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# Student Mentoring and Peer Tutoring

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Student mentoring and peer tutoring was identified as one of the six areas that would form the initial focus of the LTSN-funded Where are we Now? project [1]. This project has the aims of identifying and disseminating good practice in HE Mathematics, Statistics and Operational Research (MSOR) provision, using a survey of the QAA subject review reports for England and Northern Ireland, and similar for Scotland and Wales.

Student mentoring and peer tutoring can take various forms, but all are in place to help students to be more successful in HE, to aid retention and to help those from more diverse backgrounds cope with the demands both socially and academically of their undergraduate courses. Methods by which students help each other to learn can confer considerable benefit to all concerned, both tutors and tutees, as well as academic staff [2]. Where such methods exist they were reported as being highly valued by the recipients, usually first year students, and most successful when the mentors or tutors had received sound training from the institution and had liaison with academic staff to whom they could turn for assistance.

In the overall review report [3] it was noted that most teaching activity in MSOR comprised formal lectures, supplemented by tutorials and/or seminars, problems classes and practical sessions. Although students rarely give lectures they are often involved with the three other teaching activities. Reviewers also noted occasions when more innovative teaching and learning methods were used and included in these peer-assisted study sessions and group work, which itself can have elements of peer tutoring and mentoring. Some providers also have students fulfilling a pastoral role, by helping new students settle into the university during induction and sometimes beyond this period.

This article outlines some of the ways in which HE institutions have developed teaching and learning styles through student mentors and peer assisted learning. These often add to a range of other methods thus providing students with a wide range of teaching and learning activities. There is evidence that a variety of teaching and learning experiences help students to develop both subject-specific and transferable skills; such variety is recommended as good practice in [3].

Schemes that are set up to be pastoral often have an academic element to them whilst those that are primarily focussed on additional academic assistance may also fulfil a pastoral role. Four main ways in which students are used as mentors or as peer tutors are identified here, namely:

- In a pastoral role
- In tutorials, problems classes or practical sessions
- Peer-assisted Learning
- Group work and peer-assessment

### ***Students in a pastoral role***

With widening participation there are more students coming to university who may not have anyone in their family or circle of friends who has been through the experience [4]. Such students often find it hard to settle in and may not realise the demands of HE where they are expected to be more independent learners. A study at the University of Birmingham [5] concluded that attrition occurred mainly in the first year and that social factors and

“homesickness” had strong influences on whether students were successful. There is evidence that the first six weeks or so are crucial to this settling in and it is here that other students who have been through the same process can be helpful. Much of this cross-level help takes place on an informal basis of course through societies, student accommodation etc. However, some providers have identified the need for more formal systems to help their students initiate themselves into the institution. Some examples of good practice are given below.

Oxford Brookes has a “guider” system in which students are trained to act as mentors for new students over the induction period. This is a university-wide scheme but reviewers thought it provided crucial and effective support in the MSOR provision where assessment takes place early in the courses. Contacts made during induction often last through the whole of the first year as new challenges are met.

At Leicester, special attention is paid to first year students. They are assisted in their independent study through peer support. Small peer groups of students provide academic and social support for the first year cohort, each group being led by second year “gurus”. The groups are set up in induction week and subsequently meet on a weekly basis. The gurus undergo suitable training before working with the groups. Similarly at Ulster a peer-mentoring scheme linking first year students to second year mentors was being piloted to provide first year students with additional pastoral (and academic) support.

At Surrey the reviewers commended the “parenting scheme” in which students from later years provide support and guidance for first year students in the early stages of their degrees. This is an ongoing initiative organised by the students, but with strong background support from the Department.

### ***Student helpers in tutorials, problems classes or practical sessions***

It has long been a tradition in British universities that postgraduate students help out in undergraduate problems classes or tutorials and in marking formative and summative exercises. This tradition continues in many universities, although the dearth of post-graduates in MSOR has led to the use of 4<sup>th</sup> year (MMath/MSci) students and, in some cases, third year students to fulfil this role. This is more of a problem in the “new” universities, which, on the whole, do not run MMath/MSci courses nor have many postgraduate students.

Institutions offering this type of assistance include Edinburgh and St Andrews where it was noted that post-graduate students provided a substantial part of the tutorial cover. This was regarded by the reviewers as a useful experience for both parties. Dundee was commended for the management of the system where honours students marked tutorial questions under departmental guidance. Lancaster and Kingston used undergraduates as demonstrators in computer laboratory classes; at Sussex it was noted that students received strong academic support from post-graduates in workshops and exercise classes.

Some institutions use post-graduates (and undergraduates) in weekly supervisions, ie in small group teaching. This was regarded as good practice at Warwick, where first year students had weekly supervisions from post-graduates or fourth year undergraduate students who had been trained for this purpose. These sessions provided students with the opportunity to practice their mathematical skills, knowledge and understanding and were highly valued by the participants. Similar schemes were commended at Birmingham and Keele, the former using fourth year students, supervised by post-graduates and the latter using post-graduates with a member of staff acting as mentor.

