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Teaching large classes at college and university level: challenges and opportunities

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The past decade has seen a substantial increase in the enrolment figures of tertiary level colleges and universities in OECD countries and it is predicted that this increase will continue. One of the likely consequences of these increases is the maintenance and/or increase of class sizes in colleges and universities, especially at undergraduate level. It is clear from the research literature that large classes at tertiary level create particular problems for staff and students alike, many of which can contribute to less effective teaching and learning. Lecturing still remains the predominant teaching approach in the context of large group undergraduate teaching. However, there is evidence that other teaching approaches that focus on making large group teaching more active and student centered are also being used. More active teaching approaches may go some way towards addressing some of the problems that are being encountered in the context of large group teaching. Support for and training of college teachers and further research is needed in this context.

Keywords: college/university teaching; class size; large classes; active teaching; the lecture; teaching approaches

Levels of participation levels in colleges and universities in OECD countries

Over the past decade, most Organisation for Economic Cooperation and Development (OECD) countries have seen an increase in the education levels of citizens, with a substantial increase in some countries. The rise in enrolment figures at tertiary level has been particularly significant. For example, between 1995 and 2002 the increase in tertiary level enrolment in OECD countries was over 50% in the case of the Czech Republic, Greece, Hungary, Iceland, Korea and Poland (OECD 2004). A smaller but significant increase of more than 20% was experienced in Australia, Finland, Ireland, Mexico, Portugal, Spain, Sweden and the UK. The only countries that did not show and increase were Austria, France and Germany due mainly to the effects of demographic decline.

Increases in participation rates in tertiary level colleges and universities place new pressures on these institutions and their staff. These increases have taken place and are taking place in a context in which increasing demands are being made on staff and institutions in other areas. Demands for increased accountability, demonstrable quality assurance and increased research and development place considerable burdens on staff which are exacerbated by tight budgets and limited resources. The most recent research in this area was undertaken in the UK in 1999 by Biggs. The issues raised in

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this research are very relevant in the current context, and it is important to highlight them once again in the hope that much needed debate and action might be forthcoming.

One of the likely consequences of increased student numbers is the maintenance and/or increase in class sizes, particularly at undergraduate level. Large classes at tertiary level are not a new phenomenon and in many countries, including France, Holland, Italy and the USA, classes of between 300 and 1000 can be found (Biggs 1999). However, in other countries, such as the UK, classes have tended to be smaller until recently. Whereas in many countries there is pressure to reduce class sizes or maintain small class sizes at primary and secondary school level, large classes of up to 500 students are not uncommon at undergraduate level in tertiary level educational institutions. This situation is unlikely to change in the context of rising student numbers.

In addition to teaching larger numbers of students in tertiary level institutions, increasingly staff have to deal with a student population that is more diverse in age, experience, cultural background and socioeconomic status than ever before (Biggs 1999). Whereas once those attending college were the brightest and the most highly motivated, and unfortunately also the most privileged; now college classes are comprised of students who vary in ability, interest and motivation. This creates additional challenges for staff and makes greater and different demands on their teaching skill. In the UK context, Biggs argues that these factors suggest 'lower standards of teaching and, therefore, learning'.

The challenges of large-class teaching in colleges and universities

It is difficult to determine exactly what constitutes a 'large' class in a tertiary level education context or a class that is too large for effective teaching to occur. The effects of class size are varied and contextual (Biggs 1999). The nature of the programme or course being taught, the accommodation and facilities that are available and the resources needed are all relevant here. For example, meeting the needs of a class of 50 in a science laboratory designed for 30 is likely to be more challenging than presenting a history lecture to 220 students in a lecture room designed for 200. The range of student ability, background, age and experience are also important factors to consider when designating a class as large or 'too large' as are the skills, competencies and ability of the lecturer. Although teaching large classes is not problematic in many cases, there is sufficient evidence available to suggest that as class sizes increase at tertiary level, teachers often face new issues and problems. According to Biggs (1999), the practical problems faced by students and teachers increase and change in their nature as class size increases.

