

International Statistical Education Newsletter

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EDITORIAL

Statistical Education may be less in the public eye at some times than at others, but it's problems and challenges are always with us. This summer it surfaces in a very explicit and public fashion at ICOTS II - the Second International Conference on the Teaching of Statistics - which is to take place in Victoria, on Canada's Vancouver Island. The first of these conferences took place in Sheffield in 1982 and was generally judged a great success: so now we look forward to another occasion of great interest and value to those concerned with the subject.

NEWS AND ANNOUNCEMENTS

Directory of Short Courses

The ISI has recently compiled a Directory of Short Courses in Statistics (those lasting up to about 10 months), listing those courses which will be offered in the period ending mid-1987; it is anticipated that

this will be updated annually. Copies may be obtained from the ISI Permanent Office, 428 Prinses Beatrixlaan, P.O. Box 950, 2270 AZ Voorburg, Netherlands.

REPORTS FROM ROUND THE WORLD

Joint Universities Key Centre in Statistical Sciences.

A Key Centre for Teaching and Research in Statistical Sciences has recently been created in Melbourne, Australia, linking the Departments of Statistics of La Trobe University and the University of Melbourne, the Statistics Section of the Department of Mathematics at Monash University and the Statistics and Operations Research Group, Royal Melbourne Institute of Technology. This is one of seven government-funded Key Centres which have been established in areas which are judged to be of national importance; the others are in computer related or resource exploration research with the exception of one in Aboriginal studies and education.

The Statistical Sciences Key Centre's activities include the coordination of teaching at honours and postgraduate levels and the provision of a statistical apprenticeship for students in a commercial environment. A joint MSc by coursework is operating from the beginning of 1986. Also, by acting as a link between business, industry and government and the statistical profession the Centre aims to respond to needs for expertise in particular areas of statistical sciences and to facilitate collaborative work in these fields across institutions.

Information concerning the Key Centre can be obtained from the Director, Professor C. C. Heyde, Department of Statistics, University of Melbourne, Parkville, Victoria 3052, Australia.

Changes in the Mathematics Programme in New Zealand Upper Secondary Schools.

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The New Zealand upper secondary schools have just started teaching a new mathematics programme in the final two years of secondary school. One of the main features of this programme is the substantially increased role given to statistics and computational aspects of mathematics within the main syllabuses.

This article attempts to outline these changes and some of the main issues which arose during their development.

As with many other 'developed' countries, one of the most important factors, prompting a re-examination of the mathematics curriculum in the upper secondary schools in New Zealand, has been the massive increase in the proportion of the age cohort participating in the final years of the secondary school programme. Within this already swollen group, there has been an almost equally massive increase in the proportion of those students choosing mathematics as one of their

course components. Mathematics students in the last two years of school therefore reflect an enormous range of abilities and interests. While some proceed along traditional lines towards university courses in mathematics, the exact sciences and engineering, many others take mathematics as a general preparation for entry to a range of trades and business or industrial jobs, to support further study in the social and biological sciences, in business and commercial studies, medicine, etc.

It is against such changes in the characteristics of the mathematics studied that the case for greater emphasis on probability and statistics needs to be considered. In New Zealand the earlier mathematics syllabus, again in common with that in most other countries, was heavily weighted towards the needs of students on a relatively narrow band of disciplines with the physical sciences and engineering. Although statistics and computational mathematics existed as options within an Applied Mathematics course in the final school year, the majority of students treated Pure Mathematics as the main course and Applied Mathematics as an auxiliary subject. The question then was whether the set-up gave adequate recognition to the needs and priorities of the students, already forming the majority of students in the final years of mathematics, who did not look towards the traditional mathematics areas for their future interests.

In looking at the actual material used in first year courses at university in subjects other than the exact sciences, as well as in trade and professional examinations, two features which stood out were the universal need for interpretation of graphs and tables, and the widespread use of elementary statistical techniques. It was also very clear that an increasing number of university courses, as well as many jobs in business and the Government Service, require some use of computers, usually in the form of standard packages or spread-sheets. School students, however, were not usually well prepared for any of these demands by their existing programme in mathematics.

