

# ROLES FOR SOCIETIES IN STATISTICAL EDUCATION

Richard Tweedie  
Department of Statistics  
Colorado State University

Statistical Societies have many roles to play in statistical education. They are uniquely placed to provide written, electronic and human resources, and to carry out their own educational activities in non-traditional (ie non-school and non-college) environments. This paper will discuss some of the ways in which Societies can carry out this role, including: sponsoring short courses for practitioners, refresher courses for teachers, and workshops for continuing education; encouraging the interest of students in statistical careers; interacting at the local school level; and coordinating the provision of resources. These areas are illustrated with examples drawn from experiences in a number of different Societies with different approaches.

## 1. The effect of the type of Society

Every learned and professional society that I know of plays some part in the education of the next generation taking up its discipline.

For societies which are largely "professional", as in accountancy or SQC, the opportunities to become involved in education are very much different from those open to more "academic" societies, as in pure mathematics. Statistics societies tend to straddle the boundary. In the Societies in which I am involved (the Statistical Society of Australia (SSA), the American Statistical Association (ASA), the Institute for Mathematical Statistics (IMS) and the International Statistical Institute (ISI)), the character of the membership varies widely: the IMS is strongly academic; the ISI and the ASA are, numerically, very much non-academic; and the SSA is somewhere in the middle, with a large non-academic group which is frequently rather under-represented at the policy and operational level.

This mix, and how it operates, can make a large difference in how a Society interacts with educational opportunities. If the Society has many academics involved in running its operations, I think that somewhat paradoxically it is likely to become less involved in education, especially at the secondary and undergraduate tertiary level. The members are already doing their own thing in their own workplace. They do not want another layer of effort in that direction. For such reasons, perhaps, in the United States the IMS has done rather little in education, leaving this to the ASA.

Societies such as the ISI, conversely, have a very strong non-academic membership, and yet the ISI has identified the teaching of statistics as vitally important, setting up (as long ago as 1950) the International Statistical Education Centre in Calcutta, and in 1991 forming a separate interest group, the International Association for Statistical Education (IASE). The membership of IASE formally comprises those whose interests or professional activities include:

- Teaching statistics at a primary or secondary school
- Teaching statistics in a college, technical institute, or university
- Teaching, or developing software for statistical computing
- Teaching statistics in business or industry
- Training statistical staff for government statistical offices
- Developing statistical textbooks, audio-visual materials, or curricula.

It is notable that the educators who are highly visible in the IMS, or the SSA, namely the college academics, are much less central in this list.

Attitudes towards statistical education will vary considerably between these groups, and the roles adopted will vary accordingly. The consequence of such considerations is that the role of statistical societies might be much different depending on just who comprises any specific Society.

In classifying potential and actual society involvement, I will use this list of IASE member interests to indicate the diversity of activities in which different Societies can be involved.

## 2. The K-12 area: supporting the teachers, not the curriculum

Teaching statistics at primary or secondary schools (K-12 in US parlance) is clearly one area where we have a strong professional interest. For a long time the problem we addressed was that most people are taught no statistical material until (and unless) they enter college or university. The situation has changed over the last decade or more. Statistics is now much more visible in the K-12 curriculum [1]. The negative side of this success is that now, existing teachers are being asked to teach a subject that is relatively new to them, and often only poorly understood. All the professional help that Societies can give them would be very welcome indeed.

Within the ASA, there is a program to encourage interaction at the local school level, with allocated visitors from the Societies involved with individual teachers. This is a grass-roots effort. A local group, such as the Colorado-Wyoming Chapter of the ASA, will "adopt" a school, and will seek volunteers to visit that school. Members of the teaching staff are then invited to local meetings and encouraged to talk about their experiences and problems.

How well does this work? My impression is that this is rather patchy, and depends enormously on the energy of the teachers and of the volunteers. Nonetheless, in teaching statistics there is little to substitute for interaction with working statisticians, who can motivate an otherwise dry and (though we should not say it) sometimes very boring subject.

In this context, there should be a superb role for Societies in running "refresher" (or sometimes more honestly, "introductory") courses to enable such teachers to come to grips with this relatively new set of material that they are having to teach. To teach statistics requires understandings that a maths teacher, especially an older maths teacher, will not have without training: the maths is neither the sole nor the hard part, and better knowledge of the uses, and users, of statistics would be invaluable.

### 3. College education: workshops for the educators

Most Societies have more than enough links, through their members, into college level education. Here the question is not making contact, as in K-12, but what added value can a Society bring to the existing educational system.

Support for refresher or introductory courses for instructors seems more active at this level. For example, at Colorado State University we recently hosted a live-in course, organised by the Mathematical Association of America in conjunction with the ASA, for mathematics teachers at colleges who were being faced with teaching statistics - and faced with teaching it in an environment using computer support for statistical problems. They were able to learn from our experiences in a hands-on way. This seemed to be a great success. Although the class was small, the impact will be great, when one thinks of the many hundreds of students being better taught by those teachers.