These activities have largely been regarded as beneficial to both sets of students – the post-graduates gain some insight into university teaching duties as, traditionally, many of them would become university lecturers themselves and the tutees, who often find fellow students, albeit post-graduates, more approachable. Many of the recipients stated that they appreciated this help and that it was beneficial to their overall learning experience. It is regarded as good practice that most post-graduate and undergraduate students undertaking these tutor roles do so after some form of training and under academic guidance.

### ***Peer Assisted Learning (PAL)***

In addition to the activities described above, many institutions offer formal but voluntary schemes whereby second and third year students are selected and trained to assist lower level students with their studies.

Several British universities have adopted a peer-assisted scheme known as Supplemental Instruction (SI), whereby trained second year students assist first years to develop the study skills required to help them be successful on their course.

SI was started in the University of Missouri-Kansas City in 1975 and underwent several changes to the original model in the USA before its inception in the UK at Kingston University in 1990-91; funding through an HEFCE project in 1993 allowed dissemination to a wider audience in the UK. The essential elements are that SI is attached to modules that are difficult and traditionally have high failure rates. Thus it is not seen as remedial help for weak students (or poor lecturers). Sessions are voluntary (hence the most able can attend) and are led by trained leaders, who have been through the module themselves previously and demonstrated that they had a sound understanding of the course content and the requisite study skills. SI is only attached to modules with the approval of the lecturers concerned who support the SI leaders[6].

Some notable successes with this scheme in MSOR include the programmes at University College, London (UCL), Kingston University and the University of Leicester.

SI was introduced into the Department of Mathematics at UCL (and consequently to five other departments, including Statistics in 1993/4). The concept of student facilitating others' learning was a key feature of Enterprise in HE programme at UCL. The head of department at that time, Dr Larman, said *"The reason I like the sound of SI is because I can see quite clearly that it allows the students the opportunity to explore together their understanding of the concepts I explain in a lecture in a supportive environment, free of judgement and evaluation. In doing so, I hope the students will come to the tutorials better prepared to discuss aspects they are unsure of"*[2]. This scheme has been adapted over time to take account of the British system and the changing student needs.

SI was originally attached to the Analysis and Algebra courses in the mathematics department; the reviewers noted the scheme (now called PAL – Peer Assisted Learning) as a positive feature in the UCL provision as it promotes both personal development and learning.

At Kingston the PAL scheme has been attached to various modules. On the statistics pathway PAL has run in the two level 1 *Mathematics for Statistics* modules, which are deemed the most difficult for students on the statistics courses and for which the mathematics entry requirement is GCSE grade B or above. On the mathematics route, PAL has been attached to the level 1 *Linear Algebra* module. This programme of student support was considered by the reviewers as conferring considerable benefit on all involved, being a valuable learning experience which was highly valued by the

students who take part.

The University of Leicester has run SI (called Peer Support there) in the Department of Mathematics and Computer Science for over nine years. Its success can be measured by its growth with, currently, about 50% of first year students making some use of it during the year and typically fifteen to twenty trained leaders. Further information on Peer Support at Leicester can be found in [7].

A very similar scheme called PASS (peer assisted study session) was commended at the University of Manchester. Here, trained second year student volunteers assisted first years with example sheets, note-taking and "general university survival skills".

The University of Hertfordshire uses student proctors in a peer support system. Here students are offered the opportunity to learn from their peers in a one-to-one situation, giving them an additional level of academic support. The proctors, who are appointed after interview, need to have an appropriate academic background, normally a first class or upper second class profile, and the required personal skills such as being well-organised, being able to communicate clearly, having patience and being interested in helping other students to learn. Proctors are usually time-tabled to be available for 2-3 hours each week when students requiring help can see them on a drop-in basis. Records are kept of the use made of the service, both the number attending and the problems they bring. This evidence shows that the scheme is successful. Further information on the proctor scheme at Hertfordshire can be found in [8].

### **Group work and peer assessment**

Students often work together in informal groups, which can provide mutual support. Groupwork has many rewards, both social and academic, for all concerned, although can be fraught with problems if there is too much collaboration in individual assignments. This type of group work is defined in [9] as *"any collaboration between two or more students that is not a specific requirement of the degree course"*. Students are often encouraged to form such informal groups, under guidance that there is a difference between *"discussing a problem and helping each other with difficulties"* and *"collaborative work in individual assignments"*.

Small group work is often used in problems classes, practical sessions or tutorials; as noted above these are often led by other students and may encourage the setting up of more informal groups outside class hours. For example it was noted at UCL that first year

mathematics students had two one-hour small group tutorials each week, whilst statistics students had one small group tutorial each week throughout the three years.

