The effectiveness of peer tutoring in further and higher education: A typology and review of the literature

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Abstract. Quality, outcomes and cost-effectiveness of methods of teaching and learning in colleges and universities are being scrutinised more closely. The increasing use of peer tutoring in this context necessitates a clear definition and typology, which are outlined. The theoretical advantages of peer tutoring are discussed and the research on peer tutoring in schools briefly considered. The substantial existing research on the effectiveness of the many different types and formats of peer tutoring within colleges and universities is then reviewed. Much is already known about the effectiveness of some types of peer tutoring and this merits wider dissemination to practitioners. Directions for future research are indicated.

Research on teaching and learning in further and higher education is much less voluminous than that on teaching and learning in schools. While there have been a number of books on the topic of adult learning (e.g. Rogers 1977, Lovell 1980, Gibbs 1981, Tight 1983, Brookfield 1983, Entwistle and Ramsden 1983, Marton Hounsell and Entwistle 1984, Ramsden 1986, Richardson Eysenck and Piper 1987, Merriam and Caffarella 1991, Laurillard 1993, Sutherland 1996), both the quantity and quality of research in this area is surprisingly limited, considering the vast resources expended on the tertiary sector.

However, the quality and cost-effectiveness of teaching and learning in the sector are increasingly under the microscope. There has long been concern that traditional curricula, delivered and assessed in traditional ways, promote a surface approach to learning rather than a deep or even a strategic approach (Entwistle 1992). Teaching quality assessment exercises consistently result in criticism of departments for failing to promote the development of transferable skills in their students (Barnett 1992, Ellis 1993). At the same time, increased student numbers coupled with reduced resources have often resulted in larger class sizes, thus encouraging a reversion to a traditional lecturing style of delivery and a reduction in small group and tutorial contact – in short, less interactive teaching and learning.

The dual requirement to improve teaching quality while 'doing more with less' has recently increased interest in peer tutoring in higher and further education. However, it would be unwise to seize upon peer tutoring as a universal, undifferentiated and instant panacea. Different formats of peer

tutoring have been the subject of research of differing quantity and quality, with various outcomes.

Definitions and typology

Peer tutoring is a very old practice, traceable back at least as far as the ancient Greeks. Archaic definitions of peer tutoring perceived the peer tutor as a surrogate teacher, in a linear model of the transmission of knowledge, from teacher to tutor to tutee. Later, it was realised that the peer tutoring interaction was qualitatively different from that between a teacher and a student, and involved different advantages and disadvantages.

At this point of development, a definition might have been: 'more able students helping less able students to learn in co-operative working pairs or small groups carefully organised by a professional teacher'. However, as development and research in different formats of peer tutoring proceeded apace in more recent years, it became clear that peer tutoring is not necessarily only about transmission from the more able and experienced (who already have the knowledge and skills) to the less able (who have yet to acquire them). As peer tutoring has developed, defining it has become more difficult, and a current definition seems so broad as to be rather bland: 'people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching'. However, this definition does include reference to the gains accruing from the tutoring process *to the tutor* – increasingly, peer tutoring projects target gains for both tutors and tutees.

Peer tutoring is characterised by specific role taking: at any point someone has the job of tutor while the other(s) are in role as tutee(s). Peer tutoring typically has high focus on curriculum content. Projects usually also outline quite specific procedures for interaction, in which the participants are likely to have training which is specific or generic or both. In addition, their interaction may be guided by the provision of structured materials, amongst which a degree of student choice may be available.

A typology of peer tutoring could include ten dimensions:

1. Curriculum Content – which may be knowledge or skills orientated, or a combination. The scope of peer tutoring is very wide and projects are reported in the literature in virtually every imaginable subject.
2. Contact Constellation – some projects operate with one tutor working with a group of tutees, but the size of group can vary from two to thirty or more. Sometimes two tutors take a group of tutees together. Less traditional, and more intensive, is peer tutoring in pairs (dyads).
3. Year of Study – tutors and tutees may be from the same or different years of study.

4. Ability – while many projects operate on a cross-ability basis (even if they are same-year), there is increasing interest in same-ability tutoring (where the tutor has superior mastery of only a very small portion of the curriculum, or a pair are of equal ability but working towards a shared, deeper and hopefully correct understanding).

5. Role Continuity – especially in same-ability tutoring, the roles of tutor and tutee need not be permanent. Structured switching of roles at strategic moments (reciprocal tutoring) can have the advantage of involving greater novelty and a wider boost to self-esteem, in that all participants get to be tutors.

6. Place – Peer tutoring may vary enormously in location of operation.

7. Time – peer tutoring may be scheduled in regular class contact time, outside of this, or in a combination of both, depending on the extent to which it is substitutional or supplementary.

8. Tutee Characteristics – projects may be for all students or a targeted subgroup, e.g. the especially able or gifted, those considered at risk of under-achievement, failure or dropout, and those from ethnic, religious and other minorities.

