NEW CHALLENGES TO THE ISI EDUCATION COMMITTEE

J. Gani
Statistics Program
University of California
Santa Barbara, CA

The International Statistical Institute (ISI) was founded in 1885 as an international society to foster the development of statistics. Its small initial membership consisted mainly of official statisticians; in the past 101 years, this membership has grown to just under 1400 statisticians of varied specialisms working in over 80 countries. Statistical interests in the ISI now range widely from official statistics, through regional and urban statistics, survey sampling, mathematical statistics and probability, to statistical computation and algorithms – in short, the entire gamut of statistical methods and practice.

The ISI's general activities during the past century have included:

(a) the organization of biennial sessions, the 45th of which celebrating the ISI's centennial, was held in Amsterdam in 1985;

(b) the publication of the Bulletin of the ISI as its session proceedings, the Statistical Theory and Methods Abstracts issued since 1959, the International Statistical Review (originally the Review of the ISI) now in its 54th volume, and a variety of occasional books and reports on a wide range of statistical topics;

(c) the management of international projects, the best known of which is probably the World Fertility Survey;

(d) the upgrading of statistical procedures and organization, particularly in the developing countries, by support for the training of official statisticians in International Statistical Training Centres (ISTCs). Among these is the International Statistical Education Centre (ISEC) in Calcutta founded in 1950, for which the ISI shares responsibility with the Indian Statistical Institute;

(e) the improvement of statistical education on a worldwide basis, through the efforts of the ISI Committee on Statistical Education, established in 1949.

It is these last two activities, representing ISI's main educational thrust, which will be briefly reviewed here.

1. Early achievements of the ISI Education Committee, 1949-77

In 1949, a resolution was passed in the United Nations urging "the UNESCO and the ISI to take appropriate steps to further the improvement of education in statistics on an international scale." It was this which led,

shortly after, to the creation of the ISI Committee on Statistical Education; the work of the Committee has since been surveyed at irregular intervals by Nixon (1960), Goudswaard (1964), Zarkovich (1976) and Gani (1979).

Financial support for the Committee was provided mainly through a grant from UNESCO; the funds, which could barely sustain a single junior research worker, were not large enough to support a permanent centre or launch a major project in statistical education. It was thus left to the ingenuity of the Committee to determine the optimal use of the resources available; between 1949 and 1977 the Committee elected to concentrate mainly on the following educational priorities:

(a) statistical information and communication;

(b) training centres;

(c) teaching aids and methods;

(d) training methods and curricula.

Its principal activities under each of these categories will be outlined below.

Educational information such as accounts of relevant statistical symposia, the activities of statistical institutes and centres, or the summaries of proceedings of statistical societies were published regularly in the Review. Thus, among other topics, the value of statistical training for traffic engineers, the increasing need for electronic computation in statistical data analysis and the careful preparations required for sample surveys in industry were communicated through the Review to all ISI members. Several Round Table Conferences were organized by the Committee on educational topics such as university teaching of statistics in developing countries (1968), new techniques of statistical teaching (1970), statistics at the school level (1975) and the teaching of statistics (1977).

The Committee recognized a certain number of institutions as International Statistical Training Centres for the education of official statisticians. Among these was ISEC, Calcutta, operated jointly since 1950 by the ISI and the Indian Statistical Institute, under the auspices of UNESCO and the Government of India. This Centre set out to provide training in theoretical and applied statistics, mostly to participants in (or assigned to) government posts, from countries in the Middle East, South and South-East Asia, the Far East and the Commonwealth Countries of Africa. Directors of Training Centres were also encouraged by the ISI Education Committee to meet on a regular basis, and were able to do so successfully in 1973 and 1976.

The preparation of teaching aids was steadily encouraged by the ISI Education Committee; one may, as examples, point to Kendall and Buckland's Dictionary of Statistical Terms and Lancaster's continuing "Bibliography of statistical bibliographies". Teaching methods were reviewed at the 1970 Round Table Conference, and the ISI cooperated with UNESCO in the 1973 Survey on the Teaching of Statistics for Developing Countries.

shortly after, to the creation of the ISI Committee on Statistical Education; the work of the Committee has since been surveyed at irregular intervals by Nixon (1960), Goudswaard (1964), Zarkovich (1976) and Gani (1979).

