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# After the diagnostic test – what next ?

Evaluating and Enhancing the Effectiveness of Mathematics Support Centres

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Interim report of a maths project funded by LTSN Maths, Stats & OR Network

\* We have endeavoured to solicit responses from every UK university. If readers suspect that a Centre with which they are closely associated may have been overlooked please notify the authors who will take the necessary steps to ensure the data set is complete

The decline in the level of mathematical skills displayed by many students on entry to university has been well-documented (see, for example, [1]-[3]). Universities have taken a range of steps in an attempt to address this problem. These include such things as:

- curriculum changes to include more 'revision' material in the first year
- the provision of extra support units to be studied alongside the traditional syllabus
- the introduction of bridging units to be studied intensively at the start of the course
- staff voluntarily making themselves more available to students outside scheduled classes
- provision of some kind of mathematics support centre.

This project has carried out an investigation of the last of these. The project has not started from the assumption that this is the 'best' way to provide extra support to students or that every university should have one. Rather the starting point was that it was known that a number of universities had adopted this form of support and the project aimed to determine how widespread such provision is, how effective such provision is and to identify and disseminate good practice in the running of mathematics support centres.

The first step towards achieving these aims was a survey to discover the extent to which universities throughout the UK are providing some kind of mathematics support centre\*. Data has been gathered via an email and on-line questionnaire (still available at [http://ltsn.mathstore.ac.uk/feedback/mathsc/maths\\_support\\_centres.htm](http://ltsn.mathstore.ac.uk/feedback/mathsc/maths_support_centres.htm)) on the nature of the facilities and services on offer, staffing and funding arrangements and up-take by students. Subsequently, a series of telephone interviews has taken place with staff in a number of universities to determine their perceptions about the effectiveness of provision and also to identify areas of good practice. Visits have been made to eight centres to conduct interviews with students using them, students who do not use them and staff who tutor in them.

This article presents an interim report on the extent of the current provision and is based primarily on the data collected from the questionnaire. Later this year more detailed findings will be summarised in a practical handbook *Good Practice in the Provision of Mathematics Support Centres*, which will be made available through the LTSN Maths, Stats & OR Network web site.

## **Basic Information**

A total of 95 UK Higher Education Institutes replied to the basic question of whether they had some kind of mathematics support centre. In asking this question respondents were asked to give a broad interpretation to the term as explained below:

The term 'Mathematics Support Centre' should be interpreted to mean a facility offered to students (not necessarily of mathematics) which is in addition to their regular programme of teaching through lectures, tutorials, seminars, problems classes, personal tutorials, etc. The term should be regarded as an umbrella term encompassing a wide range of provision.

46 institutions indicated that they did have a support provision of this kind whilst 49 said they did not. Of those 46 institutions with a mathematics support centre 41 completed the questionnaire describing the operation of their facility.

The questionnaire covered basic factual information such as location and opening hours and more qualitative areas such as aims, good practice and problems. What follows is a summary of the key features which emerged from the questionnaire responses.

### Aims

Respondents were asked to describe the aims of the provision at their institution. Although there were some variations the overwhelming majority had the same theme, which is clearly seen in the sample of responses listed below:

*'To provide non-judgmental support for students outside their teaching departments'*

*'To ease the transition of all students to HE courses with a significant numerate component.'*

*'To provide a 'GP surgery' for any type of difficulty in mathematics or statistics.'*

*'To provide one-to-one support for any member of the University with mathematics difficulties no matter how small.'*

*'To offer extra help (ie outside formal classes) for any student taking any maths module.'*

Within this common theme of providing support beyond that routinely available through lectures, tutorials, etc. the main variation concerned who is allowed to access the support that is made available. In a small number of institutions the support is limited to students on mathematics degrees. At some universities only foundation year and first year students can use the centre (although some indicate that whilst not encouraging others to come they are not actually turned away). More commonly, the support is available to anyone studying a mathematics or statistics module. Finally, the most common position is any member of the university can take advantage of the support that is on offer.

Nature of Staff	% of Universities
From maths department	39
Dedicated centre staff	20
Maths dept & dedicated centre staff	12
Maths dept & post-graduates	7
Dedicated centre staff & post-graduates	7
Post-graduates	7
Under-graduates	5
Maths dept, dedicated & post-graduate	2

**Table 1: Nature of staffing in Mathematics Support Centres**

The only aim which was significantly different to those highlighted was:

*'To provide a pleasant environment where students can work, study and support each other.'*

The emphasis everywhere else was essentially on what the university does (ie to provide support, to offer help etc.) but here the emphasis is primarily on the students. This is a significant point which will be returned to later.