9. Tutor Characteristics – the traditional assumption was that tutors should be the 'best students' (i.e. those most like the professional teachers). However, very large differentials in ability can prove under-stimulating for the tutor. If tutors are students who are merely average (or even less), both tutor and tutee should find some cognitive challenge in their joint activities (e.g. Fantuzzo, Dimeff and Fox 1989). Although tutee gain may not be so great, the aggregate gain of both combined may be greater. Many projects in schools have deployed students with learning and behaviour difficulties as tutors, to the benefit of the tutors themselves (Scruggs and Osguthorpe 1986, Ashman and Elkins 1990).

10. Objectives – projects may target intellectual gains, formal academic achievement, affective and attitudinal gains, social and emotional gains, self image and self concept gains, or any combination. Organisational objectives might include reducing dropout, increasing access, etc.

Theoretical advantages of peer tutoring

The cognitive processes involved in peer tutoring have been explored by various writers over the years, many of whom emphasised the value of the inherent verbalisation and questioning (e.g. Gartner, Kohler and Riessman 1971, Durling and Schick 1976, Bargh and Schul 1980, Webb 1982, Foot, Shute, Morgan and Barron 1990, Forman 1994). A neo-Piagetian interpretation of individual development through the cognitive conflict and challenge

involved in many forms of peer assisted learning is offered by Doise and Mugny (1984). However, peer tutoring is more fully understood through the social interactionist (or socio-cultural or social constructivist) view of cognitive development. Supported (or 'scaffolded') exploration through social and cognitive interaction with a more experienced peer in relation to a task of a level of difficulty within the tutee's 'zone of proximal development' remains a theoretical cornerstone of peer assisted learning (Vygotsky 1978). This theme has been further developed by Barbara Rogoff (1990) under the label of 'apprenticeship in thinking'.

Peer tutoring is often promoted on the grounds that, for the tutors, it is 'Learning by Teaching'. This view is expanded in the old saying 'to teach is to learn twice'. Sternberg's (1985) theory of intelligent performance identifies components which might be enhanced during peer tutoring (Hartman 1990): the meta-cognitive skills of planning, monitoring and evaluating and the associated use of declarative, procedural and contextual knowledge; and the cognitive processes of perceiving, differentiating, selecting, storing, inferring, applying, combining, justifying and responding. Just *preparing* to be a peer tutor has been proposed to enhance cognitive processing in the tutor – by increasing attention to and motivation for the task, and necessitating review of existing knowledge and skills. Consequently, existing knowledge is transformed by re-organisation, involving new associations and a new integration. The act of tutoring itself involves further cognitive challenge, particularly with respect to simplification, clarification and exemplification.

An excellent study by Annis (1983) compared three randomly allocated groups of students: one which merely read the material to be studied, one which read the material in the expectation of having to teach it to a peer, and a third which read the material with the expectation of teaching it to a peer and then actually carried this out. On a 48 item test of both specific and general competence, the 'read only' group gained less than the 'read to teach' group which in turn gained less than the 'read and teach' group. The tutors gained more than the tutees. A similar study by Benware and Deci (1984) compared the relative effectiveness of reading to learn for a test and reading for learning to teach a peer. Subjects were randomly assigned to conditions and the outcome measure was a 24 item test of both rote memory and conceptual understanding. While both groups performed equally well on rote learning, the 'learn to teach' group performed better on higher order conceptual understanding, and on a questionnaire regarding motivation and learning perceived their experience as more active and interesting.

Many other advantages have been claimed for peer tutoring and related forms of peer assisted learning (e.g. Greenwood, Carta and Kamps 1990). Pedagogical advantages for the tutee include more active, interactive and

participative learning, immediate feedback, swift prompting, lowered anxiety with correspondingly higher self-disclosure, and greater student ownership of the learning process. The 'pupil/teacher' ratio is much reduced and engaged time on task increased. Opportunities to respond are high, and opportunities to make errors *and be corrected* similarly high. In addition to immediate cognitive gains, improved retention, greater meta-cognitive awareness and better application of knowledge and skills to new situations have been claimed. Motivational and attitudinal gains can include greater commitment, self-esteem, self-confidence and empathy with others. Much of this links with work on self-efficacy and motivated learning (Schunk 1987), leading to the self-regulation of learning and performance (Schunk and Zimmermann 1994). Modelling and attributional feedback are important here – perhaps peer tutoring can go some way towards combating the dependency culture associated with superficial learning. From a social psychological viewpoint, social isolation might be reduced, the functionality of the subject modelled, and aspirations raised, while combating any excess of individualistic competition between students. Moust and Schmidt (1994a) found that students felt peer tutors were better than staff tutors at understanding their problems, were more interested in their lives and personalities, and were less authoritarian, yet more focused on assessment. Economic advantages might include the possibility of teaching more students more effectively, freeing staff time for other purposes. Politically, peer tutoring delegates the management of learning to the learners in a democratic way, seeks to empower students rather than de-skill them by dependency on imitation of a master culture, and might reduce student dissatisfaction and unrest.