The student perspective on large college and university classes

Most of the problems associated with large college and university classes that have been identified relate to the negative effects on student learning. For example, the amount and intensity of interactions and exchanges between students and teachers generally reduce as class size increases and this can result in anonymity and passivity among students (Biggs 1999; Carbone and Greenberg 1998; Ward and Jenkins 1992). Students do not get to know each other and high absenteeism may be tolerated or not

noticed (Gibbs 1992). Poor engagement of students with course content, less commitment to courses and low motivation appear as some of the significant effects of being taught in large groups. Low participation levels, social isolation and lack of adequate resources also figure among the problems for students identified in the context of large classes (Gibbs 1992). Carbone and Greenberg (1998) found a general dissatisfaction among students with large classes citing such factors as inadequacy of classroom facilities and environment, lack of structure in lectures, lack of opportunity for discussion as some of the reasons for this.

Ward and Jenkins (1992) comment on being struck by the unpreparedness of first-year students to deal with the large-class sizes that confront them in college. They highlight the importance of student forming relationships with other students in their class and with staff if they are to feel comfortable in the new setting and experience a good learning environment. However, students reported being uncomfortable and confused, spending their first weeks in a 'state of shock' (27) and feeling anonymous in their large classes. Consequently, they often adopt a passive role in class and are disinclined to ask questions or make contributions. Some students respond to the anonymity and impersonal nature of large groups by engaging in behaviour that they would be unlikely to exhibit in small classes (Carbone 1999). These behaviours include arriving late for class and/or leaving early and more off-task behaviour during teaching sessions. Lessened individual accountability, noise and distraction are other problems reported by students in the context of large-group teaching (Wulff, Nyquist, and Abbott 1987). The attendance of many students can be irregular with attendance dwindling as the semester progresses and students resorting to buying lecture notes in lieu of attending class (Kuh, Schuh, and Whitt 1991). According to Kuh, Schuh and Whitt (1991), a 'compact of disengagement' tends to arise between faculty members and students in large college classes. According to their observations, staff in large-class settings send the message 'you leave me alone and I will leave you alone' to their students (362).

The teacher's perspective on large college and university classes

Undoubtedly, some teachers cope very well with large-class teaching. However, a range of problems that are frequently encountered by teachers, when they are faced with the negative effects of large classes on student learning and the stresses of trying to function effectively in the large-class teaching setting, have been identified in the literature. The main problems relate to difficulties in being able to relate as individuals to students and the challenge of responding to the large number of demands being made on them (Gibbs 1992). As Biggs (1999) points out, large classes result in informal exchanges between students and lecturers virtually disappearing. Efforts by staff to establish relationships with students are likely to result in too many demands being made on staff (Ward and Jenkins 1992). In class discussion tends to be superficial and selective and problems of acoustics, visibility and attention create further difficulties. Large-group teaching makes it difficult for teachers to elicit student answers and to know if students understand course content (Gibbs 1992).

Other problems often experienced by teachers include dealing with large numbers of students entering and exiting the lecture room, which often results in teaching sessions starting late, dealing with noise levels during in-class tasks and dealing with the large volume of marking and student feedback (Ward and Jenkins 1992).

Resources too can be a problem with too few copies of textbooks available and the futility of assigning 'extra reading' that is not readily available to large numbers of students. Given the pressure on staff to publish and undertake consultancy in addition to their teaching role, staff can very easily become overwhelmed and resort to traditional teaching and assessment methods (i.e. the lecture and written exam).

