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# Inter-institutional collaboration on Easing the Transition to University

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Bill Cox et al  
University of Aston

w.cox@aston.ac.uk

One of the primary functions of the Learning and Teaching Support Network (LTSN) subject centres is to promote and facilitate collaboration between institutions, particularly in terms of sharing good practice and resources. There are however some practical difficulties in such collaboration. These include:

- differences in level of student intake
- pressures on staff time
- differences in aims and objectives of provision
- differences in type and volume of resources
- differences in IT platforms, operating systems, strategies, etc

This article reports the progress of one group in coming together for educational development purposes with the help of and a small amount of funding from the LTSN Maths, Stats & OR Network.

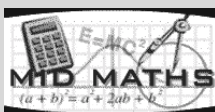
## *The MidMath Collaboration*

MidMath was set up in 1998 to bring together expertise and experience, initially in the problem of the transition to university, of five Midland universities with a Mathematics provision: Aston, Birmingham, Coventry, Warwick and Wolverhampton. Collectively, these universities provide mathematics teaching to students with a broad range of entry qualifications, (8 – 30 A-level points, vocational and Access qualifications).

Despite their differences in intake and aims and objectives the members of this group experience similar difficulties due to the variable levels of preparedness of incoming students (both special and service) in basic mathematics [1]. Each member of the group conducts initial assessment of incoming students in the form of diagnostic tests, and undertakes support and consolidation designed to ease the transition to university. It was therefore decided to pool our resources to develop a networked initial assessment facility for students, preferably web based. The idea is that tests and support activities could address similar topics at various levels, and the total pool at each level would be much larger than that available within the individual institutions. There were a number of practical difficulties to be addressed:

- the project in itself did not free up time from the normal activities of MidMath members
- none are experts in IT and networking
- different institutions were using different software for constructing tests
- no funds to pay for technical and clerical help

In the summer of 2000 the Maths, Stats & OR Network provided funding for a small number of students to work over the summer vacation to carry out, under supervision of members of the group, the routine work of authoring questions and mounting to the web. (In its previous life as CTI Mathematics the Network had in fact already been pivotal in assisting the development and operation of the MidMath Group by providing help and advice in the networking technology needed for us to work together effectively as a group).



### **The Project**

There were two main objectives of the project:

1. The production of an initial (diagnostic) assessment resource, which ultimately can be made available nationally via the Maths, Stats & OR Network web-site
2. An evaluation of the practicalities of inter-institutional collaboration

Timescales were particularly short. A project specification had to be drawn up rapidly so that students could be recruited before they left for the summer vacation. The following project outline was agreed:

- questions would be focused on basic algebra
- each institution would aim for about 100 questions each
- each question would have feedback to students
- as much as possible Question Mark (QM) software would be used to design the questions
- PC and Macintosh platforms would be tried
- A number of different software approaches would be compared
- Finally the questions produced would be assembled and organised on QM databases so that tests could be designed and put on the web

### **Question Authoring**

Despite the short timescale, there was no difficulty in recruiting four students to work at Aston, Birmingham, Coventry and Wolverhampton (Warwick was not involved due to Trevor Hawkes' sabbatical). Each student was contracted to provide 100 hours work for £500. All had good computing and mathematics backgrounds. Thus they were able to pick up the software used quickly and to have some useful input into the nature of the questions.

Overall, this phase of the project was carried out successfully. The students at both Aston and Birmingham had access to Perception. Although the initial intention had been for Aston to work on a Macintosh platform, because of the lack of a Mac version of QM and difficulties of interfacing with the rest of the group who were using PCs, Aston switched to working on PCs as well.

The student at Coventry used Question Mark Designer to author the questions. These were then emailed to Birmingham for conversion into Perception. This student also authored some questions using AIM and this work has already been reported in the Maths, Stats & OR Newsletter [2].

The student at Wolverhampton developed questions in Visual Basic, building on test software already in use at Wolverhampton. There was no easy way of integrating these into the overall database, however the development work of question design is the main task in this exercise. Authoring them in Perception is a routine task. It was also useful to compare what could be done in terms of authoring tests using widely available standard software as opposed to a propriety question design software such as QM.

