Teaching and Learning in Large Classes at Ontario Universities: An Exploratory Study

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Introduction

Over the past decade, the Ontario postsecondary sector has experienced pressure from a number of societal forces (Clark, Moran, Skolnik & Trick, 2009). The demand for increased access to postsecondary education (PSE), which is moving higher education from an elite model to one of near universal participation, has resulted in undergraduate enrolment increases of close to 50 per cent over the past decade[1]. These increases are taking place in an environment where demands in other areas are also being made on institutions and faculty. Demands for increased accountability, demonstrated quality assurance and increased research and development responsibilities have placed higher burdens on institutions and faculty, which are intensified by tight budgets and limited resources. Institutions have responded to these pressures in part, by increasing average class sizes.   In 2009, about two thirds of Ontario universities reported that 30 per cent or more of first year courses had more than 100 students[2]. The average number of FTE students per full time faculty has increased from 17 in 1987 to 25 in 2007 (Clark, Moran, Skolnik & Trick, 2009, page 99).

The consequences of this and other adjustments on educational quality are unknown. Undoubtedly, these pressures will continue and intensify in coming years given projections of demand for PSE in Ontario, particularly for undergraduate degrees.   As a result, there is a need for the higher education sector in Ontario to identify the challenges and opportunities that are unique to large class teaching environments, as well as strategies to approach these issues, in order to maintain the quality of student learning in the face of rising class sizes.

A major problem in identifying trends with large classes is in defining what constitutes a large class. This will differ according to the discipline, the level and nature of the class (such as introductory or upper year, lecture, tutorial or laboratory), and the perceptions of lecturers and individual students. For the purposes of this study, a large class is defined as one in which a change in traditional teaching methods is deemed appropriate or necessary, so it may include an introductory class of 700 students or an upper year seminar with fifty.

Purpose

The research study is exploratory in nature and seeks to describe select approaches undertaken by faculty at Ontario universities in dealing with the challenge of maintaining teaching and learning quality in large-sized classes. Findings will provide an avenue for the sharing of information among practitioners and the sector at large and will inform future research funded by the Higher Education Quality Council of Ontario (HEQCO) involving the evaluation of selected innovative and promising practices.

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[1] Based on calculations using MTCU undergraduate full-time equivalent enrolment statistics between 1999-2000 and 2009-2010
[2] Institutional CUDO data, 2009, HEQCO calculations

Background

The Relationship between Class Size and the Student Learning Experience

Intuitively, there is an assumption that smaller classes provide better learning environments, but finding empirical evidence for this assumption is more challenging. To date, much of the class size debate has occurred in the elementary and secondary school settings. Fewer studies have assessed the impact of class size on the learning experience and outcomes in the postsecondary context, and even fewer still in the Canadian or Ontario context. The issue with many of the analyses is the difficulty in isolating class size from other factors which may affect student learning, including discipline, level of course, teaching methods, individual instructors, and student demographics, in order to draw clear correlations between class size and outcomes. In particular, teaching approaches and class size are "almost inextricably intertwined" (McKeachie, 1980).

Nevertheless, a number of studies at the PSE level have indicated that increasing class size generally has a negative effect on student retention as measured by persistence to completion (Ashar & Skenes 1993) and first-year retention rates (Keil & Partell, 1997). Conversely, the research on the effect of class size on student performance provides mixed results (Arias and Walker, 1997; Keil & Partell, 1997; Fenollar, Roman & Cuesta, 2007; Hancock, 1996; Kokkelenberg, Dillon & Christy, 2008; Raimondo, Esposito & Gerschenberg, 1990; Robinson & Wittebols, 1986; Schenk, Kinicki & Webster, 1994; Toth & Montagna, 2002). Findings varied according to the additional factors accounted for, other than class size, that may impact achievement, and the indicator that was used to measure student performance.

One of the most critical problems faced by instructors of large classes is that students feel isolated and are often anonymous to both the instructor and to one another (Svinicki & McKeachie, 2010: 273). Students who perceive that they are anonymous often feel less personal responsibility for learning, have decreased motivation to learn, and attend class less frequently (Cooper & Robinson, 2000).

It is not surprising, then, that class size has been found to impact negatively on student engagement. A review of the literature indicated that instruction in large sized classes yields reduced student levels of active involvement in the learning process, reduced frequency and quality of instructor interaction with and feedback to students, reduced student motivation and reduced development of cognitive skills inside the classroom (Carbone & Greenberg, 1998; Cuseo, 2007; Fisher & Grant, 1983; Iaria & Hubball, 2008; Kuh et al, 1991; TEDI, 2003; Wulff, Nyquist & Abbott, 1987). The findings of reduced levels of active class involvement and interaction in large-sized courses have implications for student success as student engagement has been strongly correlated with academic achievement, critical thinking, and student persistence (Pascarella & Terenzini, 1991; Tinto, 1993). These implications are particularly important for students in their first year of PSE, who are more likely to be enrolled in large, introductory courses, at the same time that they are most vulnerable to attrition.

Several analyses exploring quality of instruction indicate that instructor effectiveness, as measured by student evaluation, decreases with increasing class size (Bedard & Kuhn, 2008; Cuseo, 2007). In addition, the pedagogical tools used by instructors are also found to be affected by class size, with the traditional lecture found to be the dominant mode of instruction in large class settings (Cooper & Robinson, 2000; Cuseo, 2007).

Despite these findings, it is cautioned that the skill and competency of the instructor, the teaching methods used and the course design are likely more important factors affecting student learning than class size alone (McKeachie, 1990; Biggs, 1999; Atkinson, 2010).

What Contributes to High Quality Learning in Higher Education?

In the research on teaching and learning, of which a comprehensive review can be found in a volume edited by Christensen Hughes and Mighty, (2010), there is an assumption that high-quality learning depends not only on passing exams or the completion of a credential, but on the "nature of the knowledge, skills, and conceptual understanding that students have acquired during their degree course" (Entwistle, 2010, pg 19). Entwistle (2010, pg 22) goes on to share that the research on student learning indicates that an intrinsic student focus towards a discipline, one that seeks to understand content and to develop expertise in the field, leads to higher-quality learning, in contrast with an extrinsic focus, which is concerned primarily with the attainment of qualifications. The question is: how is an intrinsic focus to a discipline enabled in order to produce a high quality learning experience?

The approaches that students take to carry out their academic work have been categorized in the research as either "deep" or "surface" learning approaches (Marton, 1976). A surface approach to learning tends to be characterized by memorization and reproduction of information in a mechanical manner, often driven by a focus on summative assessment and grades. A deep approach to learning encompasses a genuine, motivating interest in the subject, involving critical thought, interpretation, integration of new knowledge with prior understanding, application and transfer of knowledge to new contexts, and retention. A deep approach to learning has been linked to an intrinsic orientation to the subject (Entwistle, 1998, as cited in Entwistle, 2010, pg 25), and is one of the factors resulting in more positive learning outcomes and a higher quality learning experience (Lindblom-Ylänne, 2010, pg 64).

Furthermore, research also indicates that the learning environment, including faculty teaching methods, influences students' approach and strategies to learning (Christensen Hughes & Mighty, eds., 2010). In particular, it is suggested that traditional transmissive pedagogical approaches, such as the lecture, contribute to less positive learning outcomes, such as poor retention and conceptual understanding of material, and novice attitudes towards the discipline (Weimer, 2010). Teaching methods that are student-centered, such as active learning, discovery learning, inquiry-based learning, problem-based learning, case-based approaches, and just-in-time teaching have been shown to enable a deep approach to learning on the part of students, and result in more positive learning outcomes (Prince, 2004; Weimer, 2010). Clearly, such teaching methods would be the preferred approach to ensure a high quality learning experience for students. Unfortunately, the research identifies the traditional lecture as the

most common teaching approach used in large postsecondary classes (Mulryan-Kyne, 2010; Cuseo, 2007). The challenge appears to be how to encourage the implementation of student-centered teaching methods in large enrollment courses.

Research on Teaching in Large Classes

There are few sector level studies exploring the types of practices being implemented in large classes. The Teaching and Educational Development Institute (TEDI) of the University of Queensland in Australia conducted a "Teaching Large Classes Project" (TEDI, 2003), which consisted of a review of current practices adopted in the teaching of large classes; issues that emerge in the teaching of large classes; strategies used to deal with the demands of teaching large classes; and institutional responses to the challenges involved. The review was followed by a dissemination phase which involved surveys of highly accomplished instructors and educational developers, as well as several national workshops. The authors identified two key messages from the project. First, that there are qualitative differences in the way good teaching practice is enacted in large classes: the number of students is not the critical factor, rather it is how good teaching principles are implemented. Secondly, the authors stress the implications of management of the course, particularly resource allocation. The large class issues identified in the TEDI report provide the framework of issues for this study.

However, much of the literature on teaching in large classes has been in the form of case studies which seek to describe, and in some instances evaluate, the implementation of a specific teaching strategy, group of strategies, or technology at the course level within a discipline.

A fair amount of research has been conducted on teaching and learning in the sciences. A recent overview of approaches for incorporating active learning specifically in large-class settings in the sciences is provided by Allen & Tanner (2005). More specifically, results from a study set in large enrolment undergraduate physics classes (Deslauriers, et al, 2011) indicated increased student attendance, higher engagement and improved learning as a result of implementing research-based instruction relative to the traditional lecture method. The experimental instructional approach was based on the concept of "deliberate practice" and included elements such as pre-class reading assignments, pre-class reading quizzes, in-class clicker questions with student-student discussion, small-group active learning tasks, and targeted in-class instructor feedback. Similarly, improved learning and conceptual understanding were reported as a result of the introduction of increased student participation, cooperative problem solving, and frequent in-class assessment of understanding in a large upper-level lecture course in developmental biology (Knight & Wood, 2005), and evidence for the positive nature of a cooperative learning environment in a large introductory biology course was provided from student interviews and evaluations (Ebert-May, Brewer & Allred, 1997).

As a response to some of the challenges identified in teaching large classes, the introduction of technology into large class settings has become widespread. A U.S. report highlighted the experience of several large-scale re-designs of large enrolment courses at a number of PSE institutions, primarily through the integration of technology into the teaching process (Twigg, 1999). The goal of each re-design was to improve quality while controlling costs. The paper

used a case study approach which focussed on planning methodology and actual implementation, with the aim of drawing lessons to be used as a guide to practice.

The use of personal response systems (clickers) in large classes is a commonly implemented intervention, with generally positive impacts on student engagement (Caldwell, 2007; Mayer et al, 2009; Patry, 2009). An extensive bibliography on research into the effectiveness or impact of clickers on student learning is provided by Vanderbilt University`s Center for Teaching[3]. In a meta-analysis of a variety of computer driven instructional technologies, Kulik (2003) found small but increasing positive contributions to learning over the time span examined. On the other hand, there are studies in which no significant difference in learning outcomes (retention, grades) between technology enhanced instruction versus traditional methods were found (Green & Gentemann, 2001; Savage, 2009).

Blended learning formats which use a combination of face-to-face learning and varying levels of technology are being implemented to address a number of large class issues. A number of case studies of blended learning models in large courses provide a discussion of implementation benefits and challenges (Day et al, 2004; Oliver, 2006; Greyling et al, 2008; Sana, Fenesi & Kim, 2010). Other studies explore the implementation of a specific technology to address a particular large class issue, such as student communication and interaction, providing a discussion of benefits and challenges based on qualitative feedback from students and faculty (Bezuidenhout, 2009; Day & Kumar, 2010). In a recent analysis of impact on student outcomes, Bloemhof & Livernois (2011) tested the effectiveness of a hybrid teaching technology in an introductory economics course, the results of which indicated student learning outcomes were as good, or better, than those in a traditional lecture based course.

Methodology

A qualitative research approach was used in the form of consultations with key stakeholders which included instructors of large university classes and university teaching and learning support staff. With the assistance of the Council of Ontario Universities, members of the Ontario Council of Academic Vice-Presidents were contacted. Their support was requested in identifying individuals at their institutions who were practicing innovative approaches to teaching large classes. A list of instructors and teaching and learning support staff was developed and in-person consultations were arranged. Informants were selected to ensure a variety of participating institutions, disciplines and levels of courses taught. A semi-structured discussion guide was used to maintain consistency in the consultations. Informed consent was obtained from all participants and the consultations were audio-recorded to aid in note-taking. The discussions were transcribed and analysed thematically.

The limitations of qualitative research methodology signify that the findings are not generalizable to the population, but provide an indication of the perceptions and experiences of those individuals consulted. The sample of instructors consulted was a select group of individuals who had been recommended by the institutional Academic Vice-President or

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[3] http://cft.vanderbilt.edu/docs/classroom-response-system-clickers-bibliography/

Director of the Teaching and Learning Center, and so represent a group of highly motivated and committed faculty.

A list of participating institutions is included in Appendix A and the discussion guide is included in Appendix B.

