Session A1

Teaching and Curriculum Issues at Secondary School Level

Organisers:
Jim Landwehr (Murray Hill, New Jersey, USA)
David Vere-Jones (Wellington, New Zealand)

Invited Speakers:
Nasim Ahmad (Serrekunda, The Gambia)
Manfred Borovcnik (Klagenfurt, Austria)
Gail Burrill (Hales Corner, Wisconsin, USA)
Anne Morin (Rennes Cédex, France)
Richard Scheaffer (Gainesville, Florida, USA)

Contributed Papers:
Andrew Ahlgren (Washington DC, USA)
John Edgell Jr (San Marcos, Texas, USA)
Gail FitzSimons and Robert Money (Melbourne, Australia)
Bodapati Gandhi, Jorge Vélez Arocho, Poruru Gandhi and Srinivas Gandhi (Mayaguez, Puerto Rico)
David Green (Leicestershire, England)
Takaharu Ishikawa (Okazaki, Japan) and Takeyuki Hida (Nagoya, Japan)
Hiroshi Midzuno, Yoshimasa Ukita and Kensei Araya (Tokyo, Japan)
Romano Scozzafava (Rome, Italy)
Daniel Teague (Durham, North Carolina, USA)
Joe Ward Jr and Paul Foerster (San Antonio, Texas, USA)
Stephen Zayac (Livonia, Michigan, USA)

Abstracts:
Beth Bryan (Augusta, Georgia, USA)
Glyn Davies (Sheffield, England)
Jan de Lange (Utrecht, The Netherlands)
Grant Phillips (Oxnard, California, USA)

Introduction

The aim of this session was to give a bird's eye view of some key developments in statistical education from different parts of the world.

The large group of papers from the United States represents the breadth and strength of secondary school developments that are underway in the US today. These papers can be divided into two broad categories. The first group, comprising the papers by Richard Scheaffer, Gail Burrill and Andrew Ahlgren, discuss major projects of curriculum development where one of the ultimate goals is to integrate statistical work with projects undertaken by students in many different subjects. Scheaffer and Burrill both discuss aspects of the Quantitative Literacy Project (QLP), a joint effort of the Americal Statistical Association and the National Council of Teachers of Mathematics, that has been funded by the National Science Foundation. Scheaffer outlines the general context of the project, its implementation through the development of crosscurriculum units and teacher workshops. Burrill expands these topics from the perspective of her extensive experience in teaching statistics and leading workshops. Ahlgren's paper concerns the ambitious Project 2061 of the American Association for the Advancement of Science, which plans a restructuring of the whole science, technology, and mathematics curricula from kindergarten to Grade 12. Statistics is seen as arising in core segments on handling uncertainty, data, sampling, as well as throughout a range of other topics.

While such large projects have, of course, an important role in long-term educational improvements, it is also true that there is no substitute for creative and successful classroom material. Turning now to the papers presenting ideas and approaches of this type, Daniel Teague shows how data analysis can be used to reinforce ideas of functions and calculus, looking especially at transformations and residual plots. Joe Ward and Paul Foerster advocate a prediction modelling approach to regression-related procedures. John Edgell sets out a partly graphical procedure by which students can generate a whole series of probability distributions of both historical and practical interest. Bodapati Gandhi and her colleagues from Puerto Rico describe an innovative summer programme, also supported by the National Science Foundation, in which selected top students develop projects requiring them to collect, analyse, and present their own data and conclusions. Stephen Zayac uses his experience in industry to suggest an approach to problem-solving in the classroom.

Whatever cultural environment one happens to inherit, it is tempting to suppose that the way problems are perceived and solutions suggested is inherent in the problems themselves, forgetting the role of the cultural background. The remaining papers in this section offer a salutary reminder that on a world-wide basis the problems of statistical education are as varied as the historical, social, and economic characteristics of the individual countries themselves.

The papers by Manfred Borovcnik, Anne Morin and Romano Scozzafava describe some of the problems facing curriculum development in statistics in Europe. Borovcnik's paper illustrates, among other factors, the role of *language* in both reflecting and shaping our perceptions of the problems. There is no adequate translation into English of the German terms "Stochastik" which embodies elements of both probability and statistics, nor of their views of education and teacher training built into such words as "Didaktik" and "Bildungswissenschaften". In France, the difficulties described by Morin have deep roots in the structure of the French educational system itself. And in

Italy, Scozzafava describes an attempt to "merge" the teaching of probability and statistics using a Bayesian, subjectivist approach to probability that clearly owes much to the Italian school of probabilists.

There follows a group of papers from Japan. Hiroshi Midzuno and his colleagues outline the development of statistical education in Japan, with the emphasis on the formal curriculum and its implementation. Takeyuki Hida and Takaharu Ishikawa put forward a utopian vision of statistical education in the future, where probabilistic instruction is strengthened by practical studies of simple stochastic processes such as Brownian motion and Poisson processes. From these contributions and those of their colleagues in other sections, one begins to glimpse the realities facing Japanese teachers trying to introduce statistical topics into their highly organised and competitive school environment.

Finally, we return to the English-speaking world in three contributions from the British Commonwealth at opposite ends of the geographic and economic spectrum. Nasim Ahmad outlines O- and A-level curricula in statistics, developed by a group of West African countries, that could serve as a model to us all, notably its incorporation of some procedures from "official" statistics, such as economic indices, census and sampling procedures. The reality of their situation, however, was more vividly brought home by the comment in his oral presentation that the chief hurdle in determining whether a student continued with statistics might be whether their family could afford the textbook. Robert Money and Gail FitzSimons describe a major reform in the Victorian (Australia) school programme in which, as in comparable developments in New Zealand, a key development is the incorporation of project material into the formal assessment scheme. In the last paper David Green outlines the history and current policy of "Teaching Statistics", the first international journal devoted to statistical education.