more small-sized classes where there is bona fide teacher-student (human-to-human) interaction and more frequent writing assignments? Or, as some of these institutions are planning to do, should this revenue be reallocated to support upper-division and graduate courses, and reduce teaching loads to provide faculty with more time for research?

What colleges and universities decide to do with money generated by their lower-division undergraduate program is often a true test of the institution's priorities and values. Gordon Winston (1994) notes that, although colleges and universities are technically nonprofit organizations, "a fact about nonprofit institutions is that they can and usually do earn profits. What distinguishes them from 'for-profit' firms is that they can't distribute those profits to outside owners. So, what do schools do with their profits? They can use profits from one set of activities to 'cross-subsidize' other activities that the managers of the institution *want* to undertake" (p. 10).

While acknowledging that American higher education is comprised of diverse institutions with diverse missions, it is also true that the same institutions have multiple missions (e.g., general education and specialized education, undergraduate education and graduate education, teaching and research). Thus, it becomes possible for institutions to pursue one mission at the expense—literally and figuratively—of fulfilling another. Higher education scholars and reform agents have noted repeatedly that pursuit of research and graduate education has come at the expense of undergraduate education, particularly the general education of first- and second-year students. Money saved by delivering general education, arguably the most important component of a college education, in the form of large-sized classes often taught by the least experienced instructors or by graduate teaching assistants, has been used as a cost-effective strategy for cross-subsidizing the more valued activities of graduate education and faculty research. For instance, in his national review of general education programs, Jerry Gaff (1989) reached the following conclusion: "General education is usually underfunded. On most campuses it has the largest classes, the highest student-faculty ratio, the weakest teachers, and the smallest budgets (practices that help subsidize the more-valued specialized offerings) (p. 19). Similarly, Zelda Gamson (1992) reports that, "In many ways, general education is a classic organizational 'garbage can.' Administrators use general education to solve problems of enrollments, faculty morale, and finances" (pp. 70-71).

The Carnegie Foundation for the Advancement of Teaching (1991) conducted national research on postsecondary institutions that ranged from low to very high on a research-intensive continuum. (Research intensiveness was measured in terms of the institution's level of financial support for faculty research.) Results revealed that average class size for introductory undergraduate classes increased linearly with institutional level of research intensiveness, i.e., as research intensiveness increased, average class size for introductory courses increased commensurately. Institutions in the "very high" research-intensive category were found to have a mean size for introductory courses that was almost triple that of institutions in the "low" research-intensive category.

Consistent with these results are findings reported by Astin (1993), based on a 25-year longitudinal study that included a national sample of some 500,000 students and 1,300 institutions of all types. Astin discovered that institutions with a *research*-oriented faculty had some of the strongest negative effects on undergraduate outcomes investigated in the study. Among the adverse effects of a research-oriented faculty were: (a) negative effects on student perceptions of faculty as being student-oriented and negative effects on student satisfaction with faculty; (b) substantial, direct negative effects on students' leadership development, self-reported growth in public speaking skills, interpersonal skills, and tutoring other students; (c) negative effects on students' satisfaction with the overall quality of instruction and with the overall college experience; and (d) negative effects on students' overall GPA, likelihood of graduating from college, and likelihood of graduating with honors. (In fact, the only factor that was positively correlated with a research-oriented faculty was higher faculty salaries.) Astin reached the following conclusion with respect to these findings: "These results show clearly that there is a significant institutional price to be paid, in terms of student development, for a very strong emphasis on research" (p. 338).

The point here is not to devalue research, but to point out that vigorous pursuit of this mission appears to have adverse effects on undergraduate education. Some of these adverse effects may be mediated by excessively large class sizes for first- and second-year students, which are used as a cost-effective means to cross-subsidize the institution's research mission. This appears to be a clear case of the proverbial "robbing from Peter to give to Paul." Admittedly, it would be unrealistic to expect institutions with a long history of a research-intensive mission to jettison that mission and make dramatic reductions in lower-division class sizes. However, it would be reasonable to suggest that research-oriented institutions should attempt to alleviate this historic inequity by creative reorganization or redistribution of class sizes to generate more seminar-sized courses. The viability of this suggestion is supported by the fact that a growing number of research-intensive institutions have already managed to reorganize their first-year curriculum to offer small-sized "academic seminars" for first-year students, in which faculty teach course sections relating to their specialized research interests (National Resource Center for The First-Year Experience and Students in Transition, 2002). At the very least, research-intensive institutions should not exacerbate existing inequities by further increasing lower-division class sizes to cope with current budgetary constraints, nor should they continue to employ internal funding and political practices that reward departments for offering large-sized, lower-division classes. A disturbing illustration of such a practice is recounted by Page Smith (1990), former chancellor in the research-intensive, University of California system:

A "strong" chairman was someone who could negotiate more faculty positions for his

department than “weak” chairmen in rival departments. Faculty positions, called FTEs (Full Time Equivalents) in the University of California system, were the lifeblood of departments. The more FTEs a department could extract from the administration, the more powerful it became in relation to departments with fewer FTEs. One of the most reliable ways to accumulate FTEs was for a department to offer large courses required of all students or of all majors. Since FTEs were usually calculated on the basis of the number of students enrolled in courses taught in a particular department, the more students, the more FTEs. A premium was thus placed on large courses taught by a single instructor with a small army of poorly paid teaching assistants. In the FTE calculus, five hundred students in a required course in American history could provide a claim for several more FTEs. These FTEs would not, of course, teach in American history. Their primary responsibility would be to a small number of graduate students (p. 138).

While research-intensive institutions should resist fiscal and political practices that reinforce large class sizes, teaching-intensive institutions—whose historic mission has focused on undergraduate education—should resist the temptation to emulate research-oriented institutions. There is a growing trend in American higher education that has been called “mission gallop,” “mission creep,” or “mission drift.” These terms have been coined to capture the tendency of a number of undergraduate, teaching-oriented colleges that have been “galloping,” “creeping,” or “drifting” toward pursuit of a national reputation by imitating the practices of our nation’s most prestigious research universities. Unfortunately, this tendency to emulate or imitate has led to institutional practices that are at odds with their historic commitment to undergraduate education in small-class environments, and with their tradition of rewarding high-quality teaching and academic advising (The Pew Higher Education Research Program, 1992). As Gaff (1997) notes, “Because research universities educate and socialize virtually all future faculty members, these values have been extended throughout all types of institutions, even those with very different missions. We have seen a ‘mission creep.’ Comprehensive and liberal arts colleges have aspired to university status, adding master’s degree and eventually doctoral degree programs” (p. 686). A collective statement issued by legislators, institutional leaders, and senior policy analysts from 16 states captures the negative consequences of this trend:

Mission drift is carrying many institutions into full-scale retreat from the challenge posed by the changing character of students. Too many institutions seek to develop national reputations by imitating the behavior of the most prestigious research universities, at the cost of providing a quality education to the students actually enrolled in their courses” (The Pew Higher Education Research Program, 1992, p. 4A).

If there is a silver lining in this cloud, it is its demonstration that institutions of different sizes and missions are capable of altering their historical purposes and traditional priorities. If postsecondary institutions are capable of shifting priorities away from undergraduate education, then it is possible that institutional change can be made in the opposite direction—toward intentionally adopting policies and practices that elevate undergraduate education as an institutional priority. Indirect support for this contention is suggested by data generated from the National Survey of Student Engagement (NSSE) which indicate that, although small colleges generally are more effective at engaging (involving) students than large universities, there are

some large schools that do a better job than small ones. According to George Kuh, the principal architect of NSSE, “This finding should give some hope, if not inspiration, to people working at large universities, because there are places that have been able to shrink themselves psychologically or intentionally arrange their resources in a variety of ways to engage students” (Schroeder, 2003, p. 13).

Kuh’s interpretation of this finding in terms of institutional *intentionality* is reminiscent of John Gardner’s description of the freshman year experience “movement” during its nascent stages of development: “The freshman year experience efforts are manifested by their *deliberateness*, their effort to make things happened *by design*, i.e., those things that must happen if students are likely to be successful” (1986, p. 267)(italics added). It may now be time to apply this principle of “intentionality” or “deliberateness” to the redesign of class sizes for first-year students, creating more opportunities for them to experience seminar-sized classes, which provide a learning environment that is conducive to both student engagement and student success.

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