Financial support for the Committee was provided mainly through a grant from UNESCO; the funds, which could barely sustain a single junior research worker, were not large enough to support a permanent centre or launch a major project in statistical education. It was thus left to the ingenuity of the Committee to determine the optimal use of the resources available; between 1949 and 1977 the Committee elected to concentrate mainly on the following educational priorities:

(a) statistical information and communication;

(b) training centres;

(c) teaching aids and methods;

(d) training methods and curricula.

Its principal activities under each of these categories will be outlined below.

Educational information such as accounts of relevant statistical symposia, the activities of statistical institutes and centres, or the summaries of proceedings of statistical societies were published regularly in the Review. Thus, among other topics, the value of statistical training for traffic engineers, the increasing need for electronic computation in statistical data analysis and the careful preparations required for sample surveys in industry were communicated through the Review to all ISI members. Several Round Table Conferences were organized by the Committee on educational topics such as university teaching of statistics in developing countries (1968), new techniques of statistical teaching (1970), statistics at the school level (1975) and the teaching of statistics (1977).

The Committee recognized a certain number of institutions as International Statistical Training Centres for the education of official statisticians. Among these was ISEC, Calcutta, operated jointly since 1950 by the ISI and the Indian Statistical Institute, under the auspices of UNESCO and the Government of India. This Centre set out to provide training in theoretical and applied statistics, mostly to participants in (or assigned to) government posts, from countries in the Middle East, South and South-East Asia, the Far East and the Commonwealth Countries of Africa. Directors of Training Centres were also encouraged by the ISI Education Committee to meet on a regular basis, and were able to do so successfully in 1973 and 1976.

The preparation of teaching aids was steadily encouraged by the ISI Education Committee; one may, as examples, point to Kendall and Buckland's Dictionary of Statistical Terms and Lancaster's continuing "Bibliography of statistical bibliographies". Teaching methods were reviewed at the 1970 Round Table Conference, and the ISI cooperated with UNESCO in the 1973 Survey on the Teaching of Statistics for Developing Countries.

Finally, the Committee was persistently concerned with curricula and training methods for statisticians of diverse specialisms. Statistical curricula at schools and universities were the subject of constant discussion. Volume 39(1971) of the Review reported the proceedings of the 1970 Round Table Conference on new techniques of statistical teaching; discussion ranged from curricula at schools and universities to computer based methods of teaching statistics, TV courses and continuing statistical education after college.

It will be clear from this short summary that the ISI Education Committee had, between 1949 to 1977, made progress in implementing its brief to further the improvement of statistical education on the international scale. There had inevitably been criticism of its policies, but given the modest financial support offered to the Committee, the lack of a natural focus for its educational projects, the great distances separating its members and the difficulty of bringing them together on a regular basis, it is surprising that activities were maintained at such a steady level. In 1977, the ISI Bureau decided that some changes in direction were required, and entrusted their implementation to me as the newly appointed Chairman of the ISI Education Committee.

2. Criticisms end a new beginning, 1977

It is obvious that while the general objectives of the ISI Education Committee can remain the essential "improvement of education in statistics on an international scale", the directions which such improvement may take will vary with the times. Three events have affected the concept of statistical education considerably over the past decade:

(a) politically, the rapid emergence of developing countries as a powerful group in world affairs;

(b) educationally, the widespread reporting of statistical information in newspapers, government and company reports, and economic forecasts;

(c) technically, the increasing availability and common usage of electronic calculators and personal computers.

It was partly the recognition of these changes which led the ISI to re-examine the role of its Education Committee.

In an analysis of ISI educational activities, Zarkovich (1976) had already suggested the following additional projects:

(a) the commissioning of review papers as teaching aids to keep university students and teachers up-to-date, particularly in developing countries;

(b) the preparation of curricula for middle school levels by ISI, together with a related textbook to introduce statistics to schoolchildren;

(c) the writing of textbooks for elementary statistics courses at university, with appropriate emphasis on real life applications;

(d) the preparation of sample university curricula to guide teachers in new universities;

(e) the dissemination of a bulletin on new ideas and results in statistical education;

(f) organization of more informal round table discussions;

(g) the formation of a standing advisory service on educational matters;

(h) the encouragement of cooperative educational arrangements in statistics between neighbouring universities;

(i) the inclusion of special statistical topics such as census methods or industrial statistics in selected educational centres;

(j) the use of research programmes in statistical institutes for educational purposes in the training of statisticians.