Does class size really matter? What the research says

The issue of the effects of class size has been extensively researched, mostly in the primary and secondary school contexts. A meta-analysis of studies in this area conducted by Smith and Glass (1980) pointed to a 'substantial relationship' (419) between class size and pupil and teacher and attitudes and classroom climate. Small classes were found to be associated with better classroom climate and more effort on the part of teachers to individualise instruction. However, a large and growing body of research has shown that teacher expertise is a more significant determinant of student learning than class size (e.g. Andresen 1991; Ferguson 1991; Greenwald, Hedges, and Laine 1996; Kulik 1992; Rogers and Kimpston 1992; Sanders and Rivers 1996; Slavin 1987; Wenglinsky 2000; Wright, Horn, and Sanders 1997). The central role of the teacher in the provision of quality education has also been recognised by international bodies, such as the OECD (2008).

In the context of teaching at tertiary level, Biggs (1999) points to the central role of the teacher but argues that studies of class size at tertiary level to not take us very far in trying to understand the real impact of this variable. McKeachie (1990) argues that although there are both practical and theoretical reasons why class size should make a difference at tertiary level, in the end, it is the skill and competency of the teacher that counts. Research evidence suggests that large and small classes are as effective as one another when it comes to the learning and comprehension of factual information (e.g. Office of Instructional Consultation 1992). The most appropriate class size depends on the instructional goals that are being pursued. On the other hand, smaller classes are more effective when the development of higher-level cognitive skills is required. Also, because smaller classes allow for more contact between students and staff, the needs of students with low motivation and specific learning needs can be more easily addressed. The relative effectiveness of the teaching approaches used in large and small classes must be significantly related to the effectiveness of teaching in each setting (McKeachie 1990). It would appear, that more focus should be placed on ensuring that teachers are competent to instruct in college and university classes rather than on the size of those classes *per se*.

Teaching approaches in large college and university classes

The lecture

According to Cooper and Robinson (2000), it is not surprising that teaching sessions with large college classes are frequently referred to as 'large lecture' or 'large lecture sessions' as most teaching staff teach via the lecture. The small number of studies that have been carried out on teaching at university level have shown that lecturing was the most common teaching approach used (e.g. Blackburn et al. 1980; Costin 1972; Eble 1972; Thielens 1987). Thielens (1987) in his study of over 800 faculty in 80 US

institutions found that 80% of class time was spent lecturing. However, he found that more lecturing took place in the physical and life sciences and in mathematics than in the humanities with 61% of class time spent on lecturing in the humanities. As class size increased, the amount of lecturing also increased. Blackburn et al. (1980) found that 78% of university teachers used lecturing as their main mode of teaching and 55% used lecturing as their second preferred mode.

Teaching by lecture can be a very effective approach in the appropriate context. As highlighted by Gibbs (1992), many university teachers, in the context of their own research and scholarship, have developed a perspective in their area of expertise that cannot be obtained in textbooks. The lecture provides a unique opportunity for students to benefit from such expertise. This is very different from a situation in which a university teacher uses the lecture to communicate content to the students that they can quite easily read themselves. Ausubel (1963) expressed a similar view when he pointed that good lectures provide students with content that would take them much effort and time to collect on their own. In addition, preparing lectures can benefit the teacher requiring him/her to update, synthesise and reflect on the content of the course (McKeachie 1999).

Good and Brophy (2003), based on the work of Gage and Berliner (1992) and Henson (1988) and others, have designated a range of contexts in which lecturing is appropriate. These include the following:

(1) When the objective is to present information.
(2) When the information is not available in a readily accessible source.
(3) When the material must be organised in a particular way.
(4) When it is necessary to arouse interest in the subject.
(5) When it is necessary to introduce a topic before the students read about it on their own or to provide instructions about a task.
(6) When the information is original or must be integrated from different sources.
(7) When the information needs to be summarised or synthesised (following discussion or inquiry).
(8) When curriculum materials need updating or elaborating.
(9) When the teacher want to present alternative points of view or clarify issues in preparation for discussion.
(10) When the teacher want to provide supplementary explanations of material that students may have difficulty learning on their own.

Other uses of lectures that have been identified in the literature include the modelling of problem solving and critical thinking, showing enthusiasm for the subject matter and relating course content to students' personal experiences (Costin 1972; Cuseo 1998; McKeachie 1999).