Peer tutoring can have disadvantages, however (Greenwood *et al.* 1990). Establishing it does consume organisational time in designing and effecting appropriate peer selection and matching, and it may also necessitate some adaptation to curriculum materials. Certainly the requirements for training students in teaching and learning skills are greater, although it can be argued that peer tutoring merely serves to bring to the surface needs that traditional teaching tends to overlook. All these may involve increased costs in the short term, with a view to reduced costs and/or greater effectiveness in the medium and long term. The quality of tutoring from a peer tutor may be a good deal inferior to that from a professional teacher (although this should not be assumed), and the need for monitoring and quality control cannot be overstated. This also significantly consumes time and resources. Likewise, the tutor's mastery of the content of tutoring is likely to be less than that of a professional teacher, so curriculum content coverage in peer tutoring may be much more variable. For these reasons, project co-ordinators may experiment

initially with peer tutoring for consolidation and practice, rather than the first learning of new material, utilising it on a small scale with suitable topics.

Research on peer tutoring in schools

A recent review (Topping 1992) identified 28 previous reviews and meta-analyses of research on peer tutoring, mostly in schools. Sharpley and Sharpley (1981) conducted a meta-analysis of 82 studies in schools, reporting substantial cognitive gains for both tutees and tutors. Same-age tutoring appeared as effective as cross-age tutoring, and training of tutors significantly improved eventual outcomes. Cohen, Kulik and Kulik (1982) discovered 500 titles relating to tutoring. In 65 studies with control groups, tutored students out-performed controls in 45. There was again evidence that tutor training produced larger sizes of experimental effect. Highly structured tutoring was also associated with larger effect sizes. There was evidence that peer tutoring improved tutee attitudes in class, as well as tutee self-concept. In 38 control group studies measuring tutor achievement, tutors out-performed controls in 33. Improved tutor attitudes and self-concept were also reported.

There is thus substantial evidence that peer tutoring is effective in schools. Beyond this, relative cost-effectiveness may also be considered. Levin, Glass and Meister (1987) conducted a cost-effectiveness analysis of four different interventions designed to improve reading and mathematics in primary schools (elementary schools) in the USA: computer assisted learning, reducing class size, lengthening the school day, and cross-age peer tutoring. The most cost-effective intervention (peer tutoring) was four times more cost-effective than the least. The least cost-effective was reducing class size. While evidence concerning peer tutoring in schools can certainly not be automatically generalised into higher and further education, there is considerable food for thought in these findings.

Peer tutoring in higher education – previous reviews

Previous reviews and surveys of peer tutoring in higher and further education include those of Goldschmid and Goldschmid (1976), Cornwall (1979), Whitman (1988), Lee (1988), Lawson (1989), Maxwell (1990) and Moore-West, Hennessy, Meilman, and O'Donnell (1990). All of these are interesting, but the earlier papers were completed at a time when most of the literature was descriptive in nature. The Goldschmids' own empirical work (1976) was well before its time in this respect. Cornwall (1979) offered a wide ranging overview of the field, including advice on organisation and problem solving.

In a survey of 93 colleges, Lee (1988) made a comparative analysis of seven different kinds of programmes targeted on increasing retention and reducing student dropout. Programmes involving peers as resources showed up particularly well. The most expensive programmes were not more effective than cheaper ones and size of institution was not a factor in retention and dropout rates. Peer tutoring and peer counselling both showed good cost-effectiveness, while traditional remedial programmes proved very cost-ineffective. Lawson (1989) surveyed 19 colleges and universities in Canada identified as having peer assisted learning programmes. Peer tutoring was found to be more common than peer counselling. Detailed descriptions of goals, selection, training, logistics and methods for evaluation of programmes are given, but little hard data on comparative effectiveness and cost-effectiveness. Peer assisted learning programmes in United States medical schools were surveyed by Moore-West *et al.* (1990). Of 127 colleges in an association, 62 replied, and of these 47 had peer tutoring programmes, while 40 had 'advising programmes' and 13 had 'peer assessment programmes'.

Cross-year small-group tutoring

In this review of the more recent substantive literature on different forms of peer tutoring, the format most like surrogate professional teaching will be considered first. This is where upper year undergraduates (or post-graduates) act as tutors to lower year undergraduates, each tutor dealing with a small group of tutees simultaneously. The literature search revealed 18 studies of note (Bobko 1984, Meredith and Schmitz 1986, Cone 1988, Moust, De Volder and Nuy 1989, Button, Sims and White 1990, House and Wohlt 1990, Lidren, Meier and Brigham 1991, Longuevan and Shoemaker 1991, Moust and Schmidt 1992, 1994b, Johansen, Martenson and Bircher 1992, Arneman and Prosser 1993, Johnston 1993, American River College 1993, McDonnell 1994, Moody and McCrae 1994, Mallatrat 1994 and Schmidt, Arend, Kokx and Boon 1994.) Many of these gathered only subjective feedback outcome data. Of eleven studies doing this, nine reported very positive outcomes, one noted outcomes as good as those from teaching by professional faculty, and one reported less good outcomes than for professional faculty. Three studies reported reduced dropout in association with such tutoring. Five studies reported improved academic achievement, another four reported academic achievement as good as that from professional teaching and one reported achievement slightly but significantly worse than that. Much of the research is not of the highest quality, but good quality studies (e.g. Lidren 1991 and American River College 1993) do clearly demonstrate improved academic achievement.

