IASE Review, November 1997

International Association for Statistical Education

Editorial

As you well know the IASE is a very young Association, just 6 years old. But we must not forget that it is continuing the activity of what was a glorious Committee: the Committee of Statistical Education which from 1945 to 1991 carried out the ISI program aimed at developing and promoting statistical education all over the world.

Today this is the responsibility of the IASE. To cope with this task, enormous energy, enthusiasm and ideas are needed. **Energy** *is needed to foster and encourage the scientific growth of the IASE and to help circulate abroad the efforts of our members in their own countries.* **Enthusiasm** *is needed so not to be discouraged by difficulties which may occur due to the lack of recognition of our particular field of research by our colleagues. Some of them may have not yet fully understood that the lack of visibility is of enormous damage for statistics, and that statistics education is a possible way, and not the least important way, of gaining the recognition of the usefulness of statistics in society.* **Ideas** *are needed to face a changing world, with technological tools developing quickly and consequently the changing needs of our students.*

Only the widespread collaboration of all the IASE members with the Executive Committee will enable IASE to grow. Each member should aim to act as an ambassador for statistics and the Association. Each of you can give his/her contribution to extend the network between the researchers in our discipline all over the world, in line with our ICOTS-5 theme "Expanding the network". If there is a Society of Statistics in your country, you can ask if it has a group devoted to statistical education, try to take part in it if the group already exists, or help to create one. If activities already take place in your country regarding statistical education, IASE has at your disposal the ISI newsletter and the IASE Review to inform each other of any interesting initiatives! Maybe there are books, local conference or workshops which would be useful to inform other researchers about. Each of you may in some way serve as a connection between the IASE and your country, and vice-versa. Any assistance that you can give towards communicating IASE's activities to a wider audience, or introducing potential members, is very important.

We need to recognise however some peculiar difficulties of our section compared with other ISI sections. Each of us works in our own country, in our own language, and prepares educational materials that are easy to understand in our own country. Thus, it is not always easy to communicate with each other. This is one more challenge for the IASE, we should not underestimate it.

Members of your Executive Committee are here to serve you of course. If you need information, or you have any ideas about how you think that IASE could be more effective, please do not hesitate to contact any or all of its Officers.

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IASE also depends on the continuing help of a number of other people, e.g. Mary Regier (IASE representative on the ISI Membership Committee), formerly Tim Arnold and now Terry Byron (IASE Archive), Annie Morin (acting on behalf of IASE in planning programme for ISI-51, Istanbul), Rolf Biehler (IASE Editor for the International Statistical Review), Susan Starkings (ICME-9 contact facilitator).

Special thanks are also owed to Anne Hawkins, out-going President, who has worked tirelessly during her term of office to ensure that IASE can now grow from a sound basis. Also thanks to out-going Vice-presidents Richard Schaeffer involved in a number of activities including publications and Manfred Borovcnik and Abdelmegid Farrag who took responsibility for IASE promotion and national correspondents network.

Update

Since 1995 IASE membership has increased from 343 to 355 ordinary members, while institutions increased from 5 to 8, but African, Asian and Latin American Countries are still under-represented.

There are surely more people who are deeply concerned about statistical education for whom the *International Statistical Review, Short Book Reviews* and the *Annual Review of International Statistics* along with *IASE Review* and the IASE section in the *ISI Newsletter,* meetings and contact with other like-minded folk are worth IASE's modest dues.

`Subscription rates remain constant for 1998`

IASE dues for 1998 are 70 Dutch Guilders for members in developed nations and 38 Dutch Guilders for members in developing and transition countries. Amounts in other currencies may differ a little from 1997 level due to currency fluctuations. The package of benefits remains just as high. As well as receiving the above-mentioned ISI/IASE publications free, members can still take advantage of concessionary rates on conference registrations and on the purchase of ISI/IASE books and journals for example T*eaching Statistics*, which includes "IASE matters" (P. Holmes, ph@pmn1.maths.nott.ac.uk).

For new subscribers (while stocks last) **a special offer is available** which consists of a free book worth US$ 65: *The Assessment Challenge in Statistics Education* (Ed) I. Gal and J. Garfield, IOS Press, 1997, 294 pages, hardcover, ISBN 90-5199-333-1.

Getting and Exchanging Information

News for publication in the IASE section of the ISI Newsletter, edited three times in a year, may be submitted to Joan B. Garfield (address given above) within the following 1998 deadlines:

February 1, June 1, October 1

Up-Coming IASE Conferences

Fifth International Conference on Teaching Statistics, ICOTS-5

Nanyang Technological University, Singapore, June 21-26, 1998

Chair IPC, Brian Phillips, (bphillips@swin.edu.au, Fax + 61-3-9819-0821)

Chair LOC, Teck-Wong Soon, (teckwong@mailhost.net.sg)

Singapore contact, Lionel Pereira-Mendoza, (pereiraml@am.nie.ac.sg)

The ICOTS-5 theme is *Statistical Education Expanding the Network.*

Schedule of deadlines:

   earlybird registration January 31, 1998

   submission of final papers February 15, 1998

   application for accommodations May 20, 1998

See complete information at the WWW site: **www.nie.ac.sg: 8000/~wwwmath/icots.html**

Upgrades on the program can be found on **http://www.swin.edu.au/maths/icots5/intro.html**

IASE Session in the ISI's 52nd biennial meeting

Helsinki (Finland), August 10-18, 1999

There are seven sessions planned for ISI-52. One is co-organised with IAOS.