Good and Brophy (2003) make the important point that, although it is possible to identify contexts in which lecturing is appropriate, the effectiveness of the lecture is very much dependent on the effort and care that goes into the preparation of the lecture and the quality of the delivery. As with any teaching context, lectures can be more or less effective or ineffective. A similar point is made by Lammers and Murphy (2002) when they state that 'an instructor's profile of teaching techniques is not as indicative of student learning as the quality and context with which the techniques are

used' (2). According to Good and Brophy (2003), most of the criticisms of lecturing as a teaching approach are due to the inappropriate use and/or overuse of lectures and not to any problems inherent in the approach itself.

Both Bligh (2000) and Costin (1972) found that completely relying on one teaching approach is not desirable and that some combination of lecturing and other approaches is likely to be more effective. A survey by the Higher Education Research Institute (HERI 1999) suggested that there has been some movement in the last decade or so towards other non-lecture teaching approaches in US universities. This finding is reflected in the findings of a recent study by Lammers and Murphy (2002). Lammers and Murphy's study of 48 instructors in 58 classes at the University of Arkansas showed that whereas lecturing was the most prevalent teaching approach used, it was used to a much lesser degree than was shown in earlier studies. For only half of the class time the instructor was the only person involved in the learning, mainly in a lecturing mode. Lammers and Murphy attributed this to the increased discussion and research which is now available on alternative teaching approaches. However, Lammers and Murphy's study did show that during 15% of class time no one was involved due to class ending early, and a relatively small amount of time was devoted to testing and media use. Activity by a single student, a subset of the class, or between instructor and student were all below 5% of the time. Activity for the entire class was about 13%. A gender difference was also apparent in the results. Male instructors did more lecturing than their female colleagues. The gender difference shown in Lammers and Murphy's study was also noted by Stathan-Mache, Walum-Richardson and Cook (1980) and Thielens (1987).

Some useful insights can be gained from a small number of studies that compare the impact of lecturing with other forms of instruction, usually some form of discussion (e.g. McKeachie 1994, 1999; McKeachie et al. 1986; Pascarella and Terenzini 1991). McKeachie et al. (1986) reviewed 17 such comparative studies and found no differences between lectures and discussion methods for the memorisation of lower-level factual content. However, lectures were found to be less effective for the long-term retention of knowledge, the application of knowledge to new contexts, the development of higher-order thinking, attitude change and motivation. The findings of other research syntheses by Bligh (1972), Costin (1972) and Pascarella and Terenzini (1991) are consistent with those of McKeachie.

Bligh (2000) conducted a comprehensive review of studies of the effectiveness of the lecture and other approaches. The results were mixed and were very much dependent on the learning objective. However, similar to McKeachie's findings, Bligh was able to conclude that lectures compared well with other approaches for the teaching factual material, whereas, the lecture was less effective for problem solving and higher-order thinking and for developing an interest in the subject. Similar findings emerged in a review by Costin (1972).

Active teaching and learning in large college and university classes

Decades of research on teaching and learning have highlighted the importance of active teaching and learning at all levels of education. The challenge is to find ways to do this within the context of large college classes. The need for active learning by students in tertiary education settings and the placing students at the centre of the learning process in this context has been emphasised by many (e.g. Boyer 1990; Jungst,

Licklider, and Wiersema 2003; Qualters 2001). Voekl (1995) found that reduction in active involvement by students in learning can lead to decreased course performance. Therefore, active participation by students in the context of teaching and learning is an integral part of quality education. Karp and Yoels (1976) found a positive link between participation in class discussion and course reading. Also, students who came to class unprepared often held negative views towards peers who contributed in class.