In Bobko's (1984) study, the peer tutors had groups of 25 tutees for 12 hours per week. Course grades did not show a significant improvement over previous years, but previous groups may not have been comparable. Interviews with tutees yielded many reports of increased confidence and less anxiety, while tutors reported improvements in their knowledge and ability to communicate. Meredith and Schmitz (1986) reported a study involving many subjective ratings, and although some favoured peer tutoring compared to faculty tutoring, others indicated the opposite, and a great many were not significantly different. A mixed method project reported by Cone (1988) involved rotating recitation and testing between same-year peers with coaching and testing by cross-year peer teaching assistants. Tutoring objectives and materials were highly structured. Outcomes on test were markedly higher than normal expectations, but the lack of proper control groups and the absence of information about assignation to groups limits the conclusions that might be drawn.

A comparative study by Moust et al. (1989) in law included process measures which indicated that student tutor behaviours were very similar to those of professional faculty. Nevertheless, on outcome test scores the faculty tutored students scored higher than those tutored by peers. Button et al. (1990) reported cross-year tutoring (which they termed 'proctoring') in mechanical engineering and computing in relation to specific design projects. The subjective feedback from the vast majority of tutors and tutees was very positive. House and Wohlt (1990) compared achievement outcomes on Grade Point Averages for peer tutored and non-tutored students. Male peer tutored students achieved higher GPA's than non-tutored, but female tutees did not. The subjects were self selected into groups and the outcome measure was very general and probably insensitive to small scale intervention effects. Student drop-out also improved. A better quality study by Lidren et al. (1991) used randomized control groups and compared outcomes for peer tutored groups of six with groups of twenty. Both groups performed better academically in terms of examination results and positive subjective feedback than non-tutored students. The smaller peer tutored groups yielded better outcomes than the larger ones.

Longuevan and Shoemaker (1991) deployed upper year students and clerical staff as volunteer tutors. The tutors were required to attend the same lectures as the tutees prior to giving tutorial assistance. This tutoring programme charged a fee to tutees and 10–15% of undergraduates in the institution participated. There was some evidence that larger amounts of tutoring resulted in higher Grade Point Averages, although the size of difference was small and its significance not easy to establish. Johansen et al. (1992) reported subjective feedback, with tutees mostly satisfied but tutors rather anxious. Arneman and Prosser (1993) studied peer tutoring in dentistry in Australia.

Subjective feedback indicated confidence gains in tutors and tutees. Johnston (1993) deployed trainee teachers as tutors for economics students in 'micro-learning groups' of four. Although subjective feedback was very positive, the examination and test results of participants and non-participants were not very different.

American River College (1993) deployed twenty-four paid 'learning assistants' for three hours per week with groups of two to six tutees. Tutees' subjective feedback was very positive, and tutors felt their own knowledge of their subject improved. Most strikingly however, although tutees had lower general Grade Point Averages than non-tutored students, they scored as well or better than them in tutored subjects. In the area of computer science, McDonnell (1994) researched tutoring by third year students of small groups of up to four second year students, and reported very positive subjective feedback. Moody and McCrae (1994) reported on cross-year tutoring in groups of six to fourteen in law. Subjective feedback from tutors was positive. Mallatratt (1994) targeted reduced drop out rate for a peer tutoring project in computing. Half the students utilised the scheme, a quarter regularly. Tutees reported finding the experience supportive and achieved improved grades compared to previous cohorts of students. Seven students reported that peer tutoring had been the critical factor in preventing them from leaving the course, and other subjective feedback was positive.

Moust and Schmidt (1992, 1994b) found student tutored and staff tutored groups gained equally in achievement during an eight-week problem-based law course. Schmidt et al. (1994) compared the achievement of 334 peer tutored and 400 faculty tutored groups in a problem-based health sciences course. Overall, the latter achieved slightly but significantly better, but peer tutoring was equally beneficial in the first year of the course.

The Personalised System of Instruction

Fred Keller is credited with the 'invention' of the Personalised System of Instruction, which is also called the 'Keller system'. In 1968 he described the procedure, which is based upon programmed learning material, through which each student proceeds at their own pace with the goal of mastering each step. The peer tutor's involvement is largely as a checker, tester and recorder, to ensure tutee mastery. In 1977 Robin and Heselton compared training PSI tutors interactively with training by a written handbook only. The direct training produced higher quality tutoring behaviour, but no difference in tutee outcomes. Davis (1978) discussed the components of the tutoring role in PSI, and queried whether the tutors benefited more than the tutees. The most substantial review of the effectiveness of PSI was produced by Kulik, Kulik

and Cohen (1979), who meta-analysed 75 controlled studies. Of 61 studies evaluating in terms of class marks, 48 found PSI to give superior results. Of 20 studies scrutinising variation in achievement in the target group, 18 found PSI was associated with reduced variability. Sixty one studies considered final examination performance and 57 of these found PSI tutees superior.

Eleven studies also considered student subjective rating of teaching quality, ten of these finding that PSI students gave more favourable ratings. Eight studies also measured delayed retention of the material learnt, and all found PSI students superior. PSI was found to be effective across the whole ability range. It raised the final examination score of a typical student in a typical class from the fiftieth to the seventieth percentile. Effects were even more striking on delayed examination and these differences were more pronounced on essay than on multiple choice examinations. PSI effects were evident in studies with both good and less good research designs. Despite this very convincing evidence, Sherman (1992) noted that PSI use reached a plateau and speculated that computer aided learning may be currently more fashionable because it is less threatening to teachers.

