

Student performance in large classes

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Introduction

In the last decade, the Australian higher education sector has been compelled to accommodate burgeoning class sizes. In this climate, the continued provision of quality teaching and the maintenance of student satisfaction are important because student performance is linked to affective influences, such as feelings of inclusion and value. The problem with the research into the relationship between class size and quality of teaching is that it is overly dependent upon opinion surveys and student ratings of teaching efficacy. Although these measuring tools are useful, they assess student satisfaction and rating of teaching, not the relationship between class size and quality of learning (Gibbs, Lucas & Simonite, 1996). There are also fundamental biases inherent in the interpretation of students' ratings of their classes, which will be elaborated upon later.

Class size and student ratings

The predominant research into the effect of class sizes on student attitudes has been undertaken in the USA. Feldman's (1984) meta-analysis of this literature found 22 studies showing a negative relationship between class size and student ratings, 11 with curvilinear relationships (better ratings for very large classes than medium sized ones), 2 studies reporting no significant differences, and 2 reporting a positive relationship. Feldman concluded that large class size has a significantly negative influence on student ratings of teaching, most notably on ratings of the instructor's effectiveness and facilitative skills.

Students' perceptions of the quality of teaching received in different class sizes alter according to certain variables. For example, Crittenden, Norr & LeBailly (1975) discovered that students' ratings of their motivation levels, perceived learning and teacher sensitivity were the factors most affected by class size. This is because larger class sizes circumscribe students' opportunities to receive feedback and interact with other students and teachers. Crittenden et al. also reported that the relationship between class-size and students' satisfaction with their learning experiences were weaker in the disciplines of the natural sciences. But this finding is mitigated by the fact that students in these disciplines spend a significantly higher proportion of their contact time in small group work and lab sessions than students from other disciplines. Thus, Crittenden et al. propose that establishing a learning environment involving

coordinated sets of small classes, rather than large classes, will satisfy student preferences for interactivity and feedback and, thereby, raise course evaluation scores.

As aforementioned, these research findings are not objective measures of teaching efficacy in large classes. Many students express satisfaction for variables unrelated to those being measured, which has confounded results (Gibbs et al., 1996). That is, students have been known to give higher ratings to courses permitting low involvement or high absenteeism. These kinds of systematic biases in student ratings research impinge upon the validity of findings about the relationship between class size and student satisfaction.

Furthermore, much of the research in this area is dated and focused on the higher education system in the USA, rather than Australia. Student evaluations have always been of considerably greater importance in the USA than Australia, because they have significantly more power in determining the continued employment of staff, the continued operation of courses and the future recruitment of students (Gibbs et al., 1996). The market driven approach to higher education in the USA is partly responsible for prejudicing findings on the relationship between class size and student performance. Gibbs et al. argue that the lack of controls over the university sector has resulted in an absence of nationally recognised performance standards and 'grade inflation' in courses measured.

Class size and effective learning

The relationship between class size and effective learning was one of the first problems addressed by educational research (McKeachie, 1980). The debate in the academic literature remains controversial, due to conflicting research and entrenched belief schemas about the impact of class size on learning experiences (Williams, Cook, Quinn & Jensen, 1985). Many of the studies into the relationship between class size and learning outcomes have not been sufficiently large to rule out the confounding effects of other teaching and learning variables (Gibbs et al., 1996). The few studies that have measured educational efficacy in terms of performance suggest that larger classes have little effect on overall achievement when traditional achievement tests are used as measuring tools. But when the measuring tools or the variables being tested are changed, the efficacy of large classes is brought into question. For example, higher level thinking, application, motivation and attitudinal change are most likely to be developed in a small class environment (McKeachie, 1980).

Studies into the relationship between large classes and student performance have taken four main forms. The first of these has involved studies of the performance of the higher education system as a whole, as student numbers have increased over time. For example, MacFarlane (1992) examined the performance of the UK university system over a period of 20 years as student numbers dramatically increased. Despite worsening staff-student ratios and declining resources, the proportion of students receiving first or upper second

class degrees increased from 29.3% in 1969 to 47.7% in 1989. These kinds of studies fail to address the reasons for such increases and other findings (such as Gibbs et al., 1996 discussed below) maintain that patterns of individual performance have diminished with larger class sizes.