Active learning does not have to mean the demise of the lecture (Machemer and Crawford 2007). What it does mean is that opportunities for students to engage in reflection, analysis, synthesis and communication in the context of their learning need to be included in all teaching approaches, including the lecture (Fink 2003). Active teaching involves creating learning environments that are student centred, that acknowledge student diversity and that involve a reduction of student dependence on the teacher for knowledge acquisition (Millis and Cottell 1998).

Much of the literature on innovative approaches to large-group college teaching, and active teaching methods in this context, focus on adapting lectures to involve students more directly in the teaching–learning process (e.g. Bonwell and Eison 1991; Chickering and Gamson 1987; Cooper and Mueck 1990; Kozma 1978; Michaelsen, Fink, and Knight 1997; Millis and Cottell 1998; Penner 1984; Weimer 1992).

Some of the specific recommendations and suggestions that have been made in the context of trying make teaching and learning more active in large college classes include brainstorming, short writing activities followed by class discussion, quick surveys, think pair chare, formative quizzes, debate, role playing and student presentations (Bonwell and Eison 1991; Chickering and Gamson 1987; Cooper and Mueck 1990; Kozma 1978; Lammers and Murphy 2002; Michaelsen, Fink, and Knight 1997; Millis and Cottell 1998; Weimer 1992). Other approaches include the insertion of brief demonstrations during a lecture, the feedback lecture, which consists of two mini lectures separated by a small-group study session built around a study guide, and the guided lecture in which students listen to a 20–30-minute presentation without taking notes, followed by their writing for 5 minutes what they remember and spending the remainder of the class period in small groups clarifying and elaborating the material (Bonwell and Eison 1991). Ruhl, Hughes and Schloss (1987) found that if an instructor asked students to pause for 2 minutes three times during the lecture to consolidate their notes, student learned significantly more. Other recommended techniques include 'drama, simulation, and peer teaching' (Bonwell and Eison 1991).

Innovative ways of achieving quality closure to a teaching session have been suggested including asking students to write down a brief statement of the main point of the lecture, to provide questions or test problems related to class content and/or to make suggestions for course improvement (Felder 1997). This form of feedback can be used as a type of formative assessment of course effectiveness and as a basis for future course planning. It may also act to focus students' attention on course content and as an accountability measure.

Cooperative learning is regarded as an important element of active teaching (Bryant 1978; Psychl, Clark, and Abarbanel 1999) and small-group cooperative work during teaching sessions has been recommended in the context of large-class teaching at college level. According to Cooper and Robinson (2000), small-group work can contribute to effective teaching and learning by promoting cognitive elaboration, enhancing critical thinking, providing feedback, promoting social and emotional development, appreciating diversity and reducing student attrition. Advancements in

the use of technology to enhance teaching of large groups at tertiary level have also taken place in recent years with opportunities being provided for online availability of course materials, discussion opportunities, feedback to students and assessment.

Discussion

The challenges of large-class teaching at college and university level are here to stay and effective means of meeting these challenges in specific contexts need to be found. It is clear that tertiary level teachers need to move beyond the 'traditional' lecture to more active forms of teaching and learning if quality education is to be provided in large classes. Serious attention needs to be given to finding creative ways of dealing with some of the specific challenges, especially those related to levels of interaction and feedback.

Change, including the adaptation of teaching approaches in the context of large-class sizes at college level is challenging and difficult. This is not only because of the change in mindset and additional work that is likely to be needed, but also because of the discomfort and anxiety that is often associated with change, the lack of incentives for change and the self-perceptions of staff and their definition of their roles (Bonwell and Eison 1991). Change in this context also requires a break with tradition and is likely to make more demands on staff time. Lack of knowledge about alternative approaches and lack of confidence in implementing new approaches are also likely to impede change. Bonwell and Eison (1991) identify 'risk' as the greatest barrier to the use of active teaching approaches. The risks that he identifies include:

> The risk that students will not participate, use higher order thinking, or learn sufficient content, that faculty members will feel a loss of control, lack necessary skills or be criticised for teaching in unorthodox ways. (4)

Time demands for designing, implementing and testing new active teaching approaches can put additional pressure on faculty who are also trying to meet research and other institutional demands.