Supplemental Instruction

Another well known 'brand name', Supplemental Instruction aims to reduce drop-out rate and usually targets high risk courses rather than high risk students. It is often used in courses with new and difficult content, a predominance of lectures and low rates of interactive teaching, and where assessment and monitoring are relatively infrequent. It operates on a cross-age basis with one 'leader' working with several tutees. Originated at the University of Missouri at Kansas City (UMKC) in 1975, it has come to be offered to almost half of the first year students in its host institution. Over 300 institutions have been trained to use SI in the USA and more than 15 institutions now use SI or some variant thereof in the UK. Leaders are trained to 'model, advise and facilitate' rather than directly address curriculum content. They have always previously completed the same course as the tutee, and usually again attend the tutees' lectures.

Martin and Arendale (1990) report a controlled study of SI at UMKC. The drop-out rate halved, the average course grade was 0.5 to 1.0 higher and graduation outcomes were 12.4% higher. The National Centre for Supplemental Instruction (1994) reviewed evidence for the effectiveness of SI from UMKC and other universities in the USA. In UMKC data from 14 successive academic years, involving 295 courses and 11,855 SI participants, indicated statistically significant differences in grades for participants compared to non-participants, even when initial (pre-SI) academic performance was con-

trolled. There was widespread evidence of effectiveness across the whole ability range. SI participation was also associated with higher re-enrolment rates and graduation rates. Similar data were reported from 146 other institutions, involving 2875 courses and 298,629 SI participants (see also Martin, Blanc and DeBuhr 1983, Martin and Arendale 1992).

Kenney and Kallison (1994) report two studies of SI in Mathematics courses, using comparable participant and non-participant groups. One study found significant differences favouring the SI group, the other found no difference. In both studies there was evidence of low ability students responding disproportionately well to SI. Bridgham and Scarborough (1992) used a regression model to predict medical students' expected final outcomes from their entry level, finding a subsequent statistically significant 'over-achievement' for SI participants. Average SI effect size was between one third and one half of a standard deviation in final test scores.

Research in the UK was reported by Rye, Wallace and Bidgood (1993), Wallace (1993), Rust (1993), Rust and Wallace (1994), Healy (1994) and Bidgood (1994). Wallace (1993) reported that levels of attendance at SI sessions were correlated with final course marks. However, further details were lacking. Rust (1993) reported that the course work marks of SI tutees were on average 5% higher if they had attended 2 or more sessions, although the SI tutees were far from being model students. This improvement was modest and again details were lacking.

Healy (1994) reported improved performance in annual examination results of SI students as well as reductions in dropout rates, coupled with enhanced communication and other transferable skills and a deeper understanding of the principles of the curriculum area in question (engineering). However, as the groups were self selected, comparability was doubtful, and no control group was used. Healy (1994) noted the need for longer term follow up of SI effects. More persuasively, Bidgood (1994) reported that end-of-year coursework and examination marks in two successive years of a computer science course at Kingston University were statistically significantly better for SI participants than for non-participants with equivalent entry qualifications and start-of-year marks. SI students did not figure in failure or resit lists.

It has been claimed that SI in the UK has also demonstrated improved grades for SI leaders compared to non-participants, as well as gains in self confidence and communication skills, but details of the data are difficult to find. In the USA SI leaders are usually paid, whereas this is much less frequent in the UK. A related development is the establishment of faculty-wide cross-year small-group 'Student Supported Learning', with many of the features of SI but much more focus on gains for the tutors, who are unpaid but

receive credits in a course accreditation transfer scheme for their participation (Topping, Simpson, Thompson, and Hill 1996).

Same-year dyadic fixed-role tutoring

More innovative (and perhaps easier to organise) is tutoring between pairs (dyads) in the same year of study, i.e. at the same point in the course, where one member retains the role of tutor throughout. Seven studies, some of considerable age, have focused on achievement gains resulting from this practice. The classic studies by Annis (1983) and Benware and Deci (1984) referred to earlier were examples of this format. Rosen, Powell and Schubot (1977) worked with same gender pairs in which the tutors were either more, less or equally competent than the tutees. Also, for half of the participants, roles were reciprocated halfway through the project. Subjects received only 20 minutes of training and 48 out 90 pairs did not supply full data. Outcome measures included 20 item pre- and post-tests and satisfaction questionnaires. There was some evidence the changing role from tutee to tutor was associated with an improvement in achievement. There was also an indication that pairing with someone of greater or equal ability was associated with a greater achievement.

Fremouw and Feindler (1978) studied the effectiveness of dyadic same-year tutoring in contrast with that of tutorials in groups of nine led by a professional faculty member. The peer tutors were given some additional content training. Two control groups were used, one given equal attention of a different sort and another a non-participant waiting list group. The peer tutored group achieved outcomes as good as the professionally tutored group. A study in Esperanto teaching was reported by McKellar (1986). Tutors were trained in new material and study guides were provided to support the tutoring. High accountability was inbuilt, since post-test tutor and tutee scores were combined as a performance indicator. The researchers found that the more tutors gave information, the higher was the tutor score and combined tutor and tutee score. High scores were also associated with the tutee asking for clarification and asking for the main points to recall. However, where tutors gave wrong information, this was associated with reduced scores for both tutor and tutee. The tutor simply asking if the tutee understood was also associated with poorer scores.