A discussion forum was held on March 23, 2011 at HEQCO offices to allow for the sharing of practices and discussion of large class teaching strategies among a number of practitioners. A list of participating institutions is included in Appendix C.

Findings from Consultations

Issues in Large Enrollment Classes

A framework of broad issues in teaching large classes that was based on findings from the literature was used to provide a starting point for the discussions with the informants (TEDI, 2003). The five themes included:

- Student issues: motivation, interest, interaction, heterogeneity of needs/backgrounds, students at risk;
- Course management and curriculum issues: curriculum and course design, human resource coordination and management, human resource training and professional development;
- Resource and institutional support issues: teaching and assessment resources, budgeting, space and equipment requirements, staffing, institutional support for large class teaching;
- Teaching and learning strategies;
- Assessment: setting valid/authentic assessment, providing feedback, marking load and management, standardization of assessment and marking.

Although the issues are discussed individually, they are inter-related and instructors frequently commented on how factors affecting one issue resulted in subsequent consequences for others.

Student Issues

Feelings of isolation & anonymity
Student diversity
Number of at risk students
Distractions and behaviour issues
Student attitudes
Student engagement
Deep learning

There was consensus among most informants that classes with large numbers of students intensified a sense of isolation and anonymity among students. The lack of opportunities for the instructor to get to know students, and for students to form relationships with peers was cited as a disadvantage to large classes. This isolation in large classes was seen to result in students taking a more passive role to learning, being less likely to participate in class activities or take responsibility for their own learning, and more likely to be distracted. With greater numbers of students, the number of distractions and behavior issues increased. Many instructors commented on a general lack of civility in large classes: increased side conversations, students coming late or leaving early, distractions associated with inappropriate use of technology, and attributed some of this behaviour to the student perception that "no one cares," or "no one notices." It was generally agreed that a passive attitude to learning, lack of student motivation, and minimal opportunities for faculty-student interaction were major factors affecting student engagement and the likelihood of higher order, deep learning on the part of students. Instructors also commented on the negative reaction of many students to cooperative learning settings where they were answerable to or dependent on other students. Rather, it was felt that many students valued only those approaches which were oriented towards exam preparation and ensured positive grades.

Increased student diversity as a result of greater student numbers was also a frequently cited issue. Greater diversity in culture, ethnicity, social background, academic ability, motivation and interest were seen to create problems for instructors in determining at what level to "pitch" the material, and in identifying students at risk. Greater numbers of students requiring accommodations or special attention posed challenges for instructors in terms of time requirements. In addition, many large classes are at the first year level, and first year students bring with them a range of transition issues which need to be addressed, posing challenges for instructors.

However, a number of instructors also indicated that large numbers of students in a class provided opportunities for positive teaching and learning experiences. Many viewed increased student diversity in large classes as an opportunity for exploring multiple perspectives on course content and made use of it as a teaching tool. Several spoke of the increased energy in a large class which in turn motivated the instructor to "put on a big show." The opportunity for an instructor to have a positive influence on the educational pathways of large numbers of students was also noted as an advantage to teaching large classes by a number of instructors.

Course Management and Curriculum Issues

Administrative duties
Management duties
Communication requirements
Requirements for training/professional development of faculty and TAs
Time for faculty-student interaction

Greater numbers of students in the classroom led to increased administration and management responsibilities for instructors. Large classes often employ large numbers of teaching, instructional and/or administrative assistants, which require coordination, management and

training, which in most instances fell under the responsibility of the instructor. Courses taught as separate sections by a number of instructors required collaboration and coordination of numerous aspects of the course, such as curriculum design, choice of resources, and common assessments. Lack of such coordination between sections ultimately led to problems with consistency of content and quality.

A number of the large enrolment courses had undergone a substantial curriculum or course re-design, which required a one-time major investment of time and resources, but once implemented, would only require further modification as needed.

Many instructors noted that large classes required greater investment of time and resources for up-front class preparation, that an instructor was required to be much more organized and structured in teaching a large class. It was felt that anything that went wrong in a large class would have repercussions for many students, whereas in smaller classes, the effect would not be as far reaching, and there were greater opportunities for improvisation. A negative consequence of this need for structure in large classes is the lack of spontaneity to make last minute changes in response to current circumstances or events.

Finding efficient ways and time to communicate with a greater number of students was a challenge cited by all instructors, as were the greater communication needs in courses with numerous teaching and support personnel.

Instructors who were implementing strategies to address various issues in large classes often indicated that a time commitment to some form of training and/or professional development was necessary. In some instances, availability of and access to appropriate training was a problem. Lack of knowledge about alternative approaches and lack of confidence in their implementation were cited as reasons for the need of professional development. Examples included training on new technology or software, curriculum development, development of appropriate assessment tools, and relevant pedagogical practices and research. Conducting research into pedagogy and keeping abreast of recent advances in pedagogical approaches and new technologies were time consuming activities that instructors identified as necessary to improve the large class experience.

Resource and Institutional Issues

Insufficient funding, human resources, and/or time
Availability of appropriate physical spaces
Union issues
Institutional support and culture

Large classes were perceived to be a direct consequence of budgetary constraints. In some instances, decisions were made at departmental levels to increase class sizes of introductory, survey courses, in order to reallocate resources to upper year courses or courses serving discipline majors. In almost all cases, instructors identified a need for additional funding and human resources.

Most instructors also described challenges related to the availability of appropriate physical spaces, although this varied by institution. Large class lectures are often held in tiered lecture halls or auditoriums, with fixed seating, inadequate writing surfaces, poor sound or lighting, and with the instructor at the front of the class at a podium, often a fair distance away from most of the students. Such a space was not seen to be conducive to many of the potential strategies which could be used to enhance student engagement, such as group activities or discussions. For technical courses like engineering, sciences and medicine, the availability of properly configured design studios and laboratories were critical to the success of the learning experience. The availability and scheduling of appropriate testing rooms for the assessment of large numbers of students was a noted challenge, as was the availability and scheduling of smaller classrooms to be used as tutorial spaces.

A number of instructors who used peer assessment as a strategy noted difficulties with graduate student unions representing Teaching Assistants (TAs). Unions raised concerns over the use of undergraduate students as teaching assistants or for peer evaluation an as infringement on the responsibilities of paid graduate TAs. Several instructors also commented on the lack of support that they received from their faculty unions with respect to recognition of the value of teaching responsibilities relative to research.

Most instructors associated all of these issues with the level of institutional support for teaching at their university. Many commented that the culture within the university was one that favoured and valued research over innovation in teaching, and cited as evidence the tenure and promotion process. The lack of incentives for change, the self-perceptions of faculty, and how they understood their roles to be defined, contributed to the persistence of traditional teaching approaches. It was perceived that implementing alternative approaches in the classroom was a potential risk to career progression under the current institutional culture. In particular, the reliance on traditional student evaluations for measuring teaching effectiveness was noted. Instructors commented that implementing innovative teaching strategies sometimes resulted in negative student evaluations, as students often perceived more active, learner-centered approaches as the faculty member not "doing his/her job." Some instructors were of the opinion that many students preferred a passive role in learning and had the expectation that it was the job of the instructor to simply provide them with the information.

The lack of resources, and in some instances, expertise, to adequately and appropriately assess teaching strategies was also cited as an issue for faculty, who indicated that rigorous, empirical evidence on the outcomes of such approaches would provide justification and support for their further development and implementation.

Conversely, the majority of instructors implementing new strategies acknowledged that they received strong support from their dean or department chair and from the university teaching and learning center, without which they would not have been successful.

Teaching and Learning Issues

Upfront preparation time
Instructor-student interaction
Challenges to implementing active learning strategies
Opportunities to promote deep learning

All instructors indicated that in order to effectively teach classes with large numbers of students, a large amount of pre-class teaching preparation was required. This commitment extended beyond typical lecture preparation and included activities such as curriculum design/re-design; pre-recording lectures, presentations, targeted messages, guest speaker interviews; development and maintenance of course websites, communication platforms, and resource materials. The greater time requirements for preparation and management of the course consequently reduced the time available for individual instructor-student interaction.

Developing clear objectives for the course and well articulated learning outcomes for students was an important first step for many of the instructors consulted, in determining the teaching approach to be used. Although some felt that if the primary aim of the course was to acquire basic facts of the discipline, the traditional lecture was an adequate and efficient method of accomplishing this, most instructors argued that the goals of their course were more far-reaching, and that the traditional lecture format was not an appropriate approach. Course objectives often included outcomes such as the ability to creatively and independently solve problems, critical thinking skills, effective communication skills, the ability to work individually and in groups, the ability to integrate ideas from various fields and disciplines, and lifelong learning. Most instructors concurred that such outcomes required the implementation of approaches which encouraged contacts with and among students, stressed active and reflective learning, provided opportunities to apply knowledge in varying situations, and personalized teaching to diverse learning styles and needs.

In many cases, the sheer numbers of students in a large class posed a challenge for the implementation of such approaches. It was noted that principles of good teaching and learning such as communication and negotiation, applying theory to practice and encouraging higher level reasoning were more difficult to integrate into the large class context. Personalizing lectures, engaging and maintaining student attention and encouraging interaction were also seen as challenges. Most instructors understood that active teaching and learning strategies were integral components of deep learning and a quality education, and expressed concern over the difficulties in their implementation into large classes.

There were a number of instructors who indicated that large numbers of students enhanced their teaching approach. For example, the use of humour in a lecture was noted to elicit a greater response from a large student audience relative to a small one, and a number of instructors made use of this "large audience" effect and the energy in the large class in planning their instructional approaches.

There was consensus among those instructors implementing new approaches that individual strategies be introduced gradually or sequentially in order to gauge what works and what doesn't, and to ease the transition process for both the instructor and students.

Despite the challenges, instructors are exploring and implementing alternative teaching strategies in large classes. The approaches are discussed thematically in Section 5.2 and individually in Appendix D.

Assessment Issues

Opportunities for formative assessment
Challenges to setting valid / authentic assessment
Challenges to fairly assessing a diverse mix of students
Marking load and management

All instructors agreed that high student numbers and constrained resources limited the assessment methods available to them and the amount of assessment that could be conducted. Specific issues identified included: excessive marking loads, managing valid assessment, providing sufficient and prompt feedback, monitoring academic dishonesty, maintaining quality and consistency of marking, and challenges in efficiently assessing higher order thinking.

In many instances, primarily as a result of limited resources, instructors resorted to using multiple choice assessments. The challenge with this approach is to ensure valid assessment; that is, that the approach actually measures the learning outcomes which it is meant to assess, including higher order thinking skills. A common criticism of multiple choice examinations is that they assess learning at a much more superficial level than other forms of assessment, and in the process encourage surface learning strategies.

Provision of authentic assessment opportunities, that is, evaluation using tasks closely related to those potentially used in the relevant discipline or profession, was cited as problematic with large numbers of students in terms of the need for multiple assessors.

Providing opportunities for formative assessment were difficult with large numbers of students as this approach also required considerable human resources for marking and feedback. Similar challenges were cited in providing differentiated assessment opportunities for students in order to address diverse learning preferences and needs of students. When larger numbers of assessors or markers were used, ensuring quality and consistency of marking, providing training, and management and coordination of those individuals was a major time commitment required of the instructor. A similar heavy time commitment was required in monitoring issues such as plagiarism and cheating, which became more challenging with larger numbers of students, multiple assessors, or the use of online evaluation strategies.

Strategies Used in Addressing Large Class Issues

Following is a thematic discussion of the approaches being used by faculty who were consulted. Although the themes are discussed individually, there is substantial overlap in the types of issues addressed by the each of the strategies discussed, alluding to the inter-relationship of the issues. A brief description of a sampling of individual strategies employed by course faculty in a number of disciplines at various Ontario universities is included in Appendix D.

Creation of a Sense of Community

All faculty expressed concern over how to communicate a sense of caring and concern for student success in large classes where one-on-one interaction was difficult. It was understood that a student's sense of belonging and ability to connect with teaching staff and other students played an important part in fostering student engagement and better learning outcomes. Many expressed it as "how do I cultivate a sense of community in a course with so many students." It was articulated by a number of instructors that being part of a course community would give rise to the sense that "we, students and faculty, are all in this together" and "are all part of the discovery process." Ultimately, the goal was to encourage students to take more responsibility for their own learning.

In a number of courses, particularly in the sciences and business fields, supplementary tutorials and laboratories provided students with the opportunity for a small group experience, where they could more easily interact with TAs, other students, and in some cases faculty.

Almost all instructors used strategies in the large lecture to alleviate isolation and anonymity by encouraging interaction and engagement to some extent. Teaching techniques included think-pair-share, collaborative learning, question and answer with and without the use of personal response systems (clickers), circulating among students during the lecture, as well as being available before and after the class for informal interaction. Personalizing the lecture by learning even some of the students' names, incorporating personal anecdotes, and understanding the nature of the diversity in the classroom were methods instructors used to convey a sense of caring for individual student needs.