[9] defines formal assessed group work as *“tasks that have been set as part of the course and that must be completed by a group of students, who as a result gain a mark”*. Students have come together purposefully to complete a specific task. Such groups may be self-selected or chosen by the lecturer; they may constitute individuals of similar or of diverse ability. Evidence from [9] indicates that students prefer self-selection and members of similar abilities and outlooks. However, especially early in the course, selection by the lecturer may have advantages in mixing abilities to help student mentoring and tutoring and to help with social integration.

Group work, in this formal sense, is often seen as an important element in the development of key or transferable skills, such as working with others, time management and oral presentations as well as in the development of shared understanding of the subject matter and the requisite skills. Many courses in MSOR have aims and objectives that include vocational aspects and preparedness for a variety of careers. Thus group work is often deemed a necessary element in such courses, as preparation for future careers, where the mathematician or statistician is part of a team.

Formal group work is used in both case studies and on projects. At Birmingham, in the first semester of the first year, students attend a compulsory “Problem Workshop” module, which includes group work. London Guildhall (now part of London Metropolitan University) introduced group work at level 2.

A recent article [10] outlines the benefit of using industrially based group projects at the University of Derby. In the subject review report it was noted that these formed, at stage 2, part of the process of developing mathematical modelling and problem solving skills with particular reference to the needs of business and industry which form the central aim of the mathematics degrees.

In this scheme, students work in small teams (ideally of 4 individuals) on a real-life problem, normally specified by industrialists from major local companies. Not only do students have to work as a team but they need to report progress to the industrialists as well as produce a written technical report and give an oral presentation. In tackling a real-life problem, that may not have a closed solution, students need to negotiate on how to

approach the problem, what data and techniques to use and how to present their conclusions effectively. All of these activities can involve mentoring and peer-tutoring, especially as groups are chosen by the lecturers to include individuals who have a complementary range of skills.

Similarly, local industries supply case studies for group project work for honours students at the Robert Gordon University (RGU); students also carry out group modelling exercises. The review report noted that these activities encouraged students to use their initiative and helped the development of inter-personal skills.

There are several ways to assess group work, some of which involve peer-assessment. For example at RGU fellow students (and staff) critically appraised oral presentations and attempted to assess communication skills objectively. More commonly group members assess the contributions of other members of the group. All of these peer-assessment opportunities involve discussion and possibly negotiation so can aid learning for both the assessor and those being assessed. Whatever assessment method is used it needs to be clear to the students; to this end at Kingston the policy on allocating individual marks for group work is made clear by means of an interactive calculator on the faculty intranet.

Peer assessment is also used in individual work, for example at Westminster where a particular feature of the compulsory level 3 project is the mid-year poster session at which students display their work to peers (as well as staff and external examiners). More generally the University of Hertfordshire integrates peer and self-assessment into some courses at level 1.

### **Conclusions**

There are many ways in which students can help each other learn; they all confer mutual benefits to both learner and “teacher”. Some areas of good practice are listed above; many other institutions will have similar schemes and methodology for helping their students gain the most from their university careers, both academically and socially. Not all methods will suit all students but offering a range of teaching and learning activities should enable a large proportion of them to engage with the course content, enjoy their studies and be successful.

***See over for references...***

## References

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## First Announcement UMTC 2004

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The Undergraduate Mathematics Teaching Conference is a working conference that provides an annual opportunity for lecturers to meet colleagues from different universities to exchange ideas, experiences and anecdotes about the teaching of mathematics at undergraduate level.

UMTC 2004 is a 3-day event running from Wednesday 1<sup>st</sup> to Friday 3<sup>rd</sup> September. It is hoped that this format will continue to make the conference convenient for colleagues.

For those unfamiliar with UMTC, the conference includes plenary sessions by invited speakers, and presentations by delegates. However, the main focus of the conference is the work of the small working groups whose aim is to produce a report on a brief concerning a current issue relating to learning and teaching in undergraduate mathematics. The finished reports form the major part of the published proceedings.

The specifications for the briefs are still being finalised but the following topics have been selected:

- Subject based CPD - how to make it successful in mathematics
- Undergraduate project practice - organisation and assessment

- Employability skills - customization within the study of mathematics
- Teaching mathematics in interactive classrooms  
Goal orientation in mathematics education of engineers
- Design of mathematics learning environments
- Teaching statistics to non-specialists: principles, practice and politics

UMTC fees are £250 for early registration. **Registration forms and electronic registration will be available shortly.** Copies of the proceedings of last year's conference will be sent out to mathematics departments later in the year. Copies of some previous year's proceedings are available at the UMTC web site: <http://www.umtc.ac.uk/>

If you have any queries or think you can contribute to UMTC I would be glad to hear from you.