The second variety of research into the effect of class size on performance has involved comparing student grades and grade distribution in courses of different sizes. For example, Linsay and Paton-Salzberg (1987) analysed data from 1516 modules at a British college between 1981 and 1985. Their research revealed that a student's probability of gaining an 'A' grade was halved if they were in a module of 50-60 students, as opposed to a module of less than 20 students. Gibbs et al. (1996) also conducted research of this kind examining the relationship between student performance and class size over a ten-year period (1984-94) at Oxford Brookes University. Linear regression analysis demonstrated that after allowances were made for subject and year level, increases in module enrolments had a significant effect on mean module marks. Average module marks were reduced by over 1% for each additional 60 students enrolled. In addition, large classes (70+ students) produced an average mark of almost 3% less than smaller modules (20-30 students). Furthermore, an average of 10% fewer students in large classes received higher grades (A or B+) and 5% more received poor grades (C or F). A stronger relationship between class size and performance was demonstrated in certain subject areas than others, most notably engineering, psychology, technology and arts. The reasons for this finding were not investigated and confounding variables, such as the influence of personal relationships with teachers and markers on inflating grades, could not be ruled out.

The third group of studies into the relationship between class size and student performance involves comparisons of classroom interaction and measurements of various aspects of students' learning behaviour in various class sizes. Mahler, Neumann & Tamir, (1986) studied the interaction in discussion groups of medical students and found that as class size increased the quantity, duration and cognitive level of interaction declined. In smaller classes, interactions involved higher level cognitive processes (ie. analysis and evaluation of information), whereas in larger classes, interactions mostly concerned more superficial operations, such as comprehension and clarification of information. This evidence suggests that class size may affect the quality of the learning process, with increased class sizes producing qualitatively different learning outcomes. But this effect could be ameliorated by ensuring students in large classes were provided with opportunities and tasks involving higher-level thinking.¹

The final group of studies into the effect of class size on student performance involve experimental studies into the measurement of learning outcomes in courses where students are taught the same curriculum, but in different sized

¹ For ideas about how to encourage active learning see [Teaching and Assessment in Large Classes](#)

classes. For example, Raimondo, Esposito and Gershensberg (1990) examined student performances in first and second year economics courses after randomly allocating students to different sized classes. Their findings were consistent with other research suggesting that performance on standard tests is not affected by class size, but that performance on 'higher level' tasks (such as essays) is reduced in large classes. Raimondo et al. found that there was no difference in test performance by students from the different sized classes. They did find that students from the large first-year class performed significantly more poorly on a subsequent theoretical second-year course that required higher level cognitive skills.

The research into the relationship between class size and student performance demonstrates a recurrent link. Standard achievement tests fail to discern any differences in learning outcomes between students of large and small classes. It is measurements of higher level learning that reveal that students in large classes are disadvantaged. This is because larger classes traditionally result in fewer student interactions, or interaction at lower cognitive levels. Certain academics (such as McKeachie, 1999) suggest that a reorganisation and restructuring of the way large classes are delivered could deliver commensurate outcomes to small classes. They argue that the problem is that the 'traditional' methods of large class teaching fail to stimulate active, mindful thinking because they promote passive absorption of material.

Specific issues for students in large classes

It has already been highlighted that large-scale studies indicate that individual patterns of performance diminish with increased class size. Several case-based studies have attempted to do identify the variables responsible for this pattern. They have conducted surveys and interviews with students to examine the context-specific problems and, thereby identify teaching and management methods to overcome or minimise the problems inherent in large classes. This section outlines specific issues for students in large classes, drawing on educational research conducted as part of the AUTC Teaching Large Classes project (University of Queensland) and findings on the psychology of student learning.²