Providing a different template for educational activity. most statistical Societies now add specialized workshops to their major conferences. Admittedly, at the IMS for example, these have traditionally showcased the acknowledged experts in a field, talking about the latest research results. However, and especially at the smaller meetings in the US (such as those held jointly with the Biometrics Society), I think there has been a trend towards workshops with a much more substantial educational content.

It is then critical that these be advertised as widely as possible. They should ideally attract the maths teachers, or the school teachers, who do not come to the normal sessions in the conferences: and promoting as well as organizing should be a priority for the relevant Education Sections of any Society.

#### 4. Business, industry and government: a market for interactions

The IASE separates out, as distinct subgroups, those with interests in teaching statistics in business or industry, and those involved with training statistical staff for government statistical offices. Both these groups offer much stronger opportunities for educational impact than do the K-12 and college education system.

Societies are perhaps too small to make a lot of difference in K-12 and colleges. In business, industry and government, Societies can make substantial differences because these enterprises are not typically geared up to provide education. They want courses on specific topics (such as quality improvement methods, or sampling methods), and Societies can often lay their hands on real experts in these areas. They want short courses, and Societies can often set these up, and perhaps make them financially viable by attaching them to larger conferences. And not irrelevantly, they are prepared to pay, and for Societies which often have small resource bases and cannot always press for volunteers, this is important.

Conversely, business, industrial and government statisticians can bring fresh perspectives to the educational front [2]. Societies provide an outstanding vehicle to foster this, and one which should be encouraged more.

#### 5. Providing resources for students and learning

Societies are also, because of their breadth of membership, the ideal group to

coordinate resources for teaching and learning.

One thing that Societies are certainly doing, that impacts at this level, is producing regular publications that can provide teaching material. The *American Statistician* has for many years carried articles of use to all levels of teachers. Both *STATS*, from the Education Section of the ASA, and *Chance*, from the IMS/ASA, provide newer avenues for more accessible material on statistical work, using both material from established statisticians and students (including, recently, a first article from a high school student). Most of this material is, however, still at the college level. Within this context, I would urge Societies to consider how best to provide other more elementary material for the use of the K-12 teachers and students.

Societies must also move to support electronic availability of resources. Societies can provide coordinating websites on which statistical resource material could be placed, and the ASA is becoming active in this [3]. For statistical education in particular, the situation is looking promising. The ASA promotes the *Journal of Statistical Education* on-line, and [3] leads to much other material of considerable potential impact. This would also be the vehicle to incorporate the work of other IASE groups, such as those developing software for teaching and those developing texts and even audio-visual material.

On a related note, the SSA and the ASA have carried out substantial work developing career information. In terms of supporting students, one cannot ignore the importance of the work of Societies in promoting careers in statistics. Not only does this encourage those students who will become statisticians: as an educational tool the types of case-studies that this information typically provides enables teachers at all levels to gain inspiration, showing them the range of applicability of the subject, and indeed why statistics should be taught at all.

## 6. Continuing education of young statisticians

One of the best examples of societal involvement in continuing education that I know of is the Workshop for Australia's Young Statisticians (WAYS), which brings together statisticians from all areas of application to share their common background in an informal environment. This has been conducted annually for some 15 years now by the SSA. The stated purpose of the workshop is three fold, and

could form the basis of a charter for any Society:

- To provide young statisticians from different environments with an opportunity to meet and discuss their work or research in an informal and non-threatening environment. Young statisticians fill diverse roles in government, business and academia, and it can be difficult to make or maintain contact with other young statisticians working in different roles. WAYS encourages those people who would otherwise be professionally isolated in their workplace.
- To further the professional development of young statisticians. Participants can establish a network of people with similar backgrounds which could benefit their future. In addition, listening to talks by invited speakers and other participants will broaden their scope and possibly encourage further learning.
- To be the national meeting of the Young Statisticians section of the Statistical Society of Australia.

The third of these formalizes the commitment of a Society to fostering *young* statisticians; the second places the emphasis on *continuing* education, as they leave more formal systems, as the role of the Society. And, by mixing the groups as in the first aim, WAYS both educates those who apply statistics by exposing them to the most recent research in methodology; and at the same time educates researchers in the real problems that need the wider application of statistics.

This seems to be the best sort of educational experience, and I commend it as a model in all other areas.

[1] R.L. Scheaffer, Toward a more quantitatively literate citizenry, *Amer. Statistician* 44 (1990) 2-3

[2] R.D. Snee, What's missing in statistical education? *Amer. Statistician* 47 (1993) 149-154

[3] ASA Center for Statistical Education, <http://www.amstat.org/education/>