Two studies in Edinburgh are reported by Falchikov (1990). One study allocated participants randomly to tutor/tutee and study alone conditions, but found no significant differences in achievement between these conditions. Although some tutors reported subjective perceptions that they had gained more from tutoring than they would have done from independent study, some

tutees reported lacking confidence in their tutors. As in the Rosen (1977) study, it appears that random allocation can create its own problems. In the second study, following tutoring some participants became tutees again while some became tutors. Although there was less global satisfaction at role repetition, some tutees expressed more confidence in their tutors. No significant differences in achievement were found as a function of role repetition or non-repetition, but attrition at post-test was high.

In summary, most of the studies of dyadic same-year fixed-role peer tutoring have not compared the procedure to an alternative procedure, but considered organisational variations within the procedure and their relationship to outcomes. However, one study (Fremouw and Feindler 1978) showed this format of peer tutoring to be as effective as small group tutoring by a professional, two studies that it was more effective than independent study, but one study found no difference. The literature demonstrates the side-effects of random allocation to conditions and the potential problem of 'the blind leading the blind.'

Same-year dyadic reciprocal peer tutoring

Although this format might be considered even more innovative than same-year dyadic fixed-role tutoring, the first relevant study dates back to 1976. Although there is relatively little work in the area, some is of high quality. Goldschmid and Goldschmid (1976) used dyadic reciprocal peer tutoring in an undergraduate psychology course of 250 students. They compared outcomes for three groups: one involved in a seminar with faculty, one pursuing independent study, and the third involved in peer tutoring. The peer tutoring group did the best of the three on an unexpected post-test and they rated their learning experiences more positively.

More recently, John Fantuzzo and his colleagues have reported a series of high quality studies of reciprocal peer tutoring (RPT), consistently showing that it results in greater achievement, greater satisfaction and less feeling of stress in comparison to other treatment and control groups. Fantuzzo, Dimeff and Fox (1989) allocated psychology students randomly to three conditions: reciprocal peer tutoring, questioning only, and placebo control. The RPT group reciprocated roles within each session, creating tests for each other before the session, administering them to each other, scoring them, discussing the outcome and coaching their partner as necessary. The questions only group created the tests alone but never administered them – they studied to give the test. This group also saw the questions generated by the RPT pairs. In the placebo condition, students met and watched instructional videos with the same curricular content and answered the questions on the

videos. On examination scores, all three groups gained, but the RPT group did significantly better than the other two groups, which were not significantly different from each other. Student satisfaction was significantly improved and distress indicators significantly reduced for the RPT but not the other groups.

Subsequently, Fantuzzo, Riggio, Connelly and Dimeff (1989) conducted a component analysis to attempt to determine what elements of RPT were implicated in its effectiveness. One hundred and twenty five students were allocated to five conditions: a dyadic peer tutoring group with a structured interaction process, a dyadic unstructured contact group involving general discussion related to upcoming exam topics, an independent unstructured condition in which individuals had to submit a short essay on up-coming examination topics, an independent structured learning condition similar to the 'questions only condition' in the previous study, and a no treatment control group. The researchers found that dyadic interaction was associated with gains in achievement on pre-post tests, and a higher degree of structure was also associated with better outcomes. They also found that structured methods were associated with better scores on student stress inventories. Their conclusion was that it was not merely pairing but structured exchange which was effective.

Riggio, Fantuzzo, Connelly and Dimeff (1991) sought to replicate the study but with more diverse students in a different setting. The RPT group showed significantly higher achievement scores than the other groups, and there was generally a significant main effect for dyadic conditions, but not for structure. However, structure did yield better scores on two out of three stress inventories. Satisfaction ratings for the RPT group were significantly higher than those of the other groups. Thus compared to the previous study, dyadic factors showed less impact on stress and structure factors less impact on achievement. Riggio *et al.* (1991) note that the subjects were from a 'commuter' college who were not already well socialised with each other.

In the UK, all 45 students in a year-long undergraduate calculus class were involved in same-year dyadic peer tutoring (Topping, Watson, Jarvis and Hill 1996), the 12 one-hour peer sessions substituting for traditional lectures. Degree examination results in calculus were significantly better for the experimental group than for the previous (comparison) year, especially for students who were not maths majors, but the year cohorts were non-equivalent in some respects. Structured subjective feedback from the students suggested that peer tutoring had improved their transferable skills in a number of areas. Similarly, a project with 125 undergraduates in a year-long class in mathematical economics was reported by Topping, Hill, McKaig, Rogers, Rushi and Young (1996). Final degree assessment results for the experimental group were in general not statistically significantly different from those

of the previous (comparison) year. However, subjective feedback from the students indicated that peer tutoring had improved their transferable skills in a number of areas. Furthermore, students who regularly attended the peer tutoring sessions obtained significantly better degree assessment outcomes, and gave significantly better feedback about improved transferable skills, than those who did not. Additionally, student drop-out rates were lower in the experimental than in the comparison year.