While some of Zarkovich's proposals, for example (a), (h), (i) and (j) appeared somewhat ambitious, many others were readily achievable. For example, project (b) was to be carried out soon after by the UK Schools Council Project on Statistical Education at least within the British context, while suggestion (c) was partly answered by the publication of the excellent elementary text of Freedman, Piseni and Purves (1978). Somewhat later, a set of curricula (d) for both anglophone and francophone African universities was prepared for the guidance of their statistics teachers, while proposal (e) was met by the publication of the International Statistical Education News (ISEN) and Teaching Statistics which first appeared in 1979. There was little difficulty in modifying Round Table Conferences (f) to achieve greater informality, and an advisory service (g) was promptly established by the ISI Education Committee in response to Zarkovich's urging. What was now required in addition to these improvements on the existing program, was a broader plan of attack on the problems of statistical education, and this is what the new Education Committee set out to formulate after 1977.

3. Reorganization and plans for the ISI Education Committee, 1977- 86

On assuming the Chairmanship of the Education Committee in 1977, it became obvious to me that the modest UNESCO grant would not permit a frontal campaign to solve the three major problems of statistical education raised by the political, educational end technical changes outlined earlier. It was simply not possible to attack directly

(a) the statistical procedures and organization of the developing countries;

(b) the statistical literacy of ordinary citizens in both developed and developing nations;

(c) the computational literacy of developed end developing countries.

The available funds would at most permit the support of occasional Round Table Conferences, the odd meeting of Committee members, and the injection of seed money into worthy projects. It thus became the Education Committee's policy to initiate some, and support other existing projects on statistical education wherever these shared common aims with the ISI; such support, the Committee believed, would optimize the use of scant resources.

By 1979, four Taskforces had been formed by the Committee:

(a) The Taskforce on the Teaching of Statistics at the School level (TOTSAS) under the chairmanship of V.D. Barnett;

(b) The Taskforce on International Conferences on Statistical Education under the chairmanship of L. Råde;

(c) The Advisory Taskforce on Statistical Education under the chairmanship of R. Bradley (in response to Zarkovich's proposal (g)); and

(d) The Taskforce on Coordination of Statistical Training Centres under the chairmanship of M. Benyaklef.

The last two Taskforces survived only briefly. The consulting demands on Taskforce (c) proved very light, and its functions were eventually wound up at Bradley's suggestion. Taskforce (d), after organizing a further meeting of Directors of ISTCs in Rabat in 1979 and issuing an Almanac of training centres, also found its functions declining as ISTCs developed along independent lines; it was also closed down. They were replaced by

(e) The Taskforce on Tertiary and Technical Statistical Education under the Chairmanship of R.M. Loynes; Bradley and Benyaklef were co-opted to it, with continuing briefs for consultative statistical advice and the ISTCs respectively.

A short account of the achievements of Taskforces (a), (b) and (e) seems appropriate at this juncture.

Professor Barnett and his Taskforce (a) have been responsible since 1977 for a wide range of projects and publications on the teaching of statistics at schools. The magazine Teaching Statistics, sponsored by the Applied Probability Trust, the Institute of Statisticians, the ISI and the Royal Statistical Society has published articles on statistical topics and the teaching of statistics in schools three times a year starting in 1979. The Sheffield International Centre for Statistical Education, for which the ISI Education Committee provided a grant towards the training of statisticians from developing countries, has (through its members) published a set of school texts for the UK Schools Council Project on Statistical Education. The TOTSAS Taskforce newsletter has regularly disseminated information on its numerous school-centered activities. In 1982, the book Teaching Statistics in Schools Throughout the World, edited by Professor Barnett was published, and plans for two further books International Bibliography of Statisti-

cal Publications and Directory of Workers in Statistical Education Throughout the World are well advanced. The efforts of this Taskforce have effectively met the very real need for school statistics texts and an elementary statistical periodical, both in Britain and more generally the English-speaking world; a German translation of Teaching Statistics is also available. All this has been achieved at very moderate cost to the ISI.