Furthermore, instructors of large course increasingly turned to technology to create a sense of community for students. Extensive course websites provided not only basic course information and resources, video or audio recorded messages targeted for particular purposes, but also made use of discussion boards and chat rooms to provide alternative mechanisms for communication. A number of instructors used a variety of social media communication platforms such as instant messaging, Facebook and twitter, in addition to or as an alternative to traditional email, telephone and in person contact. The objective was for the online platforms to become a virtual gathering place for students and teaching staff in the course. However, in order for an online communication strategy to be effective, the instructors indicated that they themselves and their TAs needed to have a strong presence on the various platforms.

Using social media as an educational strategy takes advantage of the fact that students are already on these platforms in the classrooms, often seen as a distraction in the class.

Instructors shared the sentiment that "we may as well join them if they are there already." In several cases this type of communication vehicle was used during class time as a way to promote in class interaction. For the most part, instructors attempted to maximize the number of mechanisms by which students could interact with the course teaching personnel, but agreed that a reasonable balance was needed in order to accommodate the additional time commitment to monitor a large number of communication avenues.

Another mechanism by which faculty are targeting the isolation and anonymity felt by students, particularly first year students in large classes, was through peer mentorship programs. Embedding a structured and sustainable system into a course by which small groups of first year students were provided academic and social support from trained upper year students was a strategy implemented by several instructors.

Improving Efficiency through Reallocation of Time and Resources

The fiscal constraints that most universities are under have resulted in departments and individual faculty implementing measures to make more efficient use of resources. Increased numbers of students have added to the time faculty must spend in course preparation, communication, administration, and management.

One of the most common strategies to address those issues has been to increasingly use technology for communication and administrative tasks. Provision of basic course resources and information, communication with students and other course personnel, administrative tasks such as recording grades were, for the most part, all done online, most commonly through the institutional Learning Management System (LMS). Use of commercial assessment software was common as it provides a source of testing material and a mechanism for student feedback and assessment, thus easing the marking burden for teaching personnel and resulting in more time for instructor-student interaction. For similar reasons, the use of scan-able multiple choice assessment tests was an unpopular but common tool employed by instructors of large classes.

Many instructors used technology to pre-record (audio or video) lectures, interviews, targeted messages, and assessment feedback. All indicated that despite the large initial investment, once created, these resources could be re-used with adjustments when needed, and could save time in the long term. A number of instructors were also making use of shared open-source resources, on-line learning objects and test banks to make more efficient use of preparation time.

Using technology to provide much of the administrative and basic or theoretical course content allowed the face-to-face classroom time to be used more effectively for active learning purposes. Furthermore, time in large lectures was sometimes reduced, or even dispensed with completely and supplemented or replaced by small group tutorials led by TAs.

In several instances, deliberate decisions were made to combine smaller sections of a course taught by multiple instructors into one large lecture section taught by one instructor, and to reallocate the resources to provide for supplementary small group tutorials led by TAs. This

strategy realized some cost savings, but also addressed the issue of consistency of content and quality across the course, which ultimately saved time in subsequent student communication.

Several of the very large courses have assembled a diverse educational team to share the work, with the lead instructor supported by senior TAs, lab coordinators, technologists, educational assistants (EAs) and administrative assistants (AAs) who ease some of the burden of administration, communication and management. Commonly, graduate and undergraduate TAs, lead tutorials, labs, conducted most of the marking and provided student support.

Promoting and Supporting a Culture of Teaching

All instructors consulted agreed that the success of any strategy was dependent on departmental/faculty support at a minimum. Most indicated that they had received support from their institutional teaching and learning center, where one existed, in the form of resources, training and professional development. Instructors at institutions where more tangible commitments existed such as the support of the scholarship of teaching, the establishment of teaching stream faculty, investments in an institutional teaching and learning center or team, and including teaching excellence in the promotion and tenure process, appeared to be more willing to risk implementing innovative strategies in large classes. Instructors who had made radical changes in course design or delivery shared that direction and support came directly from the dean or chair of their department or faculty. In addition, most teaching and learning support centers offer online resources, workshops, consultation, and opportunities for professional development. A number of institutions have implemented a teaching large classes task force or initiative, which seeks to provide support for faculty on this issue.

Most institutions offered some form of recognition for teaching excellence, such as teaching awards, as a way of supporting and rewarding a culture of teaching. The University of Toronto (UofT) took this process one step further in creating a Teaching Academy[4] which consists of recipients of the President's Teaching Award at the institution. Individual members of the Academy serve as teaching ambassadors and the collective advances teaching as a valued pillar at UofT. In addition, most of the Academy members participate in an "Open Doors on Teaching" program[5] in which faculty members can arrange to observe and consult with an Academy member. This open class model has been adopted at a number of universities.

In a number of institutions, communities of practice have been developed to provide collegial support for teaching in large classes. These provide an informal forum where faculty and educators from within a discipline or from multiple disciplines share experiences and lessons learned about dealing with large class teaching issues

All instructors making use of graduate and/or undergraduate TAs indicated that appropriate training of TAs was critical to providing effective support for students in large classes. Most instructors provided such training over and above the university teacher training which is offered

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[4] http://www.teaching.utoronto.ca/academy.htm
[5] http://www.teaching.utoronto.ca/academy/open-doors.htm

to graduate students by the offices of graduate studies at many institutions. In several instances, training for undergraduate TAs was provided through their enrolment in an upper level undergraduate course in leadership, mentorship, or education, which includes a practicum component consisting of a TA-ship or mentoring in a large first year class.

Where larger teams of teaching personnel are used in a course, instructors indicated that a collegial and collaborative approach, where TAs and EAs felt supported and valued, resulted in the most effective outcomes for both the teaching team and the students.

Moving Away from the Traditional Lecture?

Likely a result of the sampling process, most of the instructors consulted had a keen interest in the research on teaching and learning in higher education. Some were involved in carrying out research, and most had consulted with experts in their respective teaching and learning centers. The goal for most was to develop and implement teaching approaches that were based on the evidence found in the pedagogical research.

Primarily as a result of limited resources, a number of faculty continued to use the traditional large lecture as the principal delivery model, but incorporated a number of in-class strategies to maintain student attention and interest, promote student engagement and foster higher order learning. These instructors found ways to ensure that students were rewarded for attending the lecture. Some considered the large lecture as a performance requiring a certain amount of physical presence and showmanship. One instructor commented that a good lecture should be like an engaging story, with an exciting plot that reaches a high point, and a satisfying conclusion. Personalizing the lecture, introducing relevant anecdotes as examples of concepts, using humour, and sharing the passion and enthusiasm for the discipline were common strategies employed to engage students. Varying the rhythm of the class every twenty minutes by introducing small group discussions, individual tasks, or videos, was a strategy used to maintain student attention and interest.

Several instructors did concede that implementing such time consuming active learning strategies required a reduction in the amount of content that could be covered in the course. Any reductions in content were made to more closely align with the course learning objectives or outcomes, which include generic skills such as critical thinking, communication and teamwork, and which are more appropriately developed through active learning strategies.

The use of technology as a teaching tool during the lecture was a common trend. Instructors were experimenting with tablet computers as an alternative to static PowerPoint presentations to allow for increased interaction, and personal response systems were commonly used for that purpose as well. Communication using technology was cited as a strategy to "meet students where they already are," giving rise to in-class use of texting, social media platforms and email to provide for interaction between students and the instructor and between students themselves.

Conversely, the majority of instructors consulted were moving away from the traditional lecture as the primary venue of learning. Most were moving to some form of a blended learning model

which involved the combination of traditional face-to-face instruction with online learning materials such as web-based learning modules, interactive demonstrations and other electronic tools. In order to be successful, this model required that students be responsible for much of the content acquisition prior to attending the lecture component, and most instructors encouraged this through incentives and assessment. In some cases, this allowed the instructor to format the live lectures to explore more challenging and interesting aspects of the course material. Alternatively, face-to-face time was used more as a tutorial would be, for illustrating application of the basic theoretical content in a variety of contexts and finding ways to encourage higher order learning, often achieved through small group problem-based learning, group project work, case study approaches, or discussion groups. In some cases the large lecture was abandoned altogether for smaller tutorials, in others, there was some combination of lecture and supplementary small group experience.

Instructors using blended learning models agreed that it was an approach that encouraged learner-centered teaching. Approaches such as web lectures and the provision of online learning materials offered an opportunity for students to customize their learning according to their specific needs.

It was clear from the consultations, that implementing alternative approaches in large classes resulted in greater enjoyment of the teaching experience, although this finding may likely be an artefact of the faculty sample itself. A number of instructors commented that the changes were implemented, in part, as a result of their own dissatisfaction and discomfort with the more traditional approach.

Student assessment in large classes was identified as a challenging issue by all faculty consulted. Most instructors used a multiple choice format on at least a portion of the evaluation scheme as a means of reducing marking load for themselves the teaching team, and in many cases this process was automated. Many of the instructors had undertaken some form of professional development in order to learn how to better design multiple choice questions that would actually assess the intended learning outcomes of the course, including higher order learning.

A number of instructors developed ways to provide opportunities for formative assessment, generally in a tutorial or lab setting. As an efficiency measure, this type of assessment usually took the form of team project-based learning experiences, but occasionally involved individual assignments. These activities were generally supervised and assessed by graduate students, but in a number of instances, the process also involved a self- or peer-assessment component as a means of increasing the amount of feedback provided, without increasing the burden on the instructor or graduate TAs. In an effort to provide a more customized approach to student evaluation, a number of instructors offered some form of differentiated assessment, which empowered students to engage in the learning process by making their own choices.

Summary and Conclusions

Given the projections of demand for PSE in Ontario, particularly for undergraduate degrees, it is likely that large university classes and the challenges in large class teaching are here to stay. What is encouraging from the findings of this exploratory study is that many faculty are seeking out creative ways of adapting their teaching approaches, through being informed by research and connections with other colleagues, as well as professional development to enhance their pedagogical knowledge and skills.

Implicit is, that although large classes may have arisen as a response to fiscal constraints, effective teaching approaches in large classes are not necessarily less costly in terms of resources. For many faculty, improving efficiency through reallocation of resources simply allowed them to remain within their current resource limits. However, time demands for researching, designing, implementing and testing new active teaching approaches can put additional pressure on faculty already busy with research and/or institutional demands. Furthermore, the use of technology and blended learning models, a common approach in dealing with large class issues, require significant investment in hardware, expertise and development, particularly in the early stages. Additionally, teaching large numbers of students requires sufficient and appropriate human resources, if not in terms of faculty, certainly in terms of trained and committed teaching support personnel.

Implementing change, in itself, can be challenging. Modifying large group teaching approaches requires a change in mindset, not only on the part of the faculty in breaking with tradition and taking the risk of implementing new strategies, but also of students, in that more of the responsibility for learning will lie with them. Success of the teaching approach will depend, in part, on student understanding and acceptance of the concept that learning is a collaborative experience between instructor and learner. A shift in institutional culture in terms of the value placed on teaching is a further necessary condition for success in modifying teaching approaches. Without incentives for change, clear definitions of faculty roles, and institutional support, the risks involved for faculty may outweigh the benefits.

This report is not meant to condone large classes, but most postsecondary educators agree that their continued presence is likely. What the findings of this study indicate, is that the challenges involved in teaching large university classes can be overcome with appropriate vision, support and cooperation of institutions, faculty and students. Exploring ways to enhance these conditions is the next challenge.

An important outcome of this study was to identify and highlight innovative approaches to teaching in large university classes. Rigorous evaluation or assessment of the outcomes of these strategies in order to further contribute to the scholarship of teaching and learning was a need identified through the consultations with faculty. Upcoming research funded by the Higher Education Quality Council of Ontario (HEQCO) seeks to evaluate pedagogical practices that aim to enhance the quality of student learning in large classes, and will build on the research into teaching and learning in general that is supported by HEQCO and currently underway.