### Operation

In seeking to fulfil their aim of providing extra support to students with difficulties, most universities used the same basic approach with minor local variations. This approach can be summarised as:

*'staff are available for consultation and one-to-one tuition at specific published times in a pre-ordained location'.*

The local variations around this method of operation relate to:

- The staff:** At some institutions there are dedicated members of staff who do little if any 'routine' teaching; this is most common when the mathematics support is part of a wider provision in student services or a student learning centre. At other institutions the support in the centre is provided by a number of academic staff (in some cases, those teaching the first year modules) on a rota basis. Sometimes part-time staff, usually with experience as school teachers or in further education, are hired specifically to work in the centre. A small number of institutions use post-graduate students with two institutions specifically using final year undergraduates. A complete breakdown of the responses is shown in Table 1.

**2. The times:** There is a large variation on how long each centre is open to provide help. At one extreme, help is available for 2 hours per week and at the other the centre is open (and staffed) for 40 hours per week. Details of the time centres are open for one-to-one help are given in Table 2. There is a variation on the common pattern and that is to have the Centre open for long periods but only staffed for a relatively short period of time. The idea here is to promote use of the facility as an area for student study generally (this approach is used at the institution whose aim was different to the majority and at a small number of other institutions) and not specifically as a place for support from staff.

Hours/Week of 1:1 help	% of Universities
<5	33
5-9	24
10-14	22
20-24	7
30-40	7
Unknown	5

**Table 2: Number of hours the Centre is open for 1:1 help**

Site	% of Universities
Maths/Computing department	46
Library/ Learning Centre	29
Central Teaching Block	10
Engineering Department	7
General Support Centre	5
Departmental (multi-location)	2

**Table 3: Location of Mathematics Support Centre**

Number of student visits per week	% of Universities
<5	10
5-9	22
10-19	22
20-29	17
30-39	10
40-100	12
>100	2
Unknown	5

**Table 4: Number of students receiving 1:1 help per week**

**3. The location:** The location of the centre is usually in one of two places: a teaching department or a central facility such as the library, learning resources centre or student services. If the room is in a central facility it is often a dedicated room, but if it is in an academic department it may be a normal teaching room. This is the pattern at institutions where the support facility is only available for a few hours a week. At institutions where the centre is open for most of the week it is usual to have a dedicated room.

**4. The resources:** There is a wide variation on what is available in the centre. Some respondents stated that the resource that students wanted was human contact and so this was all that was provided. At the other extreme, some centres have a wide range of handouts, books, videos, PCs with a range of CAL material and on-line assessments. There appears to be a correlation between the length of opening and the amount of

resources available. Where support is offered for only a few hours each week (usually in a normal teaching room) the logistics of moving resources into the room for the support sessions normally militate against anything other than human resources being provided. On the other hand, where there is a dedicated room there are usually other resources in addition to staff.

### Users and Use

Questions on the questionnaire asked which disciplines were being studied by the students who used the support centre and also in which topics students most often asked for help. To some extent the answers to these questions are determined by the aims of the centre and the nature of each university. So, for example, those centres which were set up simply to help students on mathematics degrees only helped students from these courses. In general, students visiting those centres with a wider target clientele reflected the range of courses on offer at that institution. The majority of responses indicated that students from engineering were the major users of the centre, but in institutions which do not have a large engineering provision the main users were from either business courses, nursing or health and social sciences.

The number of students using a centre for one-to-one help each week clearly depends on how long the centre is open (staffed). Table 4 gives more detail of usage. Institutions were also asked to identify which topics were most commonly the subject of requests for help. On the one hand, not all respondents answered this question, whilst on the other hand some gave a long list. Amongst those who did respond there was some variation

with the nature of provision, however three topics stood out as mentioned significantly more frequently than any others. The most frequent by some way was algebra, particularly basic manipulation. This was cited almost twice as often as calculus and basic statistics (this topic was usually mentioned at centres where the main users were from business or health and social sciences).

### ***The Good and the Bad***

At the end of the questionnaire each institution was invited to identify up to three aspects of their provision which they thought were particularly beneficial and possibly worthy of wider dissemination and also up to three barriers which reduce the effectiveness of the provision.