Professor Råde and his Taskforce (b) have successfully concentrated on the organization of international conferences on statistical education; these have been of two kinds, the larger International Conferences on Teaching Statistics (ICOTS) and the smaller informal Round Table Conferences. ICOTS I, held in Sheffield in 1982 with the cooperation of Professor Barnett, attracted 496 teachers of statistics from all over the world; discussions covered statistical problems, teaching methods, textbooks, computing and curricula in some depth as can be seen from the Proceedings published under the editorship of Professor Barnett and three colleagues. The second ICOTS 2 meeting at Victoria, B.C. in 1986, currently in progress, is the occasion of this paper: it has proved even more popular, with over 500 delegates taking part in its varied sessions, panels, tutorials and workshops. The Round Table Conferences, on the other hand, have tended to concentrate on more specific topics, such as the "Impact of Calculators and Computers on the Teaching of Statistics", the subject of the last such Conference held in Canberre in 1984; its proceedings have been published in a volume edited by Professor Råde & Speed. Plans have also been made for a volume on Readings in Statistical Education to be compiled by Professors Råde and Barnett. This Taskforce has been very responsive to the desire for contact, coordination and the sharing of information among statistics teachers throughout the world; its answer has been to organize the sequence of ICOTS Conferences. It has also provided a valuable venue for the informal discussion of specific statistical topics in its Round Table Conferences. Again at very modest expense to the ISI.

Professor Loynes and his Taskforce (e) have been responsible for the encouragement of developments in tertiary and technical statistical education, partly through Professor Loyne's prior contacts with statisticians in African and other universities. He has represented ISI as an observer at the meetings of the Statistical Training Programme for Africa. The Taskforce has consequently been involved in the preparation of syllabuses for statistics courses in anglophone and francophone universities of Africa. An International Directory of Short Courses-in- Statistics has been published early in 1986, and Professor Loynes and Dr. Benyaklef are in the process of revising and updating the current Almanac of ISTCs. Seven years after their last meeting, a further gathering of Directors of ISTCs has been organized at ICOTS 2, with Dr. M.G. Argana of the US Bureau of the Census to chair it. The Taskforce has issued its International Statistical Education Newsletter (ISEN), regularly disseminating educational material in statistics to the entire ISI membership. Finally, it is about to publish a book on The Training of Statisticians Around the World, edited by Professor Loynes, which is to form a companion volume to Professor Barnett's Teaching Statistics in Schools Throughout the World. This Taskforce has fulfilled its brief of monitoring tertiary and technical training in statistics, particularly in the developing world, end of distributing information on

statistical education throughout the statistical community. These activities have been supported at a very small price to ISI.

On the whole, the Education Committee's policy of using its limited resources to initiate some and support other existing projects of interest to the ISI appears to have paid off. The level of ISI's activity in statistical education has been substantially raised since 1977, at a cost which has remained modest. There is little doubt that if the UNESCO grant had been used to employ a single research worker, or fund a single project fully, results would have been far less substantial. So far, the seed money approach has served the Education Committee well.

4. Other activities of the Committee: ongoing projects

Some of the Committee's activities have been carried out by its joint membership, rather than through its more specialized Taskforces. For example, financial assistance for special projects is voted on by all members of the Committee; among its many grants have been those in support of

(a) the formation of the Teaching Statistics Trust and the publication of Teaching Statistics;

(b) visiting fellowships from developing countries to the International Centre for Statistical Education, Sheffield, to train fellows in current methods of teaching statistics;

(c) the purchase of a micro-computer for ISEC, Calcutta;

(d) the organization of a statistical meeting in Latin America in 1987 designed to bring together statisticians in that region with interests in education.

The Committee has also been responsible for the regular supervision of ISEC, Calcutta. I have myself frequently visited this Education Centre since 1977 to keep in touch with its staff and trainees. It was as a result of one of these visits that the Committee, together with the Applied Probability Trust and the Indian Statistical Institute agreed to fund the purchase of a micro-computer to be used in the ISEC training course. Recommendations placed before the Committee and the ISI Bureau have also resulted in improvements in living and academic conditions at ISEC, and in the recent upgrading of its graduate certificate to a diploma.

Three important current projects are concerned with China, calculators and a TV educational program. The Committee has tried to foster closer contacts with statisticians teaching in the People's Republic of China; a beginning was made in this direction at the Amsterdam ISI Session in 1985, but progress has been slow. Following Professor Råde's publication of "Calculators and Statistical Calculations: An International Enquiry" in 1985, he and I tried to interest Japanese calculator companies in the summer of 1985 in producing calculators specifically designed for statisticians. In particular, a simple solar-powered calculator for developing countries

was our first priority. Response was positive, and we have now seen the final results of our endeavours embodied in the new Sharp statistical calculator. Finally, in association with the Open University, the BBC, the International Centre for Statistical Education in Sheffield, and Blackwells of Oxford, the Committee has supported the production of a TV (or film and video) program on "The World of Statistics" for use as a teaching facility in both developed and developing countries. The purpose of this program would be to inform senior civil servants and managers in industry of the role of statistics in decision making, and to train younger workers in the use of basic statistical methods. The program will cover four main topics: population censuses and projections; resources of energy, food, industrial production and employment; social problems including crime and the underground economy; manpower planning, including education and health. At the moment, funds of the order of $1 million are being sought from industry, grant agencies and private foundations to implement the project; should we prove successful, this will be the first major project in which the Education Committee will have been involved.