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Appendices

Appendix A

List of Participating Universities

Institution	Discipline/Course	Level
McMaster	Geology	Intro
McMaster	Economics	Intro & 2nd yr
McMaster	Psychology	Intro
McMaster	Chemistry	Intro
McMaster	Psychology	Upper
McMaster	Media Studies	Intro & Upper
McMaster	Engineering	Intro
Brock	Psychology	3rd yr
Brock	Health Sciences	Intro
Brock	Psychology	2nd yr
York	Biology	Intro
York	Kinesiology	2nd & 3rd yr
York	Humanities	Intro
York	Psychology	3rd yr
York	Business	1st yr
York	Dance Studies	2nd yr
UOIT	Health	2nd yr
WLU	Business	1st yr
WLU	Business	1st yr
WLU	Organic Chemistry	2nd yr
WLU	Global Studies	1st yr
Waterloo	Business	1st yr
Windsor	Mentorship	1st yr strategy
Windsor	Foundations of Academic Writing	1st yr
Windsor	Functional Anatomy	1st yr
Windsor	Human Factors and Work Performance	2nd & 3rd yr
Windsor	Psychology	1st yr
Windsor	Biochemistry	3rd & 4th yr
Ottawa	Psychology	Undergrad
Ottawa	Psychology	3rd yr
Ottawa	Community Health (Nursing)	4th yr
Ottawa	Biology	2nd - 4th yr
Ottawa	Anatomy (Medicine)	1st yr med stds
Ottawa	Chemistry	1st yr
Carleton	Psychology	1st, 2nd, 3rd yr
Carleton	Law	2nd yr
Queens	Engineering	1st yr
Queens	Political Science	1st yr
Queens	Education	B.Ed.
Queens	Geography	1st yr

Institution	Discipline/Course	Level
Queens	Media Studies	2nd yr
UofT	Astronomy	1st yr
UofT	Engineering	1st yr
UofT	Organic Chemistry	1st yr
UofT SC	Biology	1st yr
Lakehead	Chemistry	1st yr
Lakehead	Psychology	1st yr
Lakehead	Geology	1st yr

Appendix B

Discussion Guide for Consultations

DISCUSSION GUIDE
Teaching and Learning in Large University Classes

Explanation of study and interview procedure:
- HEQCO is conducting research exploring how teaching and learning quality in Ontario's PSE sector has been affected by the consequences of pressures such as increased enrollment, constrained funding, and increased research responsibilities of faculty.
- The purpose of this study is to describe, using case studies, select approaches taken by faculty in Ontario universities in dealing with the challenge of maintaining teaching and learning quality in large-size classes.
- The information gathered in this review will potentially inform a future project involving the evaluation of selected innovative and promising practices. As mandated, HEQCO research is made public, and provides an avenue for the sharing of information amongst practitioners and the sector at large.
- As a HEQCO researcher, I will guard your privacy. Your name will not be used in the final report. With your permission, the name of your institution, the field of study/subject area of your course and the approximate size of your class will be identified in the final report.
- The audio recording of this interview will be used for the internal purposes of writing a report and will be labeled with a pseudonym so it won't be linked back to you personally. Audio recordings and any written notes will be stored in a secure location on HEQCO premises.
- Please be aware participation in the study is voluntary, that you may withdraw from the study at any time, you do not have to answer a question if you don't want to and your participation in the study will in no way affect any relationship you may have with your institution or with HEQCO.
- I am now formally requesting your written consent to proceed with the audio taped interview which should last about 30 minutes.

Have participant sign Informed Consent Form.
Press record on audio recorder and place in centre of table.

Warm-up (3 – 5 minutes)

1. In general, what do you see as the major issues/problems in teaching large enrolment classes.
   Probes
   - Use framework to tease out specific issues:
     - Student issues
     - Teaching management and curriculum issues
     - Administration, resourcing and institutional issues
     - Teaching and learning issues (including use of technology)
     - Student assessment issues

Establish context for understanding large class teaching strategy employed by participant

Large Class Teaching and Learning Strategy/Approach (15 minutes)

As you know, we're interested in describing select approaches taken by faculty at Ontario universities in dealing with the challenge of maintaining teaching and learning quality in large-size classes.

2. Tell me about the large class course that you teach and your responsibilities as a faculty member.
   Probes
   - What is the course, at what level is the course, is it a keystone course
   - How long have you been teaching this course and do you teach it on your own; if not, are you the lead instructor
   - How many students are enrolled
   - Has enrolment been increasing
   - What other responsibilities do you have besides teaching and what is the approximate proportion of time spent on each

Understand faculty responsibilities and specifics of course

3. Tell me about the strategy or approach to teaching that you are taking in your large class course.
   Probes
   - What specific factors lead you to implement the strategy that you are using
     - Use framework to tease out specific factors
   - Describe your course teaching strategy: exactly what you are doing in the course and how
   - How it is addressing the factors that you mentioned
   - What is the reaction (if any) to the strategy, from students, from other faculty, from department and institution

Learn about the specific teaching strategy, the issues it addresses, how implemented

4. Did you require any training or additional resources to implement this particular strategy?
   Probes
   - Workshops, support from institutional teaching and learning center
   - Additional staff, TAs, funds?
   - Tech support?
   - Was the support sufficient/helpful?

5. Describe some of the things that have made it hard or easy to implement this strategy?
   Probes
   - o Funding/resources/training
   - o Staff requirements
   - o Institutional/departmental support
   - o Time commitment
   - o Student buy-in
   - o Physical space
   - o Technological issues

Challenges to implementation

6. Has any assessment of the strategy been conducted?
   Probes if yes
   - o What type of assessment and when was it conducted?
   - o What were the findings? (including effects on student attendance, in-class participation, etc.)
   - o Challenges to assessment.
   - o What type of additional evaluation would you like to conduct, if any?
   Probes if no
   - o Reasons why not.
   - o What type of evaluation would you like to conduct, if any?

Assessment of teaching strategy

7. Have you had the opportunity to share your strategy or approach with other faculty or the sector at large?
   Probes if yes
   - o How and when
   - o Challenges to sharing, if any.
   Probes if no
   - o Reasons why not.

Exportable to sector

8. Can this approach be applied to other courses, other fields of study or other institutions?

Summary (5 minutes)

9. I'm finished with prepared questions. Is there anything else you would like to add?

Fill in any leftover information gaps.

Thank you.

List of Participating Institutions in Large Class Discussion Forum on March 23, 2011

Institution	Discipline/Course
Brock	Psychology
Carleton University	Educational Development Centre
University of Guelph	Economics
McMaster University	Psychology
Queen's University	Centre for Teaching and Learning
University of Toronto	Centre for Teaching Support & Innovation
University of Toronto, Scarborough College	Biology
University of Ontario Institute of Technology	Health Science
University of Waterloo	Accounting
University of Windsor	Mentorship
Wilfrid Laurier University	Business
York University	Business
York University	Communications Studies
MTCU	
HEQCO	

Selected sample strategies employed by faculty at various Ontario universities in a number of disciplines.

Brock University

Third Year Psychology, Research Methods Course

This is an upper year course with highly motivated students, many of whom have aspirations for graduate studies, and are therefore, concerned about grades. The most recent class size was approximately 60 students taught as one group, an increase from about 40 students who were traditionally taught as two groups of 20.

The course includes an intensive and heavy writing component: two short practice reports and a full-scale manuscript based on data collected and analysed as a group. The challenge lies in providing relevant, timely and in-depth feedback to students. Traditionally, marking has been conducted by a team of teaching assistants. However, with increased student numbers and no corresponding increase in resources, a more creative and efficient method of assessment was required in order to maintain the level of writing required in the course and to provide the same quality of feedback to students with the same number of TAs.

The new strategy employed is the use of individual MP3 audio feedback in conjunction with written feedback on students' writing assignments, which has been successfully implemented by another faculty member for thesis students. This process is a progressive one in which

feedback is provided by TAs on consecutive drafts of the students' work. The rationale is that a greater amount of higher level feedback can be provided more efficiently in an audio format, and will supplement written comments on the actual document. The goal is for the audio feedback to be targeted at organization and structure, and to be applicable to future work rather than specific only to the paper submitted. Students also have the opportunity to review the feedback at their own pace to incorporate it into their work.

The success of the strategy is contingent upon ensuring consistency of feedback from the teaching assistants. This requires an investment of time on the part of the faculty member to train the TAs, develop an assessment rubric and ensure alignment of the audio and written feedback. It also requires organization of TA time scheduling as this process needs to be incorporated into the number of hours allocated for TA marking.

Second Year Psychology, Research Design/Statistics

This is a second year focussing on research design and statistics, with about 450 students.

The strategy employed in this course addresses the challenge of providing detailed feedback to a large number of students on homework assignments / problems and test questions. For each problem on a test the faculty member records an audio explanation of the solution, discusses common errors that students made, and if needed creates a brief audio tutorial.

A similar process is used for homework assignment questions. The faculty member has created a bank of several hundred homework problems from which the assignments are drawn. Audio explanations of the solutions are posted on the course LMS once the assignments are submitted or the graded test papers have been returned.

This process allows for an explanation of the solution to the question rather than just providing the answer, why a particular approach or technique is used, and also allows for connections to be made between questions which are similar. The strategy requires an initial investment of time on the part of the faculty member in creating the bank of homework questions and recording explanations, but once created, the audio files can be reused with occasional updating and additions. It is used as an efficient way of providing feedback to large numbers of students and has reduced the number of students seeking individual help from the faculty member and TAs on assignments and test questions.

Introductory Health Sciences

This introductory course traditionally enrolled 400 students, but due to budgetary constraints enrolment has been restricted to about 260. In part to find an efficient method to address the large waiting list of students for the course, a compressed two-week version of the course was piloted in the spring semester of the academic year. This version of the course was offered only to those students who were non-majors. As a pilot course, it had an enrolment of about 89 students.

The compressed course involved two instructors, each taking one week of the class. Classes were held on campus from 9 a.m. to 6 p.m. on Monday through Saturday. Each day included two-hour morning and afternoon lectures presented by the instructors, each followed by one-hour online seminars supervised by three TAs. The day ended with a one-hour faculty office hour, followed by a fifty minute online test on the day's material. An exam on the week's material was held on each Saturday afternoon. Each day of instruction was equivalent to two weeks of the traditionally formatted course. Approximately eighty contact hours were provided in the compressed format.

The course content of the compressed and traditional-length course was identical: same lecture material and textbooks. The difference lay in the seminars. In the traditional-length course students were required to prepare presentations and written assignments. In the compressed course, seminars were offered entirely online, and although interactive components were offered to promote engagement, there was no major written component required. The online nature of the assessments did allow for immediate feedback to students on their progress.

The course required a major investment of up-front preparation time on the part of the instructors, including online technological issues, but a mechanism is now in place should the course be offered in this format again.

The compressed nature of the course required the students to be motivated and keep up with the course work. It allowed students the option of completing a credit in a time span of two weeks, which was attractive to students working either full-time or at summer jobs. It is also a potential option to accommodate additional enrolment in the course in a cost-effective manner.

Carleton University

Second Year Law, Research Methods Course

This second year required course was traditionally taught in smaller three hour weekly sections (35 students each) by sessional staff. A deliberate decision was made for two instructors to collaboratively develop and teach the course as one large 1½ hour lecture section each week, supplemented by weekly 1½ hour small group tutorials run by TAs. There are approximately 240 students enrolled in the course, 180 in class and 60 through Carleton University TV. The change in format provided for a more unified course and for more control over the content presented.

The course curriculum has been designed to focus on one theme which helps to address expertise issues on the part of TAs, and limits the focus for students.

Lectures deal with concepts/theories and give a broad perspective of the material. Lectures are used to disseminate information, and to engage students in discussions on sources related to the concepts that are introduced. Forums are held during lectures which include panels with faculty members or guest speakers and which provide a dialogue between students and faculty on how research in law is conducted.

Tutorials are aligned with the lecture material but are more hands on, practical, and prepare students to complete assignments in a small group experience. Support and feedback for students is provided by the TAs in the tutorials.

Technology has been used to broaden and deepen the class experience, and to provide an efficient way to engage large numbers of students. Guest speakers (e.g. judge, legislative drafter) are interviewed and the interviews are video-taped and posted on the LMS. The videos are integrated into the course material and are used to engage students in the material. The plan is to create topic based modules which can be accessed as needed. Technology is also used to provide resources for students and ease communication issues with large numbers of students. The LMS is used for posting relevant readings, assistance with research skills (e.g. screen shots produced by the law librarian with voice over on how to use electronic databases, videos on use of library resources), lecture slides, frequently asked questions for assignments, for email, and for submission and return of assignments. Discussion boards are available for general class discussions, with TA discussion boards for the tutorial groups, as well as virtual office hours.

Management of the course by the two faculty members is very time consuming, particularly up front. Collaboration is required to develop materials and resources, readings, assignments, TA workshops and TA training. TA training is offered each week before tutorials and is conducted by the faculty instructors in collaboration with the law librarian. Training is provided not only for marking but also for tutorial leadership skills, and for monitoring and posting on discussion boards. However, once many of the resources and materials are created, they can be re-used with some adaptation if needed.

The goal of the course is to excite and engage students with research, and to provide them with transferrable skills and desire for lifelong learning and inquiry.

Lakehead University

First Year Introductory Geology

This is a first year introductory geology course, taught by one faculty member, which is a requirement for those students majoring in geology. Enrollment is approximately 270 students, 25 of whom are at the Orillia campus attending via synchronous videoconference. To accommodate scheduling, the lecture is held in the evening. Laboratory sections, of 20 to 25 students each, are held weekly and are led by TAs. Due to limited resources labs are a requirement only for students majoring in geology or a related discipline, but other students may choose to take them if they wish. Most (but not all) non-majors choose to take the course as a lecture-only course without a lab. The large diversity of student interests, backgrounds and learning styles is a major issue in this course.