Dyadic cross-year fixed-role peer tutoring

This format is reported in four studies, three from Australia. Schaffer, Wile and Griggs (1990) analysed the exam results of a cohort of students, some of whom had participated in a peer tutoring programme. There was a positive relationship between degree of participation in tutoring and examination results. However, no control groups were used and no demonstration of causality is evident. A study by Black (1993) focuses on ethnic minority group tutees in nursing and midwifery, and claims 'higher than expected' pass rates, but lacks sufficient detail to enable this to be verified. Loh (1993) deployed paid peer tutors in a course for Anatomy for Nurses with a previous high failure rate. Subsequently the peer tutoring participant failure rate was less than the non-participant rate, but no information was given about assignment to groups. Subjective feedback was positive however, tutees reporting feeling more confident. Quintrell and Westwood (1994) paired newly arrived international students with host national students, expecting twice monthly contact during the year. Tutees showed more positive attitudes than a comparison group matched for course of enrolment, but not significantly better academic performance. Many of these studies appear to suffer from problems of self-selection to groups and consequent non-comparability.

Same-year group tutoring

Four studies have considered same-year group tutoring, often in the format of rotating presentations by individual students to the peer group. Unfortunately, only one of these reported achievement outcomes. Autonomous student study groups were established by Beach (1960), who measured achievement gains with pre- and post-tests. Results indicated that extroverts did better in peer tutoring than did introverts, the introverts gaining equally in traditional lectures. The study raised questions regarding interactions between teaching and learning methodologies and student personality or learning style. Fineman (1981) reported on rotational presentations to the peer group by members

of a group of twelve students of organisational behaviour. Peer assessment on peer brainstormed criteria was included. The subjective evaluation by the participants was positive.

Similarly, Hendelman and Boss (1986) found rotating presentations to groups to yield positive subjective feedback from the students. The tutees reported that peer tutoring was as effective as faculty tutoring, and the tutors that peer tutoring was more effective than faculty tutoring. A course in Computer Aided Engineering Design was the focus of a study by Magin and Churches (1993), occasioned in part by a lack of sufficient access to hardware. Those students who had had access to machines tutored those who had not had such access, over a four week period. Subjective feedback indicated the tutees found the tutoring as or more effective than tutoring by faculty.

Peer assisted writing

Within the traditional higher education system, written output is often used as a vehicle for assessment of the individual, and collaborative writing can be problematic to assess. However, in recent years there has been greater interest in writing as a device for improving learning and thinking, coupled with the advocacy of 'writing across the curriculum', 'writing centres' and 'collaborative writing' (Olson 1984, Gere 1987). Rizzolo (1982) described the use of peer tutors in a writing centre, also staffed by English faculty. The tutors were paid and trained through internship. It was noted that tutoring in writing had to be more than merely proof-reading. The tutees rated their peer tutors very highly on subjective feedback. Similarly, Bell (1983) emphasised the role of peer tutors in a writing centre in promoting confidence and encouraging new students to view writing more as a process and less as a product. More substantial data were offered by O'Donnell, Dansereau, Rocklin, Lambiotte, Hythecker and Larson (1985), who compared randomly assigned co-operative writing and writing alone conditions. The writing of the 36 students was assessed for communicative quality. The co-operative writers did better on the initial post-test and on transference to a further individual writing task.

Holladay (1989, 1990) reported on the use of peer tutors in a 'writing across the curriculum' programme at Monroe Community College. Seventy six per cent of tutees found their tutors helpful or very helpful, faculty felt the quality of papers improved in tutored classes versus non-tutored classes, and all the tutors felt their own writing had improved as a result of tutoring. This programme continued in subsequent years with even better results. A study by Levine (1990) also yielded very positive subjective feedback. The experimental class improved in meeting deadlines and the failure rate reduced from 35% to 3%. However, grades and exam results were very similar for exper-

imental and comparison groups, although comparability is unclear. Students who had tutoring in writing from faculty and peers were compared by Oley (1992) with those who had tutoring from peers only or faculty only. Many of the participants had been identified as weak writers, and some received help voluntarily and some on a compulsory basis. Assignation to conditions was random. Those who received peer tutoring subsequently attained higher grades than those who did not.

Louth and MacAllister (1990) assigned freshman composition students randomly to three conditions: some students wrote in a traditional independent manner, others wrote (partially) interactively although producing individual written products, while a third group wrote wholly interactively producing a joint product. The independent writing group, which scored higher than the other two groups at pre-test, did not improve during the project, while both collaborative conditions improved their performance, although the statistical significance of this was debatable. The use of mixed ability writing groups of four students in geography was reported by Hay (1993), who emphasised the importance of writing as a transferable skill which is vocationally valued. In groups, the students reviewed their essay assignments, read each others' writing and made written reviews of each others' work, with a rotating chair person. Hay noted that it was possible to do the reading actually in the group sessions to avoid any possibility of plagiarism. Two groups gave subjective feedback: in one 65% were positive and in the other 80%. Problems included that peers were insufficiently critical and that errors were not always detected. Ninety percent felt that the writing group should continue. The co-operative writing did not necessarily save faculty time on marking, as monitoring the group process occupied some time.