A common complaint of new students (including both mature-age and school leavers) is that they are unprepared for many of the requirements of the university experience. The evolution of tertiary education from an elite organisation to a mass participation system and the resultant burgeoning of class sizes has resulted in an increasingly isolating university experience, which has left a large section of the student population feeling anonymous, vulnerable and overwhelmed (McInnis & James, 1994; McNamara & Kelly, 1996; Ward & Jenkins, 1992). Social psychology research has shown that people who feel anonymous feel less personally responsible (Schlenker & Forsyth, 1980) and, therefore, ill-equipped to function in the university environment that is so

² [results from surveys.](#)

dependent on self-motivation and self-discipline (Holdaway & Kelloway, 1987). Furthermore, alienation from the teaching staff, deprivation of avenues of interpersonal interaction and a failure to provide social support networks undermine students' motivation to learn and increase student dissatisfaction with the learning experience (Astin, 1993).³ As a consequence, students in large classes feel as if they have been discouraged from asking questions, communicating with other students or approaching their teachers. For these reasons, large classes have been linked to a decline in intrinsic motivation for studying and increases in student attrition (Tinto, 1987).

There are a number of tactics that could be engaged to overcome many of the problems pertaining to the isolating effects of university life. First, advertising and promotional campaigns that accurately delineate the expectations of university life, as well as those entailed in specific study programs, can ease the transition for new students (Ward and Jenkins, 1992). Also, the employment of well-run tutorial or practical sessions, especially at the beginning of semesters can facilitate the formation of support networks that fail to form in large class environments. Hartley and Bahra (1992) introduced team-building and brainstorming exercises with large groups of part-time business students to facilitate the establishment of support networks. In their study, the students reported that the group exercises provided emotional, motivational and learning opportunities, which stimulated interpersonal relationships with other students. The establishment of such social support networks has a positive outcome for students, but also functions to alleviate the pressure on teaching staff from student inquiries. Finally, universities need to be able to provide formal student support services and peer-assisted learning schemes, because they have also been known to ease the transition to large classes inherent in the university experience.⁴

Students often find the large class experience overwhelming because they are exposed to a variety of lecturers and multiple or parallel tutorials and laboratory groups. Ward and Jenkins (1992) report that students express concern and confusion at receiving apparently conflicting instructions and information from different teachers of the same course. A recent study by UQ (2001) discovered that consistency could be preserved through frequent meetings, maintaining phone and email contact with teaching staff and employing experienced or senior tutors. In addition, the lecturers surveyed reported that employing past students of the course as tutors or laboratory demonstrators (often completing post-graduate study) improves the consistency of teaching.

Large classes where consistency has been assured by a minimisation of tutorials encounter different problems. In such classes, students have expressed concern at a lack of feedback and opportunity to ask questions. McKeachie (1999) suggests that the problem of a lack of feedback could be

³ See www.inform.umd.edu/edres/facres/cte/large/personal.html for ideas on personalising large lectures.

⁴ These and other strategies are addressed in the section on [Administration and management of large classes](#).

addressed by using peer-feedback techniques (such as where small groups read each other's written work), classroom assessment (such as non-graded quizzes) or interim assessment. He encourages teachers to allow draft copies of assessment to be submitted and promotes a system whereby students attach questions or suggestions for improvement. If staffing limitations preclude addressing such questions, they could be referred to small groups for students to discuss with their peers.

A major problem faced by students in large classes is the scarcity of learning resources (both material and human). Over-crowded computer and science laboratories and competition for limited library texts are still an impractical and unfair reality in some courses (Kelly, 2001). Gibbs et al. (1996) report that students are convinced that scarcity of such resources, combined with inaccessibility of tutors and slow and minimal feedback on assessment undermine their performance in large classes. The increasing response to this problem by academics and course coordinators has been to incorporate web based learning (WBL) tools into the teaching environment (Housego & Freeman, 2000). The use of WBL tools has become increasingly prevalent in recent years and has been used to manage entire courses while alleviating the demands on teaching staff and library resources. The simplicity of WBL systems, like WebCT, TopClass and Blackboard, makes their use in teaching a pragmatic option for many academics, including those operating without institutional support. WBL systems can be used to apply well established teaching strategies for students both on and off campus and, when accompanied by student-centred teaching practices, can improve teaching without imposing an unsustainable demand for resources.