One of the challenges of many of the suggested large-group teaching approaches is that they place greater responsibility for learning onto students (Bonwell and Eison 1991). How students perceive this and how they make the needed changes will be an important determinant of their appropriateness and success. A study by Machemer and Crawford (2007) showed that whereas students were positive in the reactions to active learning during class, they were less positive in cooperative learning settings where they were answerable to their group or were dependent on their groups for their learning. The study found that students valued only those things that ensured positive grades in examinations and teaching approaches that they felt were oriented towards exam preparation. It seems that students did not value approaches that required them to lose the anonymity of the large group and interact on learning content with others. This is a salutary finding and shows how student priorities form an important aspect of the fabric of the learning context. It has been suggested that high achieving students are the most apprehensive about cooperative learning as it takes them away from the more teacher-centred approach in the context of which they have been successful (Felder and Brent 1996; Peterson 2004).

The challenges involved in using more active teaching approaches in the teaching of large college and university classes can, of course, be overcome through careful

planning, commitment and belief in the advantages that will accrue to students, administrative and collegial support, and the provision of adequate and appropriate resources. However, this requires commitment from administrators and teachers alike and the cooperation of students. In the context of recent changes and trends in tertiary level as outlined in this paper, it is also time for further research that addresses some of the important issues that arise from the current context.

References

Andresen, L. 1991. *The influence of class size on teaching and learning law and the University of New South Wales*. Sydney, Australia: Professional Development Centre, University of New South Wales.

Ausubel, D. 1963. *The psychology of meaningful verbal learning: An introduction to school learning*. New York: Grune & Stratton.

Biggs, J. 1999. *Teaching for quality learning at university: What the student does*. Buckingham: Society for research into higher education, Open University Press.

Blackburn, R.T., G.R. Pellino, A. Boberg, and C. O'Connell. 1980. Are instructional improvement programs off target? *Current Issues in Higher Education* 2, no. 1: 32–48.

Bligh, D.A. 1972. *What's the use of lectures?* Harmondsworth, UK: Penguin Books.

Bligh, D.A. 2000. *What's the use of lectures?* San Francisco, CA: Jossey-Bass.

Bonwell, C.C., and J.A. Eison. 1991. *Active learning: Creating excitement in the classroom*. ASHE-ERIC Higher Education Report No. 1. Washington, DC: School of Education and Human Development, The George Washington University.

Boyer, E. 1990. *Scholarship reconsidered: Priorities of the professoriate*. New York: The Carnegie Foundation for the Advancement of Teaching.

Bryant, B.K. 1978. Cooperative goal structure and collaborative learning. *Teaching of Psychology* 5: 182–5.

Carbone, E. 1999. Students behaving badly in large classes. *New Directions in Teaching and Learning* 77: 35–43.

Carbone, E., and J. Greenberg. 1998. Teaching large classes: Unpacking the problem and responding creatively. In *To improve the academy*, Vol. 17, ed. M. Kaplan, 311–16. Stillwater, OK: New Forums Press and Professional and Organisational Development Network in Higher Education.

Chickering, A.W., and Z.F. Gamson. 1987. Seven principles for good practice in undergraduate education. *AAHE Bulletin* 39: 3–7.

Cooper, J.L., and R. Mueck. 1990. Student involvement in learning: Cooperative learning and college instruction. *Journal of Excellence in College Teaching* 1: 68–76.

Cooper, J.L., and P. Robinson. 2000. The argument for making large classes small. *New Directions in Teaching and Learning* 81: 5–16.

Costin, F. 1972. Lecturing versus other methods of teaching: A review of research. *British Journal of Educational Technology* 3, no. 1: 4–30.

Cuseo, J. 1998. Lectures: Their place and purpose. *Cooperative Learning and College Teaching* 9, no. 1: 2.

