A Survey of Uses of Government Statistical Offices in Teaching Statistics

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1. Introduction

This paper surveys the activities typical of government statistical offices that could be used as resources in the teaching of statistics, and presents examples of publications, maps, teaching kits, software etc., which the New Zealand Department of Statistics and the Australian Bureau of Statistics have that are useful in the teaching of statistics.

We also summarise some of the other ways in which government statistical offices are involved with, and support, the teaching of statistics. Briefly, here are some of them.

(i) We provide pupils for those teaching statistics - from our own staff, through bursaries and encouragement of statistics.
(ii) We provide a job market for students.
(iii) We teach statistics ourselves - to our own staff, to developing countries, through assistance with university courses.
(iv) We advance the subject of statistics and statistics as a profession - through support of professional societies, science fairs, through research, and through joint projects with educational institutes at all levels.

2. Using statistical information as a teaching resource

Applying statistical methods to data about the society students live in provides a means of making statistics relevant, and kindles an interest in statistics by those in many disciplines.

The following summarises some of the information produced by statistical offices, with examples of the way in which the Australian Bureau of Statistics and the New Zealand Department of Statistics make this available for teaching.

(i) *Macro-economic and demographic databases:* Access to databases of information, whether it be by way of files of time series provided on diskettes or by some other database system for personal computers, provides students with information for social and economic model development. Such systems in New Zealand include:

PC-INFOS	a database of selected time series drawn from the INFOS database with accompanying simple retrieval and presentation software.
SUPERMAP	a database of population census information that can be mapped and presented on paper or computer screen.

(ii) *Microdata information:* Access to microdata is generally limited by the law in New Zealand. Access has been possible by providing researchers with the facility to manipulate data using Department of Statistics' systems. The main areas of interest have been Household Expenditure and Incomes, Population Census, and Social Indicators.

In one study, the development of a New Zealand Budget Incidence Study for a PhD thesis, the department enabled a research officer to work with the researcher to access and analyse data that we would otherwise not have had access to. The department has since extended this work, and published a follow-up study.

(iii) *Maps:* Population Census field and outline maps represent the most detailed base mapping system for statistical data in Australia, and sets of these are held in most university libraries, and used extensively by demography, geography, social sciences, and town planning/architecture staff and students.

Mapping output systems include Supermap from the CDATA product, a chloropleth mapping service from the ABS mainframe system for population census output; and a limited special service for customised maps produced on microcomputer to illustrate other series on a regional basis.

(iv) *Publications:* Perhaps the most important single teaching resource offered by statistical offices is the Official Yearbook that many produce. The bringing together of descriptive, historical, analytical, and statistical information on public institutions and processes, the economy, environment, culture, and people of the nation in one publication is a remarkable exercise.

(v) *Library support:* By law, the ABS must deposit one copy of each of its publications at each of some 24 major deposit libraries in the country, about 60% of which are central university libraries. In addition, the ABS provides a limited range of publications free of charge to faculty libraries, technical and further education college libraries, and to local government (municipal) libraries.

The ABS operates Library Extension and Regional Data Centre programmes aimed at ensuring that students, business people, and other members of the community have close access to ABS products and services. These programmes provide standard sets of ABS publications and other products at selected member libraries, and special services are provided from the ABS Information Service to support statistical enquiries channelled through these gateways.

In some states, state libraries also support the placement of ABS technology products in local libraries - for example, in New South Wales about 60 libraries have been funded to own and use CD-ROM products including AMIS, CDATA, and ADDS

(Agriculture Data Dissemination Service).

(vi) *Teaching kits:* Events or particular concerns occasionally lead to the preparation of teaching kits that bring together information that makes a particular statistical survey interesting. They usually involve key statistical activities such as Census of Population and Consumer Price Index. They are usually developed with involvement of teachers or curriculum experts. Particular examples of these include:

Australia:	A Guide to the Australian National Accounts
Australia:	Schools Update (New South Wales)
New Zealand:	An Education Kit : The Census 1986

(vii) *Subject information kits:* These are useful in explaining the concepts, methods, and definitions used in survey activity generally, or specific statistics.

The Australian Bureau of Statistics provides a range of methodology papers which are used extensively in teaching. Some of the most commonly used of these include the Balance of Payments and National Accounts Concepts, Sources and Methods publications; the Guide to the CPI; training documentation and survey methodology material for various household surveys; and a range of subject-specific technical, information, and occasional papers which describe survey design, methodology, estimation methods, and accuracy, etc. All of these are used in, but not specifically designed for, teaching.

3. Using professional statistical staff as a teaching resource

In particular areas of applied statistics, such as survey design, sampling theory and methods, data analysis, time series analysis, index numbers, demography, and quality assurance, government statistical offices depend on having available good staff experienced in these activities. It is not unusual for the statistical office to be the prime centre of expertise in at least some of these areas, particularly in a small country.