Students in large classes often complain of losing focus and losing interest in their studies during the delivery of classes (Ward & Jenkins, 1992). This is due to a variety of factors including long periods of inactivity and sometimes (in the back rows) distance from the lecturer, as well as the lack of variety involved in the process. A common strategy used to maintain student interest has been to ensure students are given frequent and regular breaks (UQ survey, 2001). Students have also been requested to stand in groups where they are sitting and move to different (designated) areas, such as from the front to the back and vice versa (UQ survey, 2001).

A complicating factor that is difficult for academics to address is the heterogeneity of disciplinary and other backgrounds in large classes, especially first year faculty-core units (Ward & Jenkins, 1992). This may mean that the material presented is not necessarily relevant or comprehensible to all the students, as in a case where medical-related examples are given to agriculture students in a chemistry course. Some academics have dealt with this problem by grouping or streaming students according to their disciplines when presenting repeat lectures and tutorials, although this does negate the benefits of mixing students of diverse backgrounds. The other problem in this respect is catering for students with different background knowledge of the information

being presented. For students with some background knowledge of the area, the lecture may appear mundane, while for other students with no background knowledge, the lecture may appear incomprehensible.

Implications of the psychology of student learning

Maintaining interest in large groups is a constant challenge for teachers in all disciplines, though there are certain ubiquitous aspects of student psychology. Student concentration during a traditional lecture, where students are passively absorbing information, is psychologically constrained to a maximum of 20 minutes. The usual process is for attention span to increase steadily from the inception of the lecture over the first ten minutes, but steadily decrease from that point over the following ten minutes (Biggs, 1999). Because most standard lectures last an hour or more, students do not digest much of the content of standard or passive lectures. Students learn most effectively when they are physically or mentally engaged and, therefore, significantly more active thinking and problem-solving takes place during discussion groups than in lectures (Bloom, 1953; McKeachie, 1999). Research has demonstrated that tests given even a few days after lectures show decline in the information learned unless, during class time or shortly after, students are given a task requiring them to apply that knowledge, such as being set questions or short tests (Bligh, 1971; Rysberg, 1986). Active thinking and problem-solving activities assist memory and learning by maintaining attention with constant changes to the learning environment. Techniques to promote active learning in large classes include student questioning, learning cells, buzz groups and problem posting have been effectively used in large lectures (McKeachie, 1999).⁵

Memory and learning styles

Research into stimulating learning and memory demonstrate that the retention of data increases when multiple senses have been activated in encoding the information (McKeachie, 1999). A common strategy in large lectures is to combine the use of audio-visual materials (blackboard demonstrations, OHT's, videos, computer presentations containing tables, diagrams, figures, pictures, etc) to compliment information presented verbally. It functions to assist in maintaining the interest of the audience, but the combination of auditory and visual information also serves to enhance information retention (deHaan, Appels, Aleman & Postma, 2000). This attendance to multiple senses ensures the accommodation of various preferences for learning styles and for those who employ more than one learning style at a time (Bonacci, 1999). Instructors need to be aware of the various differences in learning styles and use appropriate methods of pedagogy and assessment to accommodate the various learning preferences of their students.

⁵ Further strategies used to keep students alert and interested are discussed in the following section on [Teaching and assessment in large classes](#).

Conclusion

Research into the psychology of human learning and motivation suggest that large classes are not as effective as smaller ones, especially for higher-level learning and interpersonal communication. Though the evidence does suggest that large classes are not as detrimental to learning as is often claimed or believed. Many academics and researchers (such as Waugh & Waugh, 1999) maintain that large classes can be very effective for inspiring and motivating students. When taught using methods that encourage interpersonal interaction and active learning, large classes can have comparable effects on student performance as smaller group settings.⁶

⁶ For further ideas and information, see the following section [Teaching and assessment in large classes](#) as well as the [Planning and Teaching guidelines](#) on this site.