During the first lecture of the class, students are asked to introduce themselves to the instructor in a one paragraph email assignment. The instructor uses this information to better understand and address the diverse interests, learning styles, and needs of the students. In order to address the anonymity students feel in large lectures, the instructor employs a number of

strategies such as circulating in the classroom and speaking to students at the beginning of each class, learning at least some students' names, and encouraging students to talk to each other and ask questions. Lecture notes/slides are not posted in an effort to promote attendance. Lecture slides are more visual than textual and are used more as a support to the lecture. Interest in the subject matter is promoted by at least one optional field trip in the semester for students in Thunder Bay and in Orillia, which is reported on and referred to throughout the lectures.

McMaster University

First Year Introductory Earth and Environmental Science

This course is an entry level course for earth sciences, environmental sciences, and geography and it is open to anyone in the university as an elective. The course is capped at 400 students, due to classroom capacity. The main issue being addressed by the strategies used in this large class is to improve student engagement through an inquiry mode of learning.

The large lecture is supplemented by weekly one hour labs run by TAs. Lab groups are approximately 25 to 30 students each, which provides the opportunity for small group interaction and practical, hands on experiences. TAs are a big part of this process and are a conduit for student feedback to the instructor. As such, TAs must be well trained and must commit to the common course philosophy, which is to improve student engagement through inquiry mode of learning in the lecture and the lab, to engage students through exciting them, have them use critical thinking skills in the course and encourage them to want to learn.

The purpose of the lecture is to build up knowledge and skills but also to generate enthusiasm and interest. Parts one and two of the lecture are used predominantly for disseminating content and the third part is used as preparation for the lab, or as tutorial time. Films or guest speakers appropriate to the course content are often used as well. Case studies and scenario-based approaches are used, the labs and lectures are very visual, and a field trip is organized for all students (two groups of 200). These strategies are employed to make the material more personal and relevant to students in order to increase engagement and motivation of students through excitement, and to promote deep learning. A sample lecture strategy used to address students' feelings of disconnection from the instructor is the "muddiest points" box. Students are asked to submit any questions they don't feel comfortable asking about in class to the box, and these questions are dealt with at the beginning of the next class.

The success of the course is contingent upon the well-organized and informed hierarchical instructional team: Professor, Instructional Assistant, Head TA, Senior TAs and Junior TAs. The need for high quality TAs and good communication within the team requires that much time is spent on training and informing the TAs, and this takes place down the hierarchical chain. The faculty member directs the large management component of labs, provides a structure for the course and spends a large amount of preparation time before the course starts to ensure that everything is set up in advance.

Introductory Economics

This first year macro economics course is taught by one instructor, enrolls about 2500 students per year, and is taught in sections of 400 to 600 students, two sections in the fall and three sections in the winter semesters. The course was originally taught by a number of instructors in smaller sections of 200 students, but was redesigned to be taught as one large course taught by one instructor with TA support in order to address consistency issues across the various sections. The course consists of only a lecture component, there are no labs or tutorials. The main issues identified in this large class are student engagement, student assessment and communication issues.

An online homework and online experiments commercial software program is being used as an alternate presentation method, a way for students to become engaged, and a way to provide ongoing feedback and assessment during the course, not just at the end, with minimal effort or resources from TAs.

The lecture is augmented with the use of a tablet computer in class which enables drawing diagrams in real time, the use of personal response systems (Clickers) and short 3-4 minutes movie clips to promote engagement and to break up the lecture. In order to encourage note-taking, lecture slides are not posted, but podcasts of the lecture are created and posted after the lecture is presented. Once created, the podcasts can be reused with occasional amendments.

TA time is used primarily for marking tests and exams which are <u>not</u> in a multiple choice format. A major time commitment is required of the faculty member in the organization, preparation, and planning of the assessment of students in the course.

Introductory Psychology

This introductory, first year course is one semester in length and enrolls approximately 3200 students. It is taken by almost every first year science student and the majority of social science students as a prerequisite for further study, and also as an elective by a large number of students. The course was redesigned four years ago to use a blended learning model, redefining how the in-class time was used, although the various components have been introduced gradually over the four years. The change was made in part, to address the increased diversity in the student population: providing a delivery model that students could customize to meet their specific needs. The redesign was also aimed at improving student engagement: motivating and inspiring students and showing them that the material is interesting and important. In addition, the model provides multiple channels of communication between students, and between the faculty member and TAs and students.

The model consists of weekly one hour live lectures led by the faculty member, weekly one hour small group tutorials led by TAs, online web modules posted on the LMS and a learning lab drop in center.

The primary course content is presented weekly in online interactive web modules which can be accessed anytime or anywhere internet access is available. The modules consist of pre-

recorded lectures synchronized with slides; posted resources and links; entirely searchable content; options to communicate with other students or the online TAs through a live chat room, on a shout wall or by email; options to self-test with checkpoints that provide feedback, participate in polls, and post links.

The in-person lectures are presented by the faculty member and provide context and application of the course materials in a colloquium-like experience. The live lectures build on the materials presented in the web modules, provide case studies and real life applications. This is where student interest and inspiration is piqued. Students are expected to view the web modules and complete the assigned readings before attending the lecture.

Students meet weekly in tutorial sections of about 25 students. Tutorials are led by paid, undergraduate TAs enrolled in a third year Applied Educational Psychology course in which training and tutorial preparation is provided concurrently with the coursework. In the tutorials, a small group experience is provided through the review of challenging material, guided discussions and activities, and question and answer sessions. In addition, the **learning lab drop-in center** is available to students during the week to catch up on web modules and speak with instructional staff.

This is a resource intensive course in that it makes use of an instructional assistant, a large number of paid TAs, and a full-time multi-media specialist in addition to the faculty member. A large investment in time is made by the faculty member in developing the course materials and resources, pre-recording the web module lectures, hiring and training the TAs, and preparing the live lectures. However, once the pre-recorded materials are complete, they can be re-used with occasional updating.

Introductory Chemistry

The first semester introductory chemistry course is a service course aimed at all science students and typically enrolls about 1300 to 1400 students per semester. The course is taught in lecture sections of about 350 students by a number of faculty who work from one set of course notes that were developed collaboratively in order to promote consistency of content material. One faculty member is the course coordinator who works closely with the lab coordinator to manage the course and the TAs. Labs are held five times per semester and are run by TAs. Voluntary tutorials are held concurrently with the lab sessions and are also staffed by TAs.

The LMS is used to manage communication with and provide resources for students. Skeleton course notes are posted before and a full set of notes are posted after the lecture is held, weekly tutorial questions are posted, course notes are archived, non-mandatory online homework using a commercial software product is available to provide student feedback, and a discussion board is available for topic based discussions and questions.

Student engagement in the lecture section is promoted by the use of live skit demonstrations, concept questions and Clickers, which provide for just-in-time teaching and instant feedback for

students. However, in-class chemical demonstrations to illustrate concepts and promote student interest are increasingly restricted due to resource limitations.

Assessment in the course is largely through multiple choice tests. Faculty members have invested in professional development to ensure that question design is appropriately linked to the course learning objectives.

Upper Year Psychology

A number of second and third year psychology courses are taught by one experienced faculty member, each as a single section. Enrolment in the courses ranges from 160 to 300 students. The faculty member uses a traditional lecture approach, promoting student engagement and interest by the use of humour, story-telling, appropriate pacing and breaks, case studies and applications. The "stage presence" of this faculty member is an important tool in sharing enthusiasm with the students. Providing some active learning opportunities such as "one-minute papers", small group work, and voting or polling on questions are strategies used to promote higher level learning. Being available before and after class for questions, getting to know even some students by name, and providing some personal information (within reason) help to increase a sense of contact and deal with the impersonality and anonymity often felt in the large class.

Resources are also provided online using the LMS. Resources include audio recorded lectures, sample quizzes which provide feedback, and an online discussion forum to facilitate additional communication between students and with the instructor and one course TA.

Communication Studies

A number of second and third year communications studies courses are taught by one faculty member with TA support for student evaluation/assessment. Enrolment ranges from 50 to 160 students and the courses are taught as single sections, supported by small group tutorials led by TAs.

As humanities courses, writing skills are a core competency.   In order to develop and evaluate students on this competency, and provide a mechanism to promote student interaction, students are required to do weekly online journaling based on an opening question, which becomes more challenging as the semester progresses. The journaling assignments also have a critical reflection component to provide feedback to the instructor. The online discussions are monitored by the faculty member; in the larger classes only a sample of the student journals are monitored. The journaling is then brought into the lecture, beginning each class with a dialogue about the journal discussions (anonymously). Midway through the semester, a formal peer evaluation (ungraded) is used which allows for feedback which students can draw on for further expansion in their journals. The faculty member evaluates all journals at the end of course, as well as students' evaluative techniques of their peers. The goal of the journaling, in part, is to produce communicators who can speak and write about concepts. The online environment for the journaling allows for interesting, low risk, low barrier student engagement early on in the semester.

Lectures are seen as the place where passion for the subject matter can be shared, a place to tell stories and to elaborate a lengthy argument or idea. Lecture notes and journaling questions are posted in advance to allow students to listen actively during the lecture. Think-pair-share techniques are used to break up the lectures and keep students engaged. Small group work is also implemented for group projects. A voluntary problem based learning activity is available for a smaller number of students: the faculty member uses contacts in the community to provide group project experiences. The outcomes of this work are then shared with the entire class, and feeds into the journaling for all students.

Management and training of the TAs, monitoring and evaluation of the journaling process and group projects, management of the peer evaluation system and building relationships with community partners for the service learning projects all pose major time and resource commitments for the faculty member.

First Year Introductory Engineering

This first year introductory engineering course typically enrolls about 850 students and is taught by one faculty member. The course was recently compressed from a one year to a one semester format. Course lectures are supplemented by weekly two hour tutorials of about 30 students each, which are led by TAs, and which consist mainly of group project work illustrating the concepts presented in the lecture. The major challenges identified by the faculty member were physical space and logistical issues, managing the course, and aligning lecture material with the project work done in the tutorials. The large number of small group tutorials required to accommodate all of the students resulted in substantial duplication of staffing and effort, and difficulties in room and resource scheduling. A larger design studio, accommodating 200 to 250 students, would be a more efficient venue for delivery, in that the faculty member could present a short lecture on a concept to the entire group, followed by problem application in small groups led by TAs in the same room. This would also facilitate alignment of lecture content and concept application, which would improve student learning.

In order to ease the burden of TA management, the course moved from using a large number of part-time TAs to a smaller number of full-time TAs. Smaller numbers of TAs allows for each TA to develop some expertise in the material to better support students, allows for more consistency in grading and presentation, and facilitates adequate training of the TAs by the faculty member.

Communication in the course is facilitated by the LMS: each project group makes use of a blog for communication among group members. Message postings are monitored by the TAs and the faculty member.

Queen's University

Engineering

This first year engineering course enrolls approximately 700 students and is taught in 3 to 4 sections by two faculty members. The course is structured in three modules:

A problem analysis based module, using model eliciting activities, which are complex open ended, realistic scenarios. The focus of the module is to develop complex problem solving skills. One lecture is held every two weeks over the semester. Lecture sections are further divided into groups of 78 for studio sessions, led by TAs. A problem is introduced and framed in the lecture; problem solving procedures, content about decision making, and technical concepts are discussed. In the studio, students work in pairs at computers on solving the problem guided by TAs. An innovative learning space would be ideal for this module of the course. One which would allow for the combination of all components into one session (lecture and tutorial, concepts and application) would integrate all parts of the module.

The design of experimentation module is an investigative module. Students work on designing an experiment based on techniques used in typical chemistry or physics labs.

The project design module is a more independent module. Workshops on design, team skills, communication and conflict resolution are held using guest lecturers such as the librarian and a practicing engineer. Online instructional modules are also provided in tandem with the workshops. This module involves design projects done with community groups, as a form of community service learning. Students work in groups of four with the community client and are supervised by trained and paid fourth year students who act as mentors. This approach provides benefits for both mentors and mentees. About fifty mentors, each supervising four teams of students, meet with each group for one hour each week, in addition to other training and support tasks. Each mentor commits to approximately nine hours per week per semester. Contact between course personnel and students, is provided through the mentors. The strategy allows for an opportunity for small group work but still provides structure in the course.

There are no major lecture components to the experimentation and design modules, they are based primarily in the lab or on the project.

This approach requires substantial organization and management. It requires a different responsibility for the instructor; there is not as much lecturing but much behind the scenes time is spent in organization, supervision and training of TAs and mentors, providing feedback on and revising projects.

Political Science

This first year, full year political science course is taught in two sections of 350 students. One instructor teaches both sections in the fall semester, a second instructor teaches both in the winter. The instructor consulted has rethought the purpose of the lecture and has moved away from the idea that the lecture is the primary delivery mechanism for content or information. The

instructor uses the lecture time to get students excited, engaged, and interested in the subject and to prepare them for later mastery of the material.

The first month of the course is more about socialization issues for first year students, which are not related to political science but are important, and dividends are seen later. A consequence of this is that it leaves less time for content. The instructor's teaching approach has also changed to address the increased student diversity in the class terms of background and ability.