In summary, of nine studies on peer assisted writing, five give only subjective feedback, but this is generally very positive. Four studies give data on gains in writing competence and of these, two good quality studies show tutee gains, one shows no statistically significant difference and a third shows some tutee gains of equivocal status. Other improvements include raised deadline attainment rates, reduced failure rates, and self report of improved writing in the tutors.

Peer assisted distance learning

In distance learning feedback and support from any peer group is problematic. Attempts to build this in by way of occasional summer-schools are little more than a token gesture, and the loneliness of the long-distance learner is a widespread phenomenon. Distance learning is also fundamentally difficult to research, and the quantity and quality of evidence on the role of peer support

in this process limited. Amundsen and Barnard (1989) worked with bank employees studying accounting and business administration. One set met in peer support groups, a second had peer support groups and also distance learning on study skills, while a third had both of these and also a nominated mentor who was a previous graduate of the programme. A fourth group was a control condition. Outcome measures included assignment grades, final exam scores, final degree grades and subjective self-assessments. However, the study groups were formed inevitably on a geographic basis, and were thus self selected and of doubtful comparability. Furthermore, the degree of conformity to the intended process was in doubt and some subjects were excluded from the analysis. Virtually no significant differences were found between the groups. However, the authors are to be commended for a brave effort in a difficult area.

A programme for audio-teleconferencing as a part of continuing education for nurses was developed in Australia by Hart (1990). The topics varied from week to week and were suggested by the participants. Each tele-conference involved between 6 and 12 nurses. The majority of participants were women and the author discusses whether females need or seek group support more than males. Subjective feedback from the participants was reported, but the response rate was only 34%. This paper does include a good discussion of practical problems involved. In summary, although there is some weak evidence that building in peer contact is liked by some participants in distance learning, there seems to be little satisfactory evidence that it increases student achievement. However, further research in this area is certainly needed.

Summary and conclusion

Peer tutoring is already widely used in further and higher education, in a variety of different forms. Surveys suggest several hundred institutions deploy this interactive method of teaching and learning. Of course, the existence of one small pilot project at one time in an institution does not constitute peer tutoring on a large scale across the curriculum which is quality controlled and embedded within the organizational culture. Of the different formats and methods, the Personalised System of Instruction and Supplemental Instruction have most nearly approached the latter scenario.

A considerable amount is already known about the effectiveness of peer tutoring in further and higher education. Cross-year small-group tutoring, the format least disparate from traditional methods, can work well. Studies of achievement gains almost all indicate outcomes as good as or better than group tutoring by faculty, and student subjective feedback is generally very positive. The Personalised System of Instruction has been widely used and evaluated

in the US. Two thirds of studies found PSI involvement associated with higher class marks and 93% of studies found PSI associated with higher final examination performance, compared to control groups. PSI also improved longer term retention of the material learnt. Supplemental Instruction adopts a very different model of operation and has become more popular outside the USA than PSI. There is very substantial and persuasive evidence from the USA of impact on course grades, graduation outcomes and drop-out rates. Research in the UK is improving in quality and also demonstrating positive outcomes.

Same-year dyadic fixed-role tutoring has been the subject of several studies over the years, research of mixed quality yielding mixed results. However, two good quality studies found improved achievement from this format, while three others found achievement the same as with faculty teaching.

Five out of 6 studies of same-year dyadic reciprocal tutoring have demonstrated increased attainment. There was also evidence of reduced student stress and improved transferable skills. The degree of structure in the programme was positively related to outcomes. Dyadic cross-year fixed-role tutoring has been the subject of three studies of poor quality. Same-year group tutoring has yielded positive subjective feedback in four studies, but no harder evidence on achievement outcomes.

Nine studies of peer assisted writing have shown generally favourable outcomes in terms of subjective feedback. Gains in writing competence were shown in two or three of the four studies examining this, despite the inherent difficulty of this kind of research. There is little evidence that peer assistance in distance learning improves achievement outcomes, but this area is even more difficult to research.

In summary, three methods of peer tutoring in further and higher education have already been widely used, have been demonstrated to be effective, and merit wider use in practice – these are Cross-year Small-group Tutoring, the Personalised System of Instruction and Supplemental Instruction. Same-year dyadic reciprocal tutoring has been demonstrated to be effective, but has been little used, and merits much wider deployment. Same-year dyadic fixed-role tutoring and peer assisted writing have shown considerable but not necessarily consistent promise and should be the focus of continuing experimentation and more research of better quality. In three areas there are barely the beginnings of a satisfactory body of evaluation research: dyadic cross-year fixed-role tutoring, same-year group tutoring and peer assisted distance learning.

It is essential that subsequent research strives to achieve adequate quality in design and execution, preferably including control groups or comparison groups which are truly comparable, and addresses issues of achievement gain and parameters of successful course completion as well as subjective par-

ticipant feedback. If achievement gains can be demonstrated that go beyond the narrow confines of the institutional assessment system and endure in the longer term, so much the better. This implies that impact upon wider cognitive abilities and transferable skills should also be measured.

However, peer tutoring is usually a relatively small component of a wide range of teaching and learning strategies deployed in higher education, so the extent to which it is realistic to expect associated gains to be measurable, widespread, maintained and generalised is debatable.

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