### **Collecting and Collating Questions**

By the end of the summer the students had successfully authored around 400 questions. The task that remained now was to assemble these into a Perception database on a server at Birmingham that could be used to generate tests. Generating the database turned out to have some technical difficulties.

In transferring the material developed in various Question Mark software packages to the Birmingham server a number of problems were encountered relating to the number and size of GIF files. In displaying mathematics something more than standard text is needed and this sometimes requires the use of some kind of graphics file. These need to be kept as small and few in number as possible. Furthermore, in QM there is a need for careful housekeeping to ensure that pointers within questions authored on one machine and then transferred to another still find the correct graphics files.

Conversion from Question Mark Designer to Perception proved to be straightforward but did highlight one difficulty. Question Mark Designer allows a supplementary question to be built in to a basic question. This feature is the only way of giving formatted feedback since the standard feedback boxes cannot be formatted. In many mathematical questions the formatting is an essential feature of the feedback. Unfortunately the supplementary question facility is not available in Perception and so the feedback to many questions was lost.

Eventually the questions were loaded to a QM database for subsequent processing. We then found:

- the questions from different institutions were different in style
- they were different in format and presentation – and not consistently labelled
- some saved as large gifs, some with sparing use of gifs
- the range of questions varied
- there were varying levels of difficulty
- the questions were not categorized in an agreed consistent manner

At this stage, major re-authoring of questions was impracticable. Therefore we proceeded to production of tests, noting these points as lessons that the pilot had taught us.

### 'Test' Tests

To design tests there was a need to categorize the questions in some way. Recognizing that this would require considerable discussion and wishing to speed the production of prototype tests that would give a preliminary idea of the issues arising at all stages of the development, the questions were initially categorized into the following groups:

- ARITHMETIC
- ALGEBRA OF BRACKETS
- FACTORISATION
- POWERS AND INDICES
- SOLVING EQUATIONS
- QUADRATICS
- RATIONAL FUNCTIONS

Within each category there are sub-categories defining specific topics or learning outcomes, and a preliminary attempt was made to assign levels of difficulty. Categorised in this way questions could then be selected from the QM database to provide tailored tests to suit students at different levels. Each category had at least five questions from which a given test would select randomly. It is also possible to design tests with questions of comparable difficulty, so that students' results could be compared across the tests.

Once the questions had been categorised and assembled on the server database at Birmingham it is in principle easy to produce test sessions. This was hurriedly done for the purpose of seeing the whole process through from inception to production of a prototype, to give a preliminary idea of the lessons learned. Two prototype tests were produced for different levels of students. Although these were rather crude, it was at this stage that many of the strengths and weaknesses of such collaborations emerged. The range of people involved generated many ideas and insights and examples of different approaches – it also led to headaches in achieving tests that looked coherent. It was found that once an initial file management structure is put around the questions, the test is easy to author, but a lot more needs to be done on the structure, categorisation, and labelling of questions at the initial design stage to facilitate this.