Lecture capture is used: taping the instructor speaking and also providing slides. This approach has changed the behaviour of students in the class by allowing them to listen, think and ask questions rather than frantically writing; students have the opportunity to review lecture later. It improves the efficiency of delivering material/content and sets a tone early about allowing and encouraging questions. Interestingly, it has not affected attendance.   Some content is sacrificed, but the point of the lecture is to spark the imagination and get students excited. Once excited they have the opportunity to explore other resources provided by the instructor.

Clickers are also used as a mechanism for students to provide feedback on a variety of questions, on whether they understand the concepts presented, and to track attendance.

Tutorials are offered to provide a parallel track with lectures, providing real life examples and application of concepts discussed in the lecture.

Education

This course in the teacher education program, enrolling approximately 500 students, was originally a course with a large number of sections taught by adjunct faculty. It was restructured as two lectures of about 250 students each, taught by one faculty member, with seminars of forty students led by TAs. The change was made primarily to ensure consistency in content and quality in the course.

Student engagement is promoted in the lectures by the use of stories, pop culture, video clips; the use of humour or emotion, short activities, or small surveys to provoke discussion.
The TAs, all teachers, are mentored through the process, which provides for high retention of TAs from year to year. The instructor and TAs work as a collaborative team, sharing expertise and strategies to improve the course.

Geography

This first year geography course had an enrollment of approximately 430 students and was taught as a large traditional lecture section by the faculty member with the assistance of TAs. An experiment to test blended learning strategies was implemented this year with a cohort of 180 students. Lectures from the previous year were captured on video and provided to students in the experimental class. Students are responsible for viewing the lectures, and reading the text outside of class time. The course is divided into 3 tutorials of sixty students each, held once a week for one and a half hours, led by TAs and the instructor.

Tutorials consist of class exercises that explore concepts in course. They begin with a short i-Clicker quiz on the lecture and text material for the week, which requires that students come to class prepared. The subsequent class exercise is done in smaller groups of six or ten students, and sets students up with a problem. TAs and the instructor circulate to help and answer questions. Each group prepares a poster presentation on their work and presents to another group who evaluate. The presentations and process are also evaluated by the TAs and the instructor in a debrief session immediately following the tutorial. In this way, course work is done steadily throughout the entire term, although a final short answer exam is also used for student assessment.

The strategy allows for increased interaction with students and the instructional team, and greater opportunities for active learning. This approach involves a major time commitment in developing online materials (although recorded lectures can be re-used with occasional updating), training TAs and in face-to-face time with students. Making the strategy sustainable with larger numbers of students will be the next part of the experiment.

Media Studies

This is a second year elective course enrolling about 1000 students, taught by one faculty member.   It is offered as one lecture per week, with no tutorial sections. The faculty member has made use of multiple technologies and communication platforms to promote interaction and engagement in the course. Much of the learning activity takes place outside of the weekly lecture time.

The lecture is interactive, using Clickers to do live polling, allowing for students' perspectives to be reflected in the presentation. A multi-media PowerPoint presentation is part of the lecture, with multiple embedded videos and some class discussion.

Upper year undergraduate students who previously took course are paid to attend the lecture and record observations, providing pedagogical feedback. They meet with the instructor after each lecture to debrief and this feedback is used to adjust the course.

The lectures are video-taped by paid upper year undergraduate students. Paid student editors edit the films and lecture slides to provide visually appealing lecture highlights and post them on an open source platform, providing a resource for review, or for students unable to attend the lecture.

The course has a live twitter feed and upper year students are paid to tweet during the lecture, modeling and encouraging other students to do so. This horizontal communication provides highlights of what is being said and questions in the lecture. Students are sometimes asked to check facts online and tweet the answer to everyone. Re-tweeting by students amplifies the questions and answers. The rationale used is that students are online anyway, it may as well be used as an educational tool and bring students back into the lecture.

The instructor has followed students into social media, responding to their needs and demands for more technology. There is a branded facebook page for the course to promote student

interaction, such as posting videos, asking questions, reproducing polls, exchanging lecture notes. There are also threaded discussions for the course on facebook and on the LMS. The instructor monitors all of the communication platforms to stay informed of what the students are discussing. In order to ensure that all of the platforms are integrated into the course, the instructor is involved and has an online presence.

This course requires an extensive time commitment from the faculty member, in terms of learning about new technologies and how to use them; hiring, training and debriefing the undergraduate student assistants; and monitoring all communication channels/platforms.

University of Guelph

Introductory Microeconomics

Traditionally, this course was taught in sections of approximately 300 to 600 students. Students were required to attend three one-hour lectures per week.

In 2010, the format of one section of about 300 students was redesigned as a hybrid course, in order to free up classroom contact time for more productive teaching and learning activities. Pre-recorded lectures and resources are provided online for students, with the expectation that students familiarize themselves with the material before coming to class. The requirement is for students to read the textbook, watch the videos and take notes based on this material. The section is divided into three smaller groups, and students are required to attend only one one-hour class per week. Class time is now used to engage students in active learning activities such as discussions of applications of theoretical material, group problem based learning activities, and simulation games.

University of Ontario Institute of Technology

Health Studies

This is a second year, one semester, and a required course in the BScN program that enrolls approximately 150 students. All students at UOIT receive a high performance laptop computer for use within the undergraduate programs that comes loaded with course-specific software and access to a high level of individualized IT support on an as-needed basis.

Several strategies have been implemented to improve opportunities for developing connections with students, and to better meet the needs of the diverse population of students in the class. Many of the students are mature students, commuter students, who worked full time and had family commitments and, therefore, needed flexibility in educational delivery. Originally taught as one large lecture section, it was divided into two smaller sections. The course was redesigned to be delivered in a hybrid format, which reduced the in person lecture component of the course from three hours per week to ninety minutes per week, with the remainder of the course interaction conducted online.

Case studies and facilitated discussions based on case studies are conducted during classroom time. Answers to the case studies are not posted online, which encourages class attendance. Additionally, the mid-term and final examinations place considerable weight on case studies similar to those discussed in class. There are specific expectations for what students are required to do online and in class: that at least 6 hours per week is spent on study outside of the classroom time; students must come to class prepared using the online resources (case study, PowerPoint, readings, text). A personalized course homepage was developed on the LMS with weekly modules consisting of face-to-face and online components. Communication with students is primarily through the LMS email, weekly discussion board assignments and Skype. Online learning objects have been developed in collaboration with other faculty to deliver content, using interactive approaches such as games, audio files, podcasts, movies, experts sharing experiences/thoughts, and online discussions.

Knowledgeable TAs, who are nutrition professionals, assist with the design, support and marking of the major assignments for the course, and online communication with students.

This course requires a major commitment of time and resources in the collaborative development of the hybrid model and learning objects, although once developed, these materials can be reused with adjustments when needed. Management of the TAs and communication with students on various channels also require major investments of the instructor's time.

Faculty members have successfully applied to an internal "Teaching Innovation Fund" to access funding for the design, implementation and evaluation of learning objects. Further, faculty rely heavily on multimedia staff employed in the Centre for Teaching and Learning to build capacities related to the use of new information communication technologies (ICT) for teaching and learning. Because UOIT is a technologically rich institution, core faculty are evaluated on their use of ICT for teaching and learning.

University of Ottawa

Undergraduate Psychology

Introductory undergraduate psychology is taught as sections by a number of instructors. Enrolment in each section is about 250 students. The faculty member consulted presents lectures in real time to on-campus and distance education students, who can interact and ask questions. The lectures are taped, edited and posted online using a commercial platform for lecture capture. Certain components of the live lecture, such as video or U-tube clips, are not posted in an effort to encourage attendance at the lectures. The captured lectures provide a review tool for all students, but are particularly useful for students whose first language is not English, and for students with learning difficulties.

A course community or meeting place is provided on the LMS, in the form of discussion boards monitored by the instructor and TAs, online study groups and chat rooms. Use of these resources promotes student interaction online, and provides for peer-assisted learning and

collaboration. Additional resources posted on the LMS include the course syllabus, skeleton lecture slides, online quizzes, case studies, mock exams with feedback and answers.

Student engagement and attention in the lecture is promoted by the use of stories, application of principles to real life situations and building upon previous knowledge, breaking up the lecture with up-to-date video clips to illustrate principles, the use of humour, and question and answer sessions. Scenario-based activities are used to encourage short discussions/interactions with neighbouring students and create a feeling of community.

Upper Year Psychology

For several third year psychology courses, with enrolment at about 100 students, the faculty member offers a program of differentiated evaluation of students. Over the past three years, the instructor has combined the use of traditional evaluation, that is, mid-term tests and final exams, with the option to conduct a project from a list of equivalent alternatives. All students are required to complete the traditional mid-term and final examinations, but can also choose to complete a term project from the set of options. A large minority of students take advantage of this option. In addition to offering an alternative to standardized evaluation models, this approach also empowers students to engage in the learning process by making their own choices, and creates a more collaborative relationship between instructor and student. Students participating in the differentiated evaluation option receive their best final grade, whether by considering only the performance on the examinations, or by considering performance on the examinations and on the term project. As a result, the student's final grade cannot be adversely affected by their participation in the differentiated evaluation. This approach requires a major time commitment on the part of the faculty member in terms of time spent in organization of the evaluation alternatives and their assessment.

Various strategies are also used in the lecture to engage students and promote active learning. A number of channels of teaching are used such as case studies, questionnaires, class exercises replicating the results of research experiments to illustrate complexity of research, film clips followed by whole class and small group discussions. As a result, a change in the course learning outcomes/objectives has been necessitated along with a reduction in course content, in order to accommodate the variety of learning activities.

Community Health Nursing

This is a required fourth year nursing course, with an enrolment of about 150 students. It is taught by one faculty member, who also supervises the clinical placement component of the course.

In order to facilitate active learning in the lecture, students work in their clinical placement groups of ten to twelve students. The lecture begins with a presentation of concepts and theory by the instructor, which could include slides, guest speakers, film clips, followed by in class questions. The class then breaks into groups to work on an assignment, often a case study, which had been posted prior to the lecture, and for which students are expected to come prepared. The work of each group is reported to the class as a whole, discussion and feedback

from the instructor and other groups is provided, after which a finalized report is submitted by each group online through the LMS. The case study approach is also used as a component of the mid-term and final examinations.

To provide for a non-threatening communication channel between instructor and students, a student-teacher advisory group is formed, made up of one representative from each clinical placement group. This channel allows for the instructor to receive anonymous student feedback on the course and to respond accordingly where possible.

The time commitment involved on the part of the instructor in preparation and organization of the group-based learning approach is substantial.

Upper Year Biology

A second year genetics course with an enrollment of almost 500, and a third year cell physiology course with approximately 150 students, are two of the courses taught by a faculty member using a case based teaching approach. The implementation of the approach is an effort to promote higher levels of learning in the classroom. The approach is more successful in the third year course, which may be a result of the maturity level of the students or the number of students in the course, or both.

The case-based teaching and learning approach brings the culture of the lab into lecture; it helps students think like scientists and to use the scientific method. Each module or theme in the course centers on a case, usually a synopsis of a published research article, which is chosen based on its relevance to the module. Students are expected to work on the case individually at home. In the lecture, the case is introduced and presented. As the lecture continues, questions about the case study are planted which provide an opportunity for discussion, and to break up into groups to respond to those questions. At the end of each module, the case study is used for review. Case studies are also a component of the final exam.

For the second year course, a more directed approach is used with additional scaffolding, which is more appropriate to the level of student ability. In order to accommodate the additional lecture time required to use this approach, the amount of content covered in the course has been reduced.

Numerous resources are provided on the course website, which is separated into the lecture themes or modules. Each module includes a summary page, lecture plan, objectives and learning outcomes, key words to define, self-assessment exercises, the case study with related questions, suggested activities and slides, and links to recorded class lectures.

Anatomy

This is a first year medical school course with about 160 students. The medical education program underwent a curriculum and delivery redesign in an effort to provide a more student centered approach.   The medical school class of 160 students was divided into three groups

and rotates daily through its courses, rather than having one large lecture for each course. The curriculum is integrated across subject areas. For example, when studying the liver, students rotate in their groups through anatomy, then radiology, etc. A clinical component, where students see patients, is scheduled in afternoon of the same day. This approach requires instructors to teach the same material more often as each group rotates through their course.

In the anatomy course, traditional large lectures have been replaced by lab or tutorial sessions using a team based learning approach. The course instructor prepares short podcasts with slides which give content basics and references, as well as develops resource materials and activities, and posts them online. Students are required to come to class having reviewed the materials and activities. A quiz to assess preparation is given at the beginning of the class. This is followed by a case based discussion session in groups and facilitated by TAs, where students are required to analyse and apply information to a problem. The instructor discusses and summarizes the group work at the end of the class. The goal of the approach is to improve student collaboration and communication, particularly for students who are having difficulty. Group work also promotes some motivation and competition between groups. The approach also provides immediate feedback for the students.