Eble, K.E. 1972. *Professors as teachers*. San Francisco, CA: Jossey-Bass.

Felder, R.M. 1997. Beating the numbers game: Effective teaching in large classes. Paper presented at the ASEE Annual Conference, 15–18 June, in Milwaukee, WI.

Felder, R.M., and R. Brent. 1996. Navigating the bumpy road to student-centered instruction. *College Teaching* 44: 43–7.

Ferguson, R. 1991. Paying for public education: New evidence on how and why money matters. *Harvard Journal on Legislation* 28: 465–98.

Fink, L.D. 2003. *Creating significant learning experiences: An integrated approach to designing college courses*. San Francisco, CA: Jossey-Bass.

Gage, N., and D. Berliner. 1992. *Educational psychology*, 5th ed. Boston: Houghton Mifflin.

Gibbs, G. 1992. Control and independence. In *Teaching large classes in higher education: How to maintain quality with reduced resources*, ed. G. Gibbs and A. Jenkins, 37–59. London: Kogan Page.

Good, T., and J. Brophy. 2003. *Looking in classrooms*, 9th ed. New York: Macmillan.
Greenwald, R., L.V. Hedges, and R.D. Laine. 1996. Have times changed? The effect on school resources on student achievement. *Review of Educational Research* 66, no. 3: 361–96.
Henson, K. 1988. *Methods and strategies for teaching in secondary and middle schools*. New York: Longman.
Higher Education Research Institute. 1999. *The American college teacher: National norms for the 1998–1999 HERI faculty survey*. Los Angeles, CA: Higher Education Research Institute, University of California at Los Angeles.
Jungst, S., L.L. Licklider, and J. Wiersema. 2003. Providing support for faculty who wish to shift to a learning-centered paradigm in their higher education classrooms. *The Journal of Scholarship of Teaching and Learning* 3, no. 3: 69–81.
Karp, D.A., and W.C. Yoels. 1976. The college classroom: Some observations on the meanings of student participation. *Sociology and Social Research* 60: 421–39.
Kozma, R.B. 1978. Faculty development and the adoption and diffusion of classroom innovations. *Journal of Higher Education* 49: 438–49.
Kuh, G., J.H. Schuh, and E.J. Whitt. 1991. *Involving colleges: Successful approaches to fostering student learning and development outside the classroom*. San Francisco, CA: Jossey-Bass.
Kulik, J.A. 1992. *An analysis of the research on ability grouping: Historical and contemporary perspectives*. Storrs, CT: National Research Center on the Gifted and Talented, University of Connecticut.
Lammers, W.J., and J.J. Murphy. 2002. A profile of teaching techniques used in the university classroom: A descriptive profile of a US public university. *Active Learning in Higher Education* 3, no. 1: 54–67. http://alh.sagepub.com/cgi/content/short/3/1/54 (accessed February 12, 2010).
Machemer, P.L., and P. Crawford. 2007. Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education* 8, no. 1: 9–30.
McKeachie, W.J. 1990. Research on college teaching: The historical background. *Journal of Educational Psychology* 82, no. 2: 189–200.
McKeachie, W.J. 1994. *Teaching tips: Strategies, research and theory for college and university teachers*. 9th ed. Lexington, MA: DC Heath.
McKeachie, W.J. 1999. *Teaching tips: Strategies, research and theories for college and university teachers*. 10th ed. Boston: Houghton Mifflin.
McKeachie, W.J., P.R. Pintrich, L. Yi-Guang, and D.A.F. Smith. 1986. *Teaching and learning in the college classroom: A review of the research literature*. Ann Arbor, MI: Regents of the University of Michigan.
Michaelsen, L.K., L.D. Fink, and A. Knight. 1997. Designing effective group activities: Lessons for classroom teaching and faculty development. In *To improve the academy*, Vol. 16, ed. D. Dezure, 373–98. Stillwater, OK: New forums Press and the Professional and Organizational Development Network in Higher Education.
Millis, B.J., and P.G. Cottell, Jr. 1998. *Cooperative learning for higher education faculty*. Phoenix, AZ: Oryx press.
OECD. 2004. *Education at a glance 2004*. Paris: OECD (Organisation for Economic Cooperation and Development).
OECD. 2008. *Education at a glance: Indicators*. Paris: OECD (Organisation for Economic Cooperation and Development). http://www.oecd.org/dataoecd/23/46/41284038.pdf (accessed November 15, 2009).
The Office of Instructional Consultation. 1992. *Teaching large classes at UCS*. Santa Barbara, CA: University of California. http://oic.id.ucsb.edu/faculty-handbook-teaching/teaching-learning/teaching-large-classes-uc-santa-barbara (accessed February 12, 2010).
Pascarella, E.T., and P.T. Terenzini. 1991. *How college affects students*. San Francisco, CA: Jossey Bass.
Penner, J. 1984. *Why many college teachers cannot lecture*. Springfield, IL: Thomas.
Peterson, T.O. 2004. So you're thinking of trying problem-based learning?: Three critical success factors for implementation. *Journal of Management Education* 28, no. 5: 630–48.