The first major problem which arose in trying to address these questions concerned the structure of the courses to be offered in the final two years at school. In Form 6 (11th year, ages 15-16) a "core plus options" scheme was initially proposed, and strongly backed by some groups of teachers, but gave rise to equally strong objections, both on principle and on practical grounds, from university teachers and others. It was ultimately replaced by a single integrated curriculum, with reduced overall content, but which nevertheless provided a first introduction to elementary calculus (rate of change and area) and to probability and statistics. Then in Form 7 (12th year, ages 16-17), an initial proposal first favoured by the universities for a hierarchical structure (General + Advanced Mathematics) was rejected by the teachers in favour of two parallel courses of equal weight, each capable of being taken either by itself or in conjunction with the other. After interminable discussions over nomenclature, these were finally labelled "Mathematics with Statistics" and "Mathematics with Calculus".

The first includes a 20% component of internally assessed practical work, and includes revision and extension of basic work in algebra and graphs, and of the elementary calculus from the Form 6 programme, together with a major component in probability and statistics up to the beginning of work on inference (large sample tests for the mean and proportion; practical aspects of sampling) and a continuing thread of computational work with calculators and/or minicomputers.

The "Mathematics with Calculus" course picked up the bulk of the traditional material in basic calculus, coordinate geometry and vectors, but departed from tradition by including applications, again including computational work, alongside the theoretical topics on the syllabus.

Indications at the end of last year were that more students would be enrolling for "Mathematics with Statistics" this year than for the "Mathematics with Calculus", a considerable swing in a direction which

had, however, already been apparent in the increasing popularity of the statistics and computational mathematics options of the old Applied Mathematics syllabus.

Among the many further issues which arose in discussing these changes, three may be singled out as representing concerns which will undoubtedly be under fairly constant review. Perhaps the most obvious of these is the role of the practical component in the Mathematics with Statistics paper, particularly its assessment. Teachers were rightly apprehensive both of the increased load associated with introducing and assessing practical work, and of the problems of assuring comparability between schools. Initially the school based work will be moderated by the results of the final examination (nationally based) but the future of this itself is under debate and the procedure is at best rough justice which has the merit of being relatively simple to administer.

More subtle issues concern the roles of applications and proofs within the syllabuses. Both are treated gingerly. How best to treat applications, when to bring them in, whether they aid or hinder the acquisition of new concepts - these are very unclear methodological issues which require far more discussion and experimentation than they have currently been given. As for proofs, there is a body of university opinion which holds the view that, as a result of changes in mathematics teaching of just the kind under discussion, the art of proof has been largely if not wholly lost by the current generation of students. The extreme view may be exaggerated, but the issue is of more general concern, and again it is not clear what methodological approaches, or what variations of the syllabus material, would best develop students' skills in setting down logically coherent arguments, in whatever branch of mathematics they may be studying.

Finally there was the question of providing suitable backing material for the new courses. Actually New Zealand has a relatively long school involvement with statistics teaching, stemming from the pioneering work by G.H. Jowett and others in the early 1960's, which led to the development of the statistics option in the Applied Mathematics course. Despite this long preparation, and many series of in-service courses etc. there is still a substantial number of mathematics teachers who have so far avoided teaching topics such as statistical or computational mathematics, and who are concerned with their ability to cope with the substantially increased numbers now likely to demand teaching in these subjects. A major new programme of in-service courses, and preparation of teacher guide notes has been undertaken by the Department of Education. The Department is also preparing a guide to software, and a disk, compatible with the most commonly used minicomputers, containing basic statistics and other routines for classroom demonstrations, which will be available on request. At the same time the local Mathematics Associations are jointly preparing a set of locally produced, cheap, short-term texts to bridge the initial gap between the introduction of the programme and the appearance of suitable conventional texts.

While some issues have been discussed equally in many other countries, its small scale and relatively well-prepared teaching force give New Zealand an advantage in putting them into early operation. It is an advantage, however, which will no doubt carry with it the consequential penalty of being the first to experience any unforeseen difficulties which the new proposal may create. A general regret is that it seems so difficult to measure, in any objective and uncontroversial manner, the effect such major experiments can have on students' real achievements in mathematics.

Note Further information on the new syllabuses can be obtained by writing to: The Secretary, New Zealand Universities' Entrance Board, P.O. Box 12348, Wellington, New Zealand, or to the Curriculum Officer for Mathematics, Department of Education, Private Bag, Wellington, New Zealand.