This strategy requires a substantial time commitment from the instructor, in development of the online materials and in the training of TAs to ensure that they are all committed to the problem based learning approach. It is also a resource intensive strategy, requiring human resources and appropriate physical spaces.

Introductory Chemistry

This first year general chemistry course enrolls about 2400 students and is taught in sections of 200 to 240 students each. Each section is taught independently by different instructors. There is a common textbook, general curriculum and evaluation scheme, however, each instructor is free to teach individually based on their area of expertise. The course consists of lecture and lab components, and optional tutorial sessions. The labs are managed by a lab coordinator and tutorial sessions are led by TAs. The faculty member consulted, who teaches one of the course sections, has committed time to lead one tutorial per week, on a rotating basis, which allows the instructor to see smaller groups of students, allowing for more face time with students, and improve student-instructor interaction.

The instructor also uses technology to promote interaction and to assist with course management. Asynchronous discussion groups are posted on the course website for interaction with the instructor and TAs, and a student message board is available for students to interact with each other, which promotes collaboration. All boards are monitored by the instructor and TAs. Homework assignments have been shifted online using a commercial software program available through the textbook, which provides a variety of question types and allows for immediate feedback to the students. The LMS is used to post skeleton slides, course notes, resources, and grades, and is used to keep students apprised of events and due dates.

In the lecture the instructor has made use of Clickers to promote student engagement, breaking up the lecture into manageable chunks, and providing for immediate assessment of student

learning and any need for review. Videos are also used in the lecture as a replacement for demonstrations, due to physical space constraints.

University of Toronto

Engineering

This first year engineering design course enrolls approximately 950 students. Due to the nature of design, the fact that it requires opportunities to practice, a strategic decision was made to allocate resources to smaller practical tutorials of thirty students led by TAs. Only one lecture section is held weekly in Convocation Hall for all 950 students, and is presented by three instructors over the course of the term.

Tutorials are used to work through the design process. Students work in teams on an agenda of activities directed by about thirty trained TAs.   Students also work in teams on service learning projects. Community partners are recruited as clients, with and for whom the student groups work, with TA support and facilitation by the faculty members. Two full time administrative assistants deal with community partner issues as approximately 170 community partners are recruited. Assessment is on the interim project deliverables and final report.

Instructors make use of i-Clickers in the lecture to promote interaction and engagement. Tablet computers, which allow the instructor to sketch as the lecture proceeds, write overtop of a downloaded photo or figure, and save what is written, are also used. They provide an alternative to PowerPoint as a less static form of presentation, allowing for spontaneous discussion, and deviation from the lecture if interesting questions come up. To facilitate questions from students in the large hall, one of the instructors allows students to text questions to a cell phone monitored by a TA during the lecture, which are then addressed by the instructor.

The LMS is used to post lecture note outlines, audio files of recorded lectures, marks, announcements, and for a class discussion board.

The course carries a large administrative load in its work with community partners and in the management and training of a large number of TAs.

Organic Chemistry

This first year course enrolls approximately 1000 students. The course is split into three sections, each of which is taught by one instructor for the first third of the course. A second instructor teaches all sections of the second third of the course, and a third instructor completes the course. One instructor acts as the course coordinator. This approach was taken in order to provide uniformity of instruction and content across sections. Lectures are held weekly, and supplemented by weekly voluntary tutorials of forty students led by TAs. Laboratory sections, with a student to TA ratio of sixteen to one, and managed by a lab coordinator, are held every

second week. Both the tutorials and the labs provide the students with small group experiences.

The instructor who was consulted uses strategies in the lecture to promote student attendance and engagement. Only basic outline notes are provided online, in advance of the lecture, and elaborated upon in class. Assessment includes the materials available only in class. Chemistry is a discipline which requires problem solving and drawing chemical structures so the lecture is paced to allow for active listening and note-taking. A tablet computer, along with the PowerPoint outline, is used during the lecture to solve problems and draw diagrams. The instructor makes use of humour, personalizes the material by relating it to everyday experiences, conducts demonstrations and invites student volunteers to participate, and asks numerous questions during class. The course website provides resources, as well as a discussion board to promote interaction.

Management of the course requires a major time commitment in the training, organization and supervision of TAs, managing the multiple channels of communication with students, and in marking, as a large proportion of the student assessment is in the form of short answer and problem solving.

Astronomy

This first year course has an enrolment of 1350 students and is a popular elective for non-science students who take it to fulfill the institution's "breadth requirement." Lectures are held in one large section in Convocation Hall. A deliberate decision was made to eliminate all written assignments in the course to alleviate TA time used for marking, and instead use TA time to lead small group tutorials of 30 to 45 students. A problem based learning approach is used in the tutorials: groups of students are assigned problems and solve them with TA guidance. The tutorials provide students with the opportunity for some personal contact and the ability to get to know some people in the course. To provide students with feedback during the course of the semester, the prior written homework assignments were replaced with a commercial online homework program which is computer graded so no TA time is needed for marking. In addition, planetarium tours in groups of twenty students are provided and managed by one TA.

The instructor uses strategies in the lecture which encourage attendance. These include active learning techniques; breaks every twenty minutes for critical thinking exercises with friends where they discuss, open books, and refresh themselves; frequent questions; and the use of Clickers. The instructor concedes that some of these activities do disrupt the class, and a strong personal presence is needed to get students settled after each activity.

Many avenues for communication with students are provided. A discussion channel using MSN involves about 100 students on a regular basis. The LMS provides a discussion board as a forum for asking questions of the instructor and TAs, in addition to an anonymous discussion board for feedback from students. There is a dedicated email for the course to which the TAs respond. The instructor also organizes "café chats" in which small groups of five students meet informally with the instructor off campus for about thirty to sixty minutes to discuss various

issues. These chats are sometimes directed at particular groups such as mature, or ESL students.

The course is both time and resource intensive in that it involves managing a hierarchy of TAs: a head TA is responsible, with instructor support and oversight, for developing the curriculum of the tutorials, TAs who teach in the tutorials, administrative TAs, TAs responsible for grading, one TA allocated to chatting with students on MSN and one TA conducting observatory tours.

Introductory Biology

This first year biology course enrolls approximately 900 students. Lectures are delivered weekly and are supplemented by labs every second week. The course is managed by a course coordinator who also manages the lab component. Lecture content is delivered by four to six biologists over the course. Labs are led by trained TAs.

There are two major goals for the course: to create a sense of community in the large class, and to move the students from passive to active learning by encouraging students to think of themselves as scientists in training, not as students in a science course.

The lectures provide some opportunities for some small group interaction and meaningful student engagement: lectures are punctuated every ten to fifteen minutes with an activity (discussion, comparing notes), Clickers are used, examples of test questions are provided, and humour is incorporated into the presentation.

The LMS is used for low stakes online quizzes, posting resources and grades, and for communication. A help desk is manned by two senior TAs knowledgeable with the course content.

A component called Foundation Skills for Scientists (FS^2) was designed and incorporated into the lecture to address deficiencies in soft skills that were affecting student success with the biology content. These are generally skills that are difficult to address in a large class. The component is managed by a separate coordinator and is integrated into the course syllabus. Specialists from the library, teaching and learning center, and researchers, are organized to present various topics during the lectures.   Topics include research possibilities and what is needed to start working like a scientist; working at higher levels using Bloom's taxonomy; keeping up with material; writing skills; lines of communication. FS^2 sessions are directly linked to class work and assignments in order for students to see their value. A consequence of the FS^2 component is a reduction in the amount of biology content that can be covered in the course.

Administration and management of the various components and human resources make it very time intensive for the coordinator and instructors.

University of Waterloo

Business

This is an introductory business course which is a requirement for many programs at the University of Waterloo. It is a one semester course with a fall enrollment of about 1200 students and a winter enrollment of about 350. The course is taught by one instructor in sections of 200 students each. In order to provide opportunities for engagement and active learning, a blended learning approach is used, with some of the course work and the major course project being done online.

Class time may have a mini lecture component, but most of the time is spent on questions and small group discussions facilitated by Clickers. Students are expected to come to class prepared by doing the online component of the course, including online self-assessment quizzes, and the readings.

The major course project is a team-based commercially available, online business simulation game. Students are randomly assigned to groups of four early in the semester. The game involves running a manufacturing business, making business decisions, and competing against other teams in the class. Students are expected to participate in online discussions analyzing the performance of their company (financial results, marketing, operations, finance), and produce a reflective report as a team.

Trained undergraduate TAs, who have previously taken the course, support the students in the simulation game. Each TA is responsible for forty students (ten teams of four); they participate in the online discussions of their own groups, conduct a valuation of the reflection at end of term, and provide feedback on the quality of the analysis performed in the game. In addition, a senior TA manages the team TAs, and two TAs monitor the "Ask a TA" discussion board for the course.

This is a resource intensive course, which requires substantial management and organization of the thirty-three TAs and 300 student project teams.

University of Windsor

Mentorship Program

The main goal of the Faculty of Arts and Social Sciences Mentorship Program is to facilitate active learning in large enrollment, first year classrooms. Currently, sixty-five mentors facilitate learning for 1500 students in History, Psychology, Drama, Sociology, and Political Science. This constitutes about ninety per cent of Faculty of Arts and Social Sciences first year students each fall.

The program is designed to enhance first year student learning and engagement, while also providing an opportunity for upper year mentors to acquire leadership, facilitation, pedagogical

and learning skills. Building on the content and learning outcomes of the first year courses, mentors work with small groups of students during the last forty-five to sixty minutes of each first year lecture to review the material, discuss readings, and work on small group activities. Although the program has an academic focus, the mentors also help with other student success issues, provide an opportunity for small group interaction, and provide a point of connection for first year students.

The mentors themselves are enrolled in a Mentorship and Learning course, which introduces them to learning theory, learning styles, group facilitation, effective leadership, critical thinking and reading skills, and information literacy. The mentorship of the first year students is the practicum component of this course. Mentors must attend the lectures for the course in which they are mentoring, take notes, do readings, meet with the professor to determine focus areas for the breakout session during the lecture, keep weekly journals tracking progress, and attend a weekly debrief and planning session.

TAs in the Mentorship and Learning course, all students who have successfully completed the program, act as senior mentors by modeling mentorship skills.

The program requires a major commitment of administration time by the program leaders, not only in running the Mentorship and Learning course, but in the organization of participating first year course faculty, and organization and management of the mentors and TAs.

Foundations of Academic Writing

This is a required first year course for all students in the Faculty of Arts and Social Sciences and the Faculty of Engineering. It is taught completely online and enrolls approximately 2000 to 2300 students.

The decision to deliver the course online was based primarily on efficiency, cost and physical space issues. The course is delivered through a platform/software that is commercially available through the textbook publisher.

The course is separated into sections of about 400 students, taught by one of four sessional faculty instructors. Each sessional instructor supervises a head TA (a TA who has been with the course for two to three years) and each head TA leads a team of TAs, one for each eighty students in the first half of the course, one for each forty students in the second half of the course. The TAs are all successful graduates of the course and are responsible for managing discussion boards to connect with their students, marking papers, and monitoring the progress of their students. Sessional instructors conduct an orientation session for their own section, manage their own TAs to some degree, provide office hours (online and face-to-face), and deal with content based and conflict issues.

The full time faculty member coordinating the course makes the decisions, in consultation with sessional instructors, about content, curriculum, textbooks, readings, exams, quizzes, and assignments. A master course is created and then copied for each section. This strategy provides for some measure of consistency across sections.

A face-to-face orientation session is held at the beginning of the course for students to meet the faculty and the TAs. The course is delivered completely online except for the exams, which are held on campus. An administrative assistant helps with the coordination and scheduling of exams. Content is delivered in modules, which include readings, resources like an online practice area, video/audio resources, practice quizzes, quizzes that are assessed, and assignments. The platform also provides a time-management mechanism, discussion boards and email. A peer review system is used as a resource for students to work on drafts of the writing component. The platform sorts students into online peer review groups of five. After a unit on how to provide constructive feedback, students review four other students' papers, and are graded on the feedback given. Students rewrite their paper based on the peer feedback and submit a final version to their TA for marking.

The main issues for the head faculty member are administrative and management issues in dealing with sessional instructors and the large number of TAs.

Psychology

This introductory psychology course enrolls approximately 1200 to 1300 students per year. The course was originally taught as fourteen small sections by different instructors. Currently, the class is divided into only three sections. Two sections of five hundred each are taught during the day by one full time faculty member. One section of about 200 students is taught in the evening by a graduate student under the guidance of the faculty member. The main reason for the restructuring was to ensure consistency in instruction and content, and for fiscal issues.

The daytime sections consist of a weekly two hour lecture, supplemented by a weekly one hour lab. The faculty member envisions the large lecture section as "a big show" and uses humour and entertainment to promote an exciting and dynamic environment. The instructor does not lecture for more than ten minutes on any one topic before breaking for questions or a video; examples are frequently presented, students are asked to look things up on the internet, there are guest speakers, and demonstrations.