The positive feature which was most frequently identified was the one-to-one support which is offered to students. This was seen as important because it provided focused help with immediate response to student questions. However, alongside this the whole issue of the atmosphere and the environment of the centre was frequently mentioned as being an important and highly positive feature. A selection of comments which make this point are listed below.

*'Making students feel appreciated and in control.'*

*'Allowing students to seek help in a non-threatening environment'*

*'A safe, protective environment'*

*'Comfortable, unrushed atmosphere'*

*'Provides technical and emotional support'*

*'Informal and relaxed'*

*'Informal and confidential, separate to home department'*

These comments identify that a widespread problem is one of lack of confidence and even fear with regard to mathematics. An objective for the centre is then to create a safe place where students can ask any question, no matter how basic, without fear of being thought stupid. The role of the staff members in this process is essential and staff were generally the only 'resource' mentioned in the list of good features of a centre.

In the list of factors which were barriers to the effectiveness of the centre there was one which was mentioned by almost 70% of respondents. Perhaps

surprisingly it was not funding, although a number of responses did indicate that the opening times were limited because of the funding available. The main factor reducing effectiveness was student reluctance to use the provision. Comments such as

*'The students who need it most don't use it'*

*'Student immaturity - they try to avoid their weak maths rather than doing something about it'*

were widespread. Furthermore, respondents were asked to rate the effectiveness of the centre in meeting its aims on a scale of 1 to 10. Totally unsolicited many institutions gave two figures in answer to this question, one for students who came and one for students who didn't and a number of those who gave only one figure (usually a low score) qualified this by saying that a higher score could not be awarded because too many students who needed the provision did not come to make use of it.

Interestingly, the centre whose aim was different to the vast majority (namely, 'to provide a pleasant environment where students can work, study and support each other') did not report any barriers to greater effectiveness.

### ***Evaluation***

The questionnaires asked how the effectiveness of the centre was evaluated. That this is a difficult task was recognised by many respondents. The most commonly used methods are given below.

**1. Student feedback:** A variety of methods are used to obtain feedback from students. At one extreme, it is completely informal and based on conversations between centre staff and students who use the centre. At the other extreme formal processes are used with specific questions on module questionnaires relating to the support centre. In between are methods such as voluntary comment cards and discussion at course committees.

**2. Attendance levels:** The number of students that visit the centre is a measure of the value students perceive it to have. This is particularly true of return visits as this usually indicates that the student felt sufficient benefit from the first visit to warrant a further visit.

**3. External Reports:** A number of institutions mentioned comments in reports from organisations such as QAA and Professional Body Accreditation Panels as indications of their success.

**4. Reduced Failure Rates:** Underlying most support provisions is the desire to enable more students to successfully complete their course. Centres are seen to be needed because a significant number of students are in danger of failing. If a centre is successful then fewer students will fail the mathematics component of their courses. However, the effect of a support centre on failure rates is very difficult to measure. In the first few years of provision it may be possible to compare pass rates with those when no centre existed; but when a centre has been established for several years it is very difficult to prove that pass rates would be lower if it did not exist.

**5. Staff Comments:** Solicited and unsolicited comments from academic staff, particularly in non-mathematics departments, can give an indication of the value of the support centre.

### **Conclusions**

As the first step of an LTSN Maths, Stats & OR Network funded project investigating mathematics support centres, a survey has been carried out to determine the extent of provision of mathematics support centres throughout higher education. The questionnaire revealed that at least 46 UK universities and higher education colleges have mathematics support centres. This was almost 50% of those who responded. Centres are not confined to higher education colleges and 'new' universities. Many long established 'old' universities have their own centres. This indicates that there is a widespread feeling that mathematics causes special problems which mean that students need extra support if they are to succeed in their studies. A final project report will be published in this journal on completion of the project and a handbook *Good Practice in the Provision of Mathematics Support Centres* will be produced and made available on the LTSN MSOR website.

### **References**

- [1] Engineering Council (1995) *The changing mathematical background of undergraduate engineers* (R.Sutherland & S.Pozzi), Engineering Council, London.
- [2] LMS, IMA, RSS (1995), *Tackling the mathematics problem*, London Mathematical Society, London.
- [3] Engineering Council (2000), *Measuring the mathematics problem*, Engineering Council, London.

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