Ways in which government statistical offices share this expertise include:

(i) sponsoring visiting experts/sharing expert staff;
(ii) sponsoring research fellows;
(iii) sponsoring joint research projects;
(iv) providing training courses/lecture series;
(v) commissioning research.

The official statistics agencies in Australia and New Zealand have interacted with the teaching community in all these ways.

4. Using statistical office facilities as a teaching resource

The facilities of government statistical offices include computing hardware and software, communications systems, support staff, conference and other facilities, and general survey facilities such as classifications, methods, and directives.

(i) *Computer systems:* Information dissemination is made easier by systems such as PC-INFOS (DX) or SUPERMAP (CDATA) which present and graph time series and geographic data respectively.

Expert systems can be used to select parameters for complex survey design or analysis problems, such as the ABS adjustment expert system.

There is a range of ABS output products which includes software as an important component, which are of direct use in teaching. Examples include:

(a) CDATA and other CD-ROM products which provide sophisticated data extraction and mapping facilities;
(b) DIRECT, directory of social statistics on floppy disk, which facilitates social data item identification and search.

The use of micro-based systems within the organisation is now reaching a level where generalised software applications are beginning to emerge. One example of this is a graphics package based on the sophisticated Mirage graphics system. The ABS has developed an interface which simplifies access to and use of Mirage, and which tightens standards in the use of graphics through the provision of a set of standard presentation options.

(ii) *Conference facilities:* Government statistical offices may have teaching facilities, perhaps oriented around the technology used in their offices, that could be applied to those in teaching. As information technology extends in statistical offices, this may become more important than at present, in New Zealand or ABS.

(iii) *Classifications:* Classifications are vital tools for statistics. Their ready access is usually an objective of central statistical offices.

Both the ABS and New Zealand Department of Statistics see as part of their corporate role, responsibility to develop, maintain, implement, and promote the use of standard classifications, frameworks, and definitions, to help ensure the compatibility and comparability of data derived from different statistical systems. There are a number of examples which are public documents and used extensively in research, teaching, industry, and commerce, etc. These classifications cover industry, occupation, commodities, international trade, welfare activities, geography, transport, and so on.

Promotion of the use of these classifications is taken very seriously, and one way of encouraging their widespread use is to offer products which make it desirable and cost effective for them to be adopted into work, teaching, and other environments. The ABS has released product-specific software for the industry (ASIC) and occupation (ASCO) classifications which are being accepted in the marketplace as effective automated coding and directory systems.

5. Supporting students and teachers of statistics

By helping make statistics of value to the community, and by encouraging a high level of excellence, government statistical offices help make statistics a discipline people willingly come to learn. Support for those learning, and those in the profession, is part of this.

(i) *Being a centre of excellence in applied statistics:* The government statistical office can become a naturally accepted place of employment for the best graduates in statistics, and is able to develop valuable effective relationships with those involved in teaching statistics.

(ii) *Support for professional bodies:* Professional bodies, in statistics, economics or demography, in particular, are those most likely to be well supported by official statisticians. Such bodies provide forums for exposing new ideas, opinions, and research; while intangible, support for them is an important contribution to those involved in teaching statistics in academic institutions.

(iii) *Presentation of professional papers:* Papers presented at conferences, or in publications, often document very technical problems facing official statisticians, providing a focus for research directions and studies.

(iv) *On-the-job training of staff:* The on-the-job training of staff can arise from the availability of vacation employment. For those who go to academic occupations after a career in the government statistical office, as noted earlier, skills will be developed for later application when teaching.

(v) *Advice on career prospects:* For example, the ABS undertakes extensive campus recruitment advertising and on-site career advisory programmes at all university campuses throughout Australia each year. This extends to a prominent role in general Australian Public Service recruitment activities, leading to an ABS intake of up to 100 graduate recruits each year, covering a wide range of disciplines, with emphasis on students with majors in computer science, economics, mathematics, and statistics.

(vi) *Science fairs and science prizes:* By supporting science fairs, and providing prizes to winners in the competitions that are associated with such or similar events, government statistical offices encourage an interest in statistics and research by the young.

(vii) *Bursaries and Scholarships:* Scholarships can support the training of those who early on have the academic excellence and interest to be official statisticians.

(viii) *International activities to improve the teaching of statistics:* The support of those in other countries in the learning of statistics spans a range of approaches. It may involve supporting teaching activity coordinated by international bodies such as SPC, ESCAP, and other UN agencies, or direct assistance in developing countries. Such training may be the only substantial opportunity for learning in countries where academic courses do not exist.