A component of the content is provided online and students are expected to complete readings and come to class prepared. Pre- and post- online tests which are mastery based, and marked online, provide feedback for students on their progress. An online peer review platform for feedback on written assignments is used: each piece of student work is reviewed and graded by six random peers; Students are evaluated by the instructor on the feedback given to others.

Other strategies which have been used in the lecture include participation tickets, discussion hats, and use of Virtual Lecture Hall technology (audio recordings of lectures along with PowerPoint slides uploaded to the internet after lecture).

Labs are held for groups of 50 students and led by graduate students in small group discussions, demonstrations and debates.

Administration and management of the course are facilitated by an administrative assistant who deals with emails and communication with students on minor issues, and setting up exams.

Wilfrid Laurier University

Business

This is a first year business course enrolling approximately 2000 students in total. Students are divided into sections of about 200 students, five sections are directed at BBA majors, and 5 sections are directed at non-majors. Consistency is maintained across sections by common course curriculum, lab manual and exams.

The sections consist of two weekly one and a half hour lectures or one three hour lecture, supported by mandatory weekly one and a half hour labs. Labs are led by trained third and fourth year business students, and are used to support the lecture content and to apply it. Soft skills are a focus in the labs as well. They generally involve case study discussions and soft skill development.

One of the instructors of a non-majors section has been amending the teaching approach in the lecture to be more student-centered, customizing the learning experience to meet the needs of learners. A blended learning model is used where some content is provided online so that more time can be spent in the lecture on active learning activities, and the creation of a course community to alleviate the sense of anonymity that students feel in a large class. The first lecture is spent on introductions and the collaborative development of a clear set of course and behavior expectations for students and the instructor, providing some ownership and accountability in this process for the students. One expectation is that students come to the lectures and labs prepared by reviewing the readings and resource material.

During lectures, there are stretch breaks, Clickers are used to promote discussion, role playing with volunteer students, humour, think-pair-share and small group problem activities are used. The course website provides academic resources, student photos with names, and also provides information on support services (counseling, health services, writing center, library, etc.) to address some of the other issues that first year students may have to deal with. Guest speakers from those service areas are invited as speakers to the lectures as well.

Supplemental instruction is available for the students in this course. These are informal, voluntary, study groups led by paid, trained upper year students who are also required to sit in on the course.

In the BBA majors sections, the faculty member who was consulted was a section instructor and the coordinator of the course. The issues addressed and the strategies used by this instructor are similar to those used by the non-majors instructor. Next semester the winter term courses will be moving to a full blending learning model. An orientation session is held to prepare students for the realities of the course. Clear expectations are set out and students are held accountable for meeting them.

Labs are also used to support and apply lecture content and involve case study discussions, simulations, presentations, soft skills development, and a major group project which involves developing a new business and presenting the results.

This course carries a heavy administrative load in organization, preparation of course materials, communication with students, and management of section instructors and TAs.

Organic Chemistry

These are a set of consecutive organic chemistry courses, one held in the fall and the second in the winter semester, which enroll approximately 300 students. Prior to this year, the course was taught as one large lecture section twice a week for eighty minutes, supplemented by labs of 48 students every second week. This year, to complement the new course format, lectures are run once a week, in the evening, for three hours.

This past year, the instructor began using a blended delivery model for the course. The strategies implemented are aimed primarily at improving student engagement, promoting active participation, encouraging students to take responsibility for their own learning, and improving efficiency.

The basic theoretical material is now presented online as pre-recorded lectures. Students are expected to complete the pre-class work which involves watching pre-recorded video lectures; completing mastery-based, weekly online homework assignments available using the commercial software program that comes with the textbook; reading the textbook; and reviewing the course PowerPoint slides. Weekly post-class work involves additional online homework assignments to provide closure to the week's work before moving on to the next chapter. The frequent homework assignments provide for ongoing feedback to students on their progress, and provide a mechanism for time management. Several online discussion boards, monitored by the faculty member are available on the LMS to promote peer interaction, collaboration, building course community, and learning.

Time in the lecture is now spent on review of the online homework, application of the online material by working on problems and answering Clicker questions, more challenging theoretical concepts, and review of materials that students typically struggle with. A tablet computer is used during the lecture to facilitate solving of problems. Although approximately sixty per cent of the final exam is made up of multiple choice questions, the instructor makes use of a testing system called the Immediate Feedback Assessment Technique (IF-AT), which allows for part marks to be assigned to multiple choice questions, gives students the opportunity to correct misconceptions and learn while being assessed, and allows for the use of more conceptual multiple choice questions.

Labs are managed by two coordinators in consultation with the faculty member, and are led by TAs (graduate students) and IAs (upper year undergraduate students). Pre- and post-lab assignments provide for assessment in this component of the course.

Supplemental instruction (SI) is available for the students in this course. These are informal, voluntary, weekly study groups led by paid, trained upper year students who are also required to sit in on the course. In addition to helping students with course content, the SI program assists students with time management, active listening and study skills.

Introductory Biology

This is a large first year biology course which is a requirement for any further study in biology, biochemistry and a number of other sciences. Enrolment is approximately 1300 students. The class is divided into three sections, two daytime sections of about 500 to 550, and one evening section of about 200 students. The two day sections are now taught by two instructors (reduced from four to provide continuity for students), one of whom is the course coordinator. These two instructors teach different components of the course, according to their expertise. The evening section is taught entirely by a sessional instructor. Course labs are led and marked by TAs. Over the past two years, the day section instructors have worked collaboratively to provide opportunities for interactive and peer learning. Students are encouraged to complete readings ahead of the lecture time, and are required to complete online reading quizzes, which are provided and marked through commercial online software. Lecture time is used to address more challenging and complex material. Clicker questions are used during the lecture to assess student preparedness and understanding of the material, to promote peer learning and interactivity. The curriculum has been redesigned to focus on clearly articulated and tangible learning objectives on which assessment is now based. In addition, course content was deliberately reduced by 25 per cent in order to provide time for adequate coverage of the material.

Labs have been redesigned to provide a guided inquiry format. They have been focused on skill building rather than content, and address issues such as the scientific method, scientific thinking, observation skills and communication skills.

Kinesiology

The instructor consulted teaches two second year and one third year course in kinesiology. All are required courses, one term in length, and enrolment in each is over 600 students. Each course is taught in two sections by the instructor to provide continuity and consistency. Each course is also supplemented by labs of approximately twenty students which provide a small group experience. Most of the strategies implemented by the instructor are directed at improving the efficiency of the management and administration of the course to allow for increased time for engagement with students during the lecture. Most communication with students is conducted through the LMS, as is posting of grades.

Although lectures are currently primarily used for presentation of content and labs provide the opportunities for application of the material, the instructor is part of a pilot project which makes use of a blended learning model in the lecture.   Using technology to present basic content in the form of recorded video lectures which are posted on the LMS and which students must review prior to class, face-to-face lectures now provide time for discussion and problem solving. Student interest in the material is fostered using humour, video clips and stories which relate the material to everyday life. The lecturer also moves around the classroom before each lecture starts to engage students in conversation and to answer questions, which allows for some relationship building.

Lecture capture is used to record lectures which are posted on the LMS, in addition to online and library readings. Discussion boards, which are monitored by the instructor, are available for each lab section through which students are encouraged to post questions and work collaboratively to answer them, promoting peer interaction and discussion. This also allows the instructor to understand any course concepts or issues that may be challenging students. The instructor also has a web presence in addition to the LMS in the form of a web page which students can access for information.

Course kits are provided to the students at a cost. These consist of detailed (but not complete) course notes and allow students to spend more time concentrating on understanding the content during the lecture, rather than in writing everything down. The notes also save time in organization for both students and the instructor prior to the lecture, as each lecture is, for the most part, set in advance.

Efficiency in student assessment is achieved by the use of well-designed multiple choice tests. Assessment of non-multiple choice tests/assignments are conducted using a strategy by which each marker assesses separate questions, or in which a clear and validated template of responses is used by the markers.

Humanities

This first year course is a general education course meant to provide students with the kinds of skills that will promote success in all aspects of university and later in the workplace. Enrolment is approximately 100 students. The strategies that the instructor has implemented are aimed primarily at promoting deep learning in the classroom and providing a high quality student experience. The strategies involve, in part, a reallocation of how the time in the lecture is used: supports and administrative functions are provided online, and the lecture is used more as a tutorial, incorporating more interaction.

The instructor has integrated technology into the course in order to efficiently provide the coaching, mentoring, modelling and scaffolding that are required to promote deep learning. The course website, hosted on the LMS, is an interactive site, promoting the development of a course community. It provides a virtual home for the course.

Pre-recorded welcoming, coaching and mentoring video messages from the instructor are provided on individual "halls" of the site. The course is taught in three modules. Each module has an online room which provides access to messages, links, sample graded past assignments, dedicated discussion rooms, homework, course slides, weekly handouts, and lecture topics. The resources available on the website allow students to customize the learning experience, using what they need to support their learning in a format and at a time convenient to them. In addition, the selection of resources, including the textbook, has been made with the characteristics of today's student as a digital learner in mind.

Face-to-face class time is now more like a tutorial. Mini lectures are conducted for about fifteen to twenty minutes followed by small group exercises, which are based on worksheets, videos or

discussions. The instructor provides modelling in the classroom by working through exercises with the students.

Student feedback on the course is provided to the instructor through class ombudsmen, who are students who volunteer to act as conduits for communication in a confidential, non-threatening manner. This process allows for the instructor to be accountable to the students, and allows for changes during course based on student feedback of their needs.

These strategies require substantial upfront work in the preparation of online materials, messages, and resources; but once prepared, they can be reused with adjustments. Maintenance of the website is also an ongoing time commitment.

Psychology

The instructor consulted teaches a third year educational psychology course with an enrolment of approximately 90 students and an introductory psychology course with approximately 150 students. Similar strategies are used in both courses to alleviate the sense of anonymity in large classes, to promote student interaction and collaboration, and to provide opportunities for formative assessment throughout the course.

The introductory course is also supported by tutorials, some of which are led by TAs and some by the instructor.

To personalize the course the instructor uses such strategies as speaking to students individually, getting to know their background and motivations, trying to learn their names, trying to relate the material to things of interest to students of this generation/age. During the lecture, students are randomly organized into groups of four. These small groups are given discussion questions and various other activities that emphasize collaboration. Student facilitators work with the small groups to support and maintain effective discussion within them. These facilitators are undergraduate students who previously took the course; this facilitator task provides the practicum component for an independent study credit course in which facilitators under the direction of the same instructor.

Students of both courses are required to complete one major project, which involves an ongoing, collaborative process, for which feedback is provided along the way. It is primarily TAs who manage and support this process, with some support from student facilitators. To alleviate scheduling problems, a WIKI page is provided for each group's project, thus providing a mechanism by which students can work asynchronously throughout the year, reducing the need for on-campus group meetings.

Electronic discussion boards using a blog format are available on the course websites where students can post questions and receive feedback and help. The instructor also posts discussion questions to which students are required to respond. These are conceptual questions designed to promote discussion, as students are able to read others' responses and provide comments.   TAs monitor the blog and provide constructive feedback, students are graded on participation and the process supports development of a community for the course.

In addition, lecture outlines are provided on the website, as are relevant links for extra study or extra help. Students can customize according to how much support they need for their learning.

The course provides a hierarchy of support, with the instructor at the top, followed by TAs, student facilitators, and peer feedback from fellow classmates. This structure requires a substantial investment of time for administration and management, particularly in terms of communication with and training of student facilitators and TAs.

Business

This is an introductory business management course with an enrollment of approximately 400 students. The course is taught as two sections of about 200 students by the same instructor, rather than multiple smaller sections by different instructors, to provide for consistency of content and message. Tutorials of about 25 students support the lecture and are led by TAs (graduate students). Admission into the business program is highly selective and students in the course are extremely motivated.

The instructor uses a blended learning model, making numerous technologies available to students as educational tools, and as resources that they may also be using in the workplace. These include: e-portfolios for feedback, interactive educational software, interactive presentation tools, mind mapping software, team meeting tools, brainstorming tools.

Course topics are taught as stand-alone modules. Learning outcomes are clear, and students use the resources to achieve those outcomes via their own learning pathway, making the learning very student-centered. A learning culture is promoted by inviting panels of business professionals to present to the students, including specialists from student services to provide instruction on learning skills, academic integrity, etc.

Lectures are conducted in twenty minute segments. Tablet computers, which enable interactivity, are used during the lecture. Students are given short critical thinking assignments, sometimes as virtual groups, and submit their responses to the instructor online, who is able to post answers on the classroom screen for discussion. Work is often highly visual. Research Assistants (RAs) (upper year undergraduate students) are assigned to sit in on lectures to provide feedback to the instructor. The instructor makes changes to the course based on this and student feedback.

Course assessment is primarily project based. Two major group projects are required of students, which are supported during the tutorials by TAs and RAs. Exams are open book/open web format.