Psychl, T.A., D. Clark, and T. Abarbanel. 1999. Computer-mediated group projects: Facilitating collaborative learning with the world wide web. *Teaching of Psychology* 26: 138–41.

Qualters, M. 2001. Do students want to be active? *The Journal of Scholarship of Teaching and Learning* 2, no. 1: 51–60.

Rogers, K.B., and R.D. Kimpston. 1992. Acceleration: What we do vs. what we know. *Educational Leadership* 50, no. 2: 58–61.

Ruhl, K.L., C.A. Hughes, and P.J. Schloss. 1987. Using the pause procedure to enhance lecture recall. *Teacher Education and Special Education* 10: 14–8.

Sanders, W.L., and J.C. Rivers. 1996. *Cumulative and residual effects of teachers on future student academic achievement (Research Progress Report)*. Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.

Slavin, R.E. 1987. Ability grouping and student achievement in elementary schools: A best evidence synthesis. *Review of Educational Research* 57, no. 3: 293–336.

Smith, M.L., and G.V. Glass. 1980. A meta-analysis of research on class size and its relationship to attitudes and instruction. *American Educational Research Journal* 17, no. 4: 419–33.

Statham-Macke, A., L. Walum-Richardson, and J. Cook. 1980. Sex-typed Teaching Styles of University Professors and Student Reactions. Report for the National Institute of Education. Washington, DC: National Institute of Education.

Thielens, Jr., W. 1987. The disciplines and undergraduate lecturing. Paper presented at the annual meeting of the American Educational Research Association, 20–24 April, in Washington, DC.

Voekl, K.E. 1995. School warmth, student participation, and achievement. *Journal of Experimental Education* 63: 127–38.

Ward, A., and A. Jenkins. 1992. The problems of learning and teaching in large classes. In *Teaching large classes in higher education: How to maintain quality with reduced resources*, ed. G. Gibbs and A. Jenkins, 23–36. London: Kogan Page.

Weimer, M.G. 1992. Improving higher education: Issues and perspectives on teaching and learning. In *To improve the academy: Resources for faculty, instructional and organizational development*, ed. D.W. Wulff and J.D. Nyquist, 13–23. Stillwater, OK: New Forum Press, The Professional and Organizational Development Network in Higher Education.

Wenglinsky, H. 2000. *How teaching matters: Bringing the classroom back into discussions of teacher quality*. Princeton: Educational Testing Service.

Wright, S.P., S.P. Horn, and W.L. Sanders. 1997. Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education* 11: 57–67.

Wulff, D.H., J.D. Nyquist, and R.D. Abbott. 1987. Students' perceptions of large classes. In *Teaching large classes well: New directions for teaching and learning*, *no. 32*, ed. M. Weimer, 17–30. San Francisco, CA: Jossey-Bass.