A further aim of the Committee has been to maintain close contact with the 3-year "Quantitative Literacy Project" funded by NSF in the USA. This project, administered by the American Statistical Association, is headed by Professor R.L. Scheaffer of the University of Florida at Gainesville. It addresses the problem 3(b) of statistical literacy of ordinary citizens in a developed country; its principal aims are to provide guidelines for teaching statistics and probability within the mathematics curriculum, to develop inservice training for teachers, to provide curriculum materials and to develop assessment mechanisms for these materials and for teaching skills in statistics. The Education Committee strongly supports this project and hopes to learn a great deal from its development and implementation.

5. New challenges for 1987-97

The three major problems of statistical education outlined in Section 3 continue to face us as members of the international statistical community: how are we to improve statistical services in the developing countries, including China; how are we to increase statistical literacy, not only in the USA and the Western world but in the emerging nations; how are we to spread the use of calculators and computers for statistics among ordinary citizens? The ISI Education Committee remains vitally interested in these problems; how can it best contribute to their solution?

Clearly two paths are open to the Committee. The first is the extension, with appropriate improvements, of its present policy, namely the use of its minor UNESCO resources as seed money to encourage existing or new projects which further statistical education. The present three Taskforces could then continue their activities in school statistics, international conferences and tertiary and technical education by identifying areas where progress could be made and supporting those individuals, centres, institutions and regional groupings initiating such progress. This can be thought of as the "gadfly role" of the Committee.

The second path is to seek larger financial support from industry, grant agencies, and private foundations for major long-term projects such as the ASA-NSF "Quantitative Literacy Project" in each of the areas outlined earlier. "The World of Statistics" project is at exactly this fund-raising stage, and one could imagine two or three other projects such as "School Statistics in China", "Statistical Literacy in Nigeria" or "Computer Literacy in Japan and the USA" being carried out at the same time. But to envisage these would mean to postulate the existence of a permanent international centre or development group in statistical education, with a staff of half a dozen experienced organizers, assured of annual funds at least ten times larger than the present UNESCO grant, and the possibility of access to even larger grants from government, industry and private foundations. This could be thought of as the "educational development" role of the Committee.

Whether the ISI prefers a "gadfly" as against an "educational development" role for its Education Committee remains to be seen. The first role is the easier; it has produced results far in excess of those expected for the funds committed. But it is a somewhat opportunistic role, and one which depends largely on the personality and energy of the Committee and Task-force Chairmen. The second role is likely to produce more basic results, but demands a heavy commitment in funds and personnel; it is equally subject to the effects of personality – a poor director could well ruin the operation of the centre or development group, and produce results no better than the current "gadfly" ones.

Which path the ISI will eventually choose will depend on a variety of political and economic factors. Personally, I think the "gadfly" role by itself has gone about as far as can be expected, and the ISI Executive and Council will soon have to think in broader terms; my own preference would be for the ISI Education Committee to maintain its "gadfly" role while it begins to explore more ambitious developmental projects, and seeks substantial funds for them. All of us will await with interest the educational developments which are likely to take place in the ISI after 1987, when the ISI and its Council will meet in Tokyo for its 46th Session, and issue the incoming Education Committee its new directives.

References

Freedman, R., Pisani, R., & Purves, R. (1978). Statistics. New York: Norton and Co. Inc.

Gani, J. (1979). The role of ISI in the field of statistical education: 1949-1979. Inter. Statist. Rev., 47, 237-244.

Goudswward, G. (1964). A re-appraisal of the statistical education programme of the International Statistical Institute. Rev. ISI, 32, 88-103.

Nixon, J.W. (1960). A history of the International Statistical Institute, 1885-1960. The Hague: ISI.

Zarkovich, S.S. (1976). A re-appraisal of the ISI statistical education programme. Inter. Statist. Rev., 44, 289-295.