Paper-based Test

University of York

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Abstract

Since 1977 a paper-based diagnostic test has been presented to first year mathematics students at the University of York. Based on an interview with the administering lecturer and a student questionnaire this case study examines the procedure, results and student responses to the diagnostic testing process.

The Execution

On 10 October 2002 in the mathematics department, 131 first year students sat a "Mathematics Pre-Knowledge Test". The paper-based test consisted of 39 multi-choice questions that covered a wide range of topics.

Each question had a selection of four possible solutions with a fifth "don't know" option being available. No time restriction allowed the students to work through the questions at their own pace. Calculators were not allowed.

The mathematics department at the University of York teaches students whose degrees are principally mathematics. The diagnostic test has been running since 1977, and is not used by other departments. The test is used to assess the students' knowledge and to identify any remedial actions that may be needed.

The Results

Between 1995 and 1996 there was a marked decline in the average score from 21.2 to 16.5, following which extra questions were added in 1997. The average score has varied little since the new version was introduced (See Table 1).

For the year 2002, the mean score (out of 39 questions) was 21.7, rather lower than last year's mean of 22.9. The median was 21.

14 students scored 30 or more with a maximum of 36 (achieved by two students). Four students scored below 13, with a minimum of 9.

The Barriers

For both the academics and the students there were no obvious problems in the coordination of the test.

The Enablers

The multiple-choice test was marked easily and quickly, ensuring rapid feedback to the students. The results provided a good source of mathematical discussion for the first 2 - 3 weeks of tutorials. In addition, it provided a chance for the tutors to assess overall levels and to consider teaching and support methods to improve mathematical skills.

In relation to the testing environment and the timetabling the responses from the students were positive. They also saw the test as a chance to determine their level of attainment.

How Can Other Academics Reproduce This?

- In this case the maths department produced the multi-choice test.

- In designing such a test, it is important to decide how many questions are needed and which areas will be covered (e.g. trigonometry, calculus, and algebra).

- The "don't know" option reduces the possibility of the student guessing and helps the lecturer determine a topic not learnt or forgotten.

- The multiple-choice format provides easy student use and an ease of marking for the lecturer. However this would change if the student numbers were to increase.

- As the test can be completed fairly quickly there is rapid feedback to the students. This enables follow-up support in the tutorial sessions.

- The use or non-use of the calculator is the choice of the institution.

Quality Assurance

Before 2001, the Mathematics Department repeated the Mathematical Pre-Knowledge test in December (week 9). Just as the first test it was not taken under examination conditions and the average results from 1997 to 2000 indicated that almost all students increased their score. The re-test was however discontinued in 2002.

Year	Oct 1997	Oct 1998	Oct 1999	Oct 2000	Oct 2001	Oct 2002
Number of Scripts	117	103	147	133	127	131
Average Score	22.5	23.4	23.4	22.2	22.9	21.7

Table 1: Mathematics Pre-Knowledge Test – Average Score (out of thirty-nine points) from 1997 to 2002