

Executive Summary

In summarizing the material and in developing its recommendations, the Review Team has found it convenient, at least conceptually, to group the issues raised under three broad headings: issues relating to the school programme; issues relating to organization and funding within and among universities; issues relating to the image and profile of statistics, including issues of employer/university interactions.

Issues relating to Statistics in Schools

We believe that there are two serious current problems with the teaching of statistics in schools, which are having a negative effect on many students' perception of the interest and importance of the subject.

The first relates to issues in curriculum design and implementation, including possibly inappropriate content and level of material and missed opportunities to provide close linkage with relevant data handling and display information and communications technologies.

The second relates to the absence of specific and sustained initial teacher training and subsequent continuing professional development to ensure that teachers of mathematics and statistics in schools have the background and resources to be able to convey statistical concepts and tools effectively and with competence and confidence to the students in their classroom.

Recommendation 1

- **Given the vital national importance of statistical education and the widespread concern about the current position of statistics taught in schools, and recognising states' autonomy and the diversity of approaches among different states, we recommend that the Federal Government fund a project aimed at identifying and disseminating good practice in the design and delivery of statistical education in Australian schools. In relation to this we recommend that the Federal Government give priority to funding the development of the National Curriculum Framework proposals put forward by the SSAI and the ABS in 2003 and supported by the Curriculum Corporation.**
- **In the context of such a project, the SSAI should be funded to co-ordinate a debate among stakeholders about the role and content of statistics taught in schools. In particular, the SSAI should facilitate debate about whether a distinction should be drawn between statistical education for the citizen and statistical education for pupils with a strong mathematical interest. The SSAI should also explore ways in which its members could contribute to improving problems of transition from school to university.**
- **We also recommend that the Federal Minister for Education, Science and Training encourage state authorities to involve formally the full range of**

stakeholders (including universities) in any future developments/changes in statistical education, the latter always to be considered against the background of ensuring a supply of appropriately trained and supported teachers to deliver the statistics curriculum.

Issues relating to the Management and Organisation of Universities

We believe that there are both funding and organisational issues that need to be addressed, some as a matter of urgency, to develop and sustain the appropriate level, mix and quality of statistics research and training in Australian universities. In particular, we believe there to be real threats to the sustainability of the core academic discipline itself. Insufficient numbers of PhD students are being trained to meet the needs of academe and research-based industries.

Overall funding of the discipline is a matter for the Federal Minister for Education, Science and Training, who also should have a role to play in initiating national strategies to ensure the long-term health of the discipline. Within universities, senior management have a role to play in ensuring that local organisational and funding models support and sustain quality statistics research and teaching throughout the institution. Academic statisticians themselves need to develop collaborative models, both within institutions and in local networks, which ensure most effective use of resources to promote and sustain the discipline. There is also a need for better systematic collection of data regarding manpower trends and student choices to guide future policy-making.

Recommendation 2

To the Federal Minister for Education, Science and Training:

As a matter of urgency, to reconsider the Relative Funding Model to ensure a more equitable funding arrangement for statistics in universities, bringing funding for statistics courses into line with the current funding levels for computer science courses.

To initiate strategies with the universities, employers and the SSAI to encourage, where appropriate, regional or national collaborative arrangements that will help sustain and enhance local capacity for the delivery of quality statistical education and training within universities.

To university managements:

- To recognise the importance of statistics as a discipline in its own right, as well as an essential support for other disciplines. This is vital for the long-term sustainability of all disciplines underpinned by statistics. Within this context to support, where appropriate, the development and maintenance of quality on-campus statistical consulting services.**
- To accept institutional responsibility for ensuring that internal structures and decisions encourage - and do not have unintended negative consequences for - the continuing existence of the discipline of statistics and the delivery of quality statistical education and training across the university in all disciplines.**

- To be proactive in the short-term in support of the discipline in local circumstances where there is currently an absence of senior leadership and/or critical mass among the academic leaders of the discipline.

To academic statisticians:

- Within institutions, to accept the inevitability of changing structures and, in the changing context, proactively to seek and pursue opportunities to best position the discipline of statistics within the institution, organisationally and in terms of collaborative working with other disciplines. In particular, to emphasise the key role of statistics in many other disciplines, we encourage statisticians within universities that do not currently have a statistical consulting centre to consider establishing such a centre.
- Regionally and nationally, proactively to seek, where appropriate, collaborative arrangements across institutions that will serve to sustain critical mass in the discipline and develop and sustain the capacity to deliver quality statistical education and training, institutionally, regionally and nationally.

To the SSAI:

- To develop, through an extension of its current activities in the accreditation of staff and courses, the SSAI's capacity to influence the quality of statistics service courses, even when these are under the auspices of a substantive discipline other than statistics.
- In conjunction with AustMS, AMSI and the upcoming ARC sponsored Review of the Mathematical Sciences, to undertake comprehensive data collection and maintenance at sufficient detail to allow assessment of trends in university level mathematical sciences as a whole and of the component subdisciplines. Where possible such data should allow assessment of:
 - ◆ staff numbers and age profiles in mathematics and statistics and also in closely related areas such as econometrics, actuarial science, financial mathematics and biostatistics;
 - ◆ student participation in mainstream mathematical sciences programs at all levels as well as service units;
 - ◆ changes in breadth of unit offerings as a result of staffing and resource changes;
 - ◆ graduations at all levels in quantitative disciplines; and
 - ◆ job demand and graduate uptake in the mathematical sciences.

Issues relating to the University/Employer interface

We have noted that there seems to be overall employer satisfaction with the technical quality of graduates employed for their generic quantitative skills, but clearly more needs to be done within the universities in relation to the communication, team-working and data-base management skills regarded as essential by many employers.

Recommendation 3

- We recommend that the SSAI, in conjunction with organizations and activities such as AMSI and the Mathematics in Industry Study Group, continue to broker closer links between universities and employers by publicising existing good practice.
- We recommend that those within universities empowered to do so (Deans, Heads of Schools) involve employers in the education process via appointment to appropriate advisory boards.
 - ◆ We recommend that the SSAI seek to encourage the development and enhancement of graduate skills by:
 - ◆ including in the accreditation process a need for evidence of formal development of communication skills (encouraging the use of university provision as part of all UG/PG education/training);
 - ◆ setting up local mentoring/networking schemes for recent graduates; and
 - ◆ further encouraging the development of Young Statistician networks.

Issues relating to Marketing, Communication and Lobbying

Statistics has a poor image and profile among students, parents and the general public. In particular, there is widespread ignorance among students, parents, teachers and careers advisers about the employment opportunities opened up by the acquisition of statistical skills. We believe that there should be a serious attempt to reverse this perception and the accompanying decline in interest in statistics.

Recommendation 4

- We recommend that the Federal Government through DEST provide support to the SSAI to work with a wide range of employers to develop a professional communication strategy aimed at producing a significant change in the perception/awareness/esteem of statistics in schools among pupils, parents, teachers and careers counsellors – in particular in relation to the career/life opportunities opened up by the continued study of a significant component of statistics at schools and universities and its importance to the national interest.
- We also recommend that the SSAI work with universities to develop a variant of this strategy aimed at a wide range of students (including trainee teachers in mathematics and statistics) during their second and third years at university.