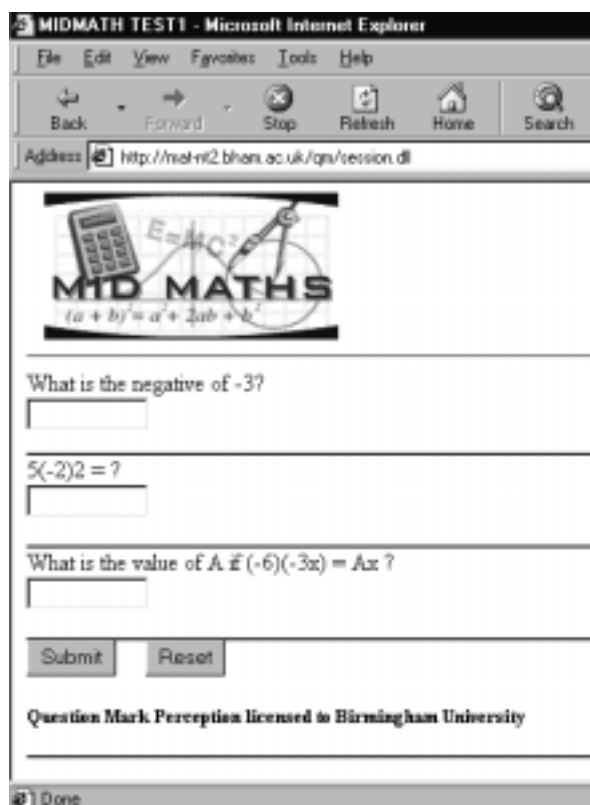


Fig 1 Test Screen from MID MATH

### Lessons Learnt

So far the project has demonstrated a number of important elements for this type of cross-institutional collaboration, which can be summarised as follows:

#### Planning

- The pedagogical aspects of the test and feedback facility need to be agreed before putting into electronic form (structure of tests and questions, categorisation, levels, etc)
- Question style, format and presentation - a suitable house-style - need to be agreed before authoring at the electronic level, to get the best out of the different authoring styles that emerged
- The task of designing and producing tests from the authored questions is not insignificant and adequate resources should be allocated to it
- Appropriate allocation of duties is needed to make maximum use of resources available For example if one university does not have the appropriate software then they can be engaged in some other activity while the others undertake the task of producing the questions
- The use of large graphics files needs to be kept to a minimum to ensure the most efficient and portable browser access, and to facilitate corrections and post-authoring editing

**Time-scale and scheduling**

- Everything takes longer than expected
- Collaboration produces its own time delay
- Although email is important as the primary means of communication, face-to-face meetings are essential in setting and meeting deadlines
- Everyone needs chasing by everyone – for all members of MidMath the project is only one activity in their busy schedules, and with the best will in the world outside things are bound to slip occasionally

**Resources and compatibility**

- Compatibility of software and hardware helps. Software packages which do not easily communicate can significantly reduce the effectiveness of the collaboration and/or produce problems which divert from the main thrust of the project

However, in a small project, with no funds for software, this may not be possible, and in the interests of collaboration means must be found to make the best of the resources available

**Funding**

- The time taken to prepare a bid for major initiatives such as TLTP and FDTL educational projects is large and wasted if the bid is unsuccessful. For small projects this is a considerable deterrent
- The recent Network call for projects [3], which requires only limited documentation, is a highly appropriate source of funding for small projects. Often what is needed is some skilled labour (as provided by the students in this project) to carry out routine or directed tasks. In such circumstances, relatively small amounts of money can be used to good effect.

**Support**

- Technical assistance is needed throughout the project. Specialist skills which most academics and project students do not have are often needed to solve the inevitable technical problems that will occur. The Network can play a crucial role here, as can local computing services departments and educational technology specialists.
- Support for the project at a senior level in each institution is highly desirable. A project of this kind can require help from a range of departments in each institution including library, computing services and finance departments. Without commitment at a senior level it is harder to

persuade others to support and assist the project.

- Supervised students are an excellent resource. The skills of our undergraduates (at the end of their second year of study or later) enable them to be very productive on projects of this kind. They quickly become familiar with the software and their mathematical knowledge enables them to contribute to the educational aspects of the project. The students benefit from their involvement not only financially but also in terms of having a useful addition to their CVs.

**Conclusions**

The project described here is still on-going. When tests become available this will be announced via MSOR Connections. The tests will be evaluated using student volunteers following which 'live' tests will be used with the new in-take in October 2001. The outcomes of the evaluation will be reported in MSOR Connections at a later date.

From the point of view of the collaborative aspects there are many valuable, if less tangible, outcomes. The continual interchange of ideas, solving problems across a range of resources and environments, and exposure to many different perspectives are stimulating and enjoyable, as well as informative. Also, tackling a specific, focused project is an ideal way to gel such a group together.

**Acknowledgements**

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- [2] Lawson D, Stone E and Tabor J, Experience in Authoring Questions in AIM, *Maths, Stats & OR*, 3, pp 15 - 17, 2000.
- [3] *Maths, Stats & OR*, 4, p2, 2000.