

# Paper-based Test

## University of Sussex

Interview with Dudley Ward ■ School of Mathematical Sciences

### Abstract

*First year students in mathematics have been tested at the University of Sussex over the past 25 years using a paper-based diagnostic test. The test has hardly changed during that time. The test and remedial measures are co-ordinated by a senior member of staff, but administered by two postgraduates.*

## The Execution

The diagnostic test is a paper-based multiple choice questionnaire. It was developed at Sussex University in the 1970s and has been practically unchanged since then.

The diagnostic test is taken by students in a lecture theatre over the course of one hour. The students are not required to stay for the full hour and can leave when they wish to. The test is administered by two postgraduates, who are very likely to have met the students before during introductory events.

Students enter answers on a separate answer sheet, which is marked manually by the two postgraduates. The marks are collated, and passed onto Dr Ward, the sub dean of the school of mathematics, who co-ordinates the diagnostic testing and follow-up measures. The test results are used by staff to obtain information about students' knowledge. The test is also intended to give students a better understanding of their skills and informally to gather data for statistical purposes. Although the results of the diagnostic tests are recorded, no overall 'academic fitness level' is produced.

The aforementioned postgraduates also run Mathematical Skills workshops (during the first term only). In these workshops all students work through the Algebra Refresher from the LTSN Maths, Stats & OR Network and the department's own 32 page Mathematics Skills exercises. The exercises done by individual students are allocated individually by the postgraduates.

Through these exercises individual student weaknesses (as identified through the diagnostic test and personal contact) are addressed. In the second and third term of the first year, the workshop is replaced by "office hours", during which the postgraduates can be consulted.

If students do not attend workshops, claiming that they do not need to, the results of the test can be used to convince them otherwise. If a student genuinely does not need the workshop he or she is free to work on other problems during the workshop (e.g. on exercises associated with a lecture course).

## The Results

Students' skills have gradually declined over the years. As the test has been used since the 1970s (with some small changes during the 1980s due to A-Level curriculum changes), some statistical data is available to indicate this. A two page memorandum was circulated inside the department in 1998. This memorandum indicated that the mean of correct responses (out of 30 questions) fell from 25 to 18.5 between the mid-1980s and the mid-1990s.

Qualitatively students are less fluent at performing mathematics, e.g. integration. However, they are better at note taking, better at project work, have more ability to work on their own, and have better general study skills.

There are no apparent differences in test performance depending on background. However, female students seem to perform better, although there is no data to back this up.

## The Barriers

The department currently has to obtain money from various sources on a year by year basis to pay the two postgraduates involved in the diagnostic testing and Maths Skills workshops. Time needs to be scheduled in the students' timetable for the Maths Skills workshops.

## The Enablers

In previous years, the Mathematical Skills workshops were allocated to students who needed them. This led to poor attendance. This year all students will go to the Mathematical Skills workshops. Students that have worked through the basic material satisfactorily may use the time to engage and get help with exercises from other classes.

Tutorials (where a teacher works through problems on the board) have been phased out in favour of workshops, where students work through problems on their own under the guidance of a teacher. This also encourages students to help each other. To encourage student co-operation further, provisions have been made in social areas within the department to allow students to work together there.

As the same two postgraduates help with the entire diagnostic testing and remedial programme, students can establish a personal relationship with them. Moreover, the postgraduates are not lecturers or permanent members of staff, but students themselves, which may help undergraduates relate to them.

## How Can Other Academics Reproduce This?

The test is freely available. A certain amount of money is needed to pay the people administering the test and remedial measures.

## Quality Assurance

Although there are no formal quality assurance measures, the long existence of the test, going back about 25 years, means that it has been tested for a long time. The person responsible for the testing, Dr Ward, has extensive first hand experience of teaching mathematics at school, and is thus able to look at the requirements of first year university mathematics from different perspectives, which is an important element in assessing and improving students' mathematical skills.