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ASSESSMENT OF EXAMINATIONS IN THE NETHERLANDS

1. INTRODUCTION

Secondary Education in The Netherlands is divided into four well-defined streams:

- Lower Vocational Education (Four years, 21 percent of the students),
- Intermediate General Education (Four years, 34 percent of the students),
- Higher General Education (Five years, 24 percent of the students),
- Pre-University Education (Six years, 20 percent of the students).

In 1985 a new program was introduced for the last two school years of pre-university education. It divided mathematics into two courses: Mathematics A, with an emphasis on applying mathematics in other subjects; and Mathematics B, emphasizing pure mathematics. The curriculum for Mathematics B is a variation development of the old program: analysis including calculus and differential equations, and geometry with a focus on 3-dimensional solids. The curriculum for Mathematics A differs fundamentally from that for Mathematics B: applied analysis including the derivative as a measure of change; applied algebra including matrices and linear programming; probability and statistics including hypothesis testing, informatics, and simple programming.

Mathematics A is designed for those who do not see mathematics as forming a substantial part of their future university studies, e.g. economics, psychology, etc. At the end of the pre-university course, students have to take a final examination in seven subjects. Mathematics is not compulsory, so students can take Mathematics A, Mathematics B, or both A and B, or no mathematics at all. In 1990, 59 percent of all pre-university students opted for Mathematics A, 47 percent for Mathematics B, and 19 percent for both A and B, leaving 13 percent of students opting for no mathematics.

Reform of the pre-university education curricula preceded that of the higher general education curricula. In this stream, students have to take a final examination in six subjects. From 1992 on, students can choose between two mathematics curricula: Mathematics A or Mathematics B. The examination syllabus for A consists of tables, graphs, formulas, discrete
mathematics, statistics, and probability. The syllabus for B consists of applied analysis and geometry in three dimensions. A governmental working group currently is devising new mathematics programs, for all school streams for the age range 12–16, that add more emphasis on applied mathematics and 3-dimensional geometry.

Half of the assessment in the final year of secondary education is made up of teacher-made tests that are often written essay tests, although they sometimes include oral and sometimes individual pieces of work. As these tests differ from school to school and depend on the textbook used, it is not a simple matter to evaluate these tests.

We will restrict ourselves to the final examination papers that are valid for the whole country, and make up the other half of the final-year assessment. As the examination for mathematics includes open-ended questions, it is not easy to obtain data on the results. The Institute of Educational Measurement (CITO) asked every school to send us the responses of five students to all questions on the examination. That approach provided us with reliable data for Mathematics A and B. We also obtained information about students' choice of other subjects, so we were able to distinguish some subgroups within the group taking the examination.

Mathematics A, mathematics in realistic contexts, was an entirely new curriculum and differed very much from what teachers and examiners were familiar with. We will, therefore, focus on it. The first examinations for pre-university education took place in 1987, so we had four years of data available for study, 1987–1990. Some problems from the examinations are shown later in this paper. The examples include $p$-values, e.g., the percentage of the mean score from the maximum score for the whole group. In the next section the examination results of three subgroups are compared. The development and use of a test grid for final examinations follow. We then describe some trends in mathematics education and assessment in The Netherlands. Finally, we come to some cautious conclusions.

2. RESULTS AND SUBGROUPS

Each year we obtained the results of the Mathematics A examination from a sample of more than 2,000 students. These data are shown in Table 1. Using these data from the four years, a decision was made as to what number of points would give a pass result, to fix the caesura (break). This was used to determine the percentage of students having an insufficient mark. The mark gained for this part of the examination counted 50 percent of the assessment of each student; the other 50 percent came from teacher-made tests. If these two figures differed too much, the inspector would try to find out the reasons or the cause. The percentage of students having an