

Paper-based Test

Queen Mary, University of London

Interview with Franco Vivaldi ■ School of Mathematical Sciences

Abstract

All students are assessed using a paper-based written test of multi-choice questions (MCQs). The test has 15 questions of which the students must pass with 12 correct. Two hours were allowed. All of the questions were on routine arithmetic and algebra with emphasis on manipulative drill and practice, e.g. decomposition into powers of primes, long division, fractions, BODMAS, surds, elementary function definition, and inequalities. The test is quite demanding and was introduced last year 2001. It is repeated for those who fail six times during the course of the year in a programme called 'Essential Mathematics'. Passing it is a mandatory requirement to proceed into the second year.

The Execution

'Essential Mathematics' is an invigilated two-hour long paper-based multiple-choice test in arithmetic and algebra delivered to mathematics students at QMUL. The environment is that of a traditional invigilated written examination. On the first taking the test is in essence a diagnostic test with repeated tries taking place in a similar environment. Support is given prior to each attempt.

The Results

The test can be repeated up to six times in the first year and must be passed before proceeding to Year 2. The proportion of students that achieved the pass mark in October 2001 was only 4.4%, eventually rising in similar proportions of the whole cohort until the September attempt with 89.6% passes. The mean number of attempts needed by any student to pass this test in 2001/2 was 5 (out of 7) and not surprisingly the response in attending support lectures of students who passed in an earlier attempt was much stronger than from those who passed late or failed. For those who repeatedly fail badly, some of the later training sessions are mandatory, and they must drop a unit (worth 15 credits) from the remainder of the first year programme if they fail the fourth attempt in January.

The Barriers

QMUL take 100 home and 20 overseas students onto the mathematics programme and accept A-Levels at BCC, with the B grade in maths. Most do a 3-year BSc in Maths with about 10 progressing to a 4-year MSc. Because of the decline in classical drill and practice, Essential Mathematics was introduced in the hope that a very systematic reinforcement, to the point of penalty, would improve standards. In some senses the requirement to pass Essential Mathematics is a barrier to students, as they cannot proceed to Year 2 without it, even if other mathematics exams are passed. QMUL has yet to evaluate results and these will not be known till the middle of 2004 at the earliest. So far there has been no adverse affect on recruitment, and applications went up in 2002/3.

The Enablers

Students are required to participate in taking Essential Mathematics. Staff at QMUL believe that the systematic reinforcement it provides is already having an effect on student persistence and confidence but it is too early to say whether or not it will ultimately prove successful.

How Can Other Academics Reproduce This?

Simply by doing likewise, though many institutions may balk at the prospect of reinforcing drill and skill by a mandatory virtual mastery test. If there is to be such a mastery test, for students of mathematics or even for service mathematics, institutions may wish that it were more broadly based than the test of basic arithmetic and algebra at QMUL.

Quality Assurance

QMUL will monitor the improvements made by introducing a mastery-type test for first year students. It will take three years for a student cohort to complete the degree and only then can results be measured and compared. If successful in substantially improving drill and practice other institutions may wish to follow suit.

Other Recommendations

'Essential Mathematics' at QMUL is a radical departure from other forms of diagnostic testing. Should other institutions wish to consider it, points to consider would be:

- Would you be prepared to make progression into second year contingent upon skill mastery
- Would a mastery test deter students from applying for courses
- Should the mastery test be broader across drill and practice than at QMUL and easier
- Can the institution take the 'risk' with a mastery test whilst awaiting a possible improvement in results over 3/4 years for example
- If the QMUL scheme works will institutions be prepared to adopt a similar scheme based on the QMUL success.