Anyone interested in taking part in these sessions should contact the organiser listed

Statistical Education and the Significance Tests Controversy, C. Batanero [batanero@goliat.ugr.es]

Issues Involved in the Assessment and Evaluation of Student Learning of Statistics, J. Garfield [JBG@maroon.tc.umn.edu]

Teaching and Training Multivariate Data Analysis, H. Bacelar -Nicolau [ulfphelb@cc.fc.ul.pt]

Visualisation as an Educational Tool, L.Weldon [weldon@cs.sfu.ca]

Statistical Education Using Flexible Learning Approaches, A. Di Ciaccio
[diciaccio@econ.uniurb.it]

Statistical Training for People Working in and with Official Statistics, C. Blumberg
[wncarolj@vax2.winona.msus.edu] and R. Smulders [The Netherlands]

Statistical Education for Life, A. Hawkins [ash@pmn1.maths.nott.ac.uk]

Planning for Future IASE Conferences

IASE Round-Table 2000

Contacts have been established with the Statistical Education Committee of Japan Statistical Society to held the next IASE Round table in Japan in 2000, in connection with ICME - 9. The theme of the round table will be: *Training Researchers in the Use of Statistics*.

ICOTS-6 2002

Expression of interest for ICOTS-6 in 2002 are being sought. Contact Maria Gabriella Ottaviani and Brian Phillips (addresses given above)

Forthcoming Conferences of PME

PME 22nd - 1998

The 22nd Annual Conference of the International Group for the Psychology of Mathematics Education (PME) will take place in the University of Stellenbosch, South Africa, 12-17 July 1998.
Contact: Alwyn Olivier [aio@akad.sun.ac.za]

The annual Conference of 1999 is scheduled in Israel

The annual Conference of 2000 is scheduled in Japan

Publications Edited by the IASE

Under the Presidency of Anne Hawkins some publications have appeared of great importance for Statistical Education

Research on the Role of Technology in Teaching and Learning Statistics, Proceedings of the 1996 IASE Round Table Conference. Edited by J. Garfield and G. Burrill. Voorburg, The Netherlands: International Statistical Institute. Available from the ISI for US$ 30.00 which includes postage.

This soft-cover volume contains 21 papers and five summaries of discussions, grouped into the following categories: (1) How technology is changing the teaching of statistics at the secondary level, (2) Developing exemplary software, (3) What we are learning from empirical research, (4) How technology is changing the teaching of statistics at the college level, and (5) Questions to be addressed on the role of technology in statistics education.

Computational Statistics and Statistical Education, Proceedings of the Tartu Conference, (Tartu, Estonia, 1996). IASE/IASC. Editor: E. M. Tiit. For information, contact E. Tiit at E-mail: etiit@ut.ee, Tel.: +37-27-465488, or Fax: +37-27-465898. Price: US$ 10.

Contents: Statistical software as an environment of teaching statistics, Statistical education - Where are we going?, Some computational problems in multivariate applied statistics.

The Assessment Challenge in Statistical Education. Edited by I. Gal and J. Garfield, 1997, IOS Press, The Netherlands. For more information, contact IOS Press at: market@iospress.nl, Fax: +31-20-620-3419. Price: US$ 65.

Published under the ISI and IASE logos, this book is divided into four sections: Curricular goals and assessment frameworks, Assessing conceptual understanding of statistical ideas, Innovative models for classroom assessment, Assessing understanding of probability.

IASE members receive a discount of 20% off the list price. Anyone who registers to become a IASE member will receive a complimentary copy of the book while supplies last.

Papers on Statistical Education, presented at ICME-8. Edited by Brian Phillips, Swinburne University of Technology, Australia. Available from Brian Phillips (address given above). Price: US$ 20, which includes postage and handling.

This book is a collection of 16 papers on statistics education that were presented at the Eighth International Conference on Mathematical Education held in Seville, Spain, during July 1996.

ISI World Numeracy Programme

In Istanbul, at ISI 51 during August, a meeting of the Advisory Committee of the WNP was held under the Chairmanship of Luigi Biggeri. IASE President Maria Gabriella Ottaviani was present, confirming that IASE is a natural Section to have a major involvement in the World Numeracy Programme.

At that meeting Anne Hawkins [ash@pmn1.maths.nott.ac.uk], IASE past-president, agreed to try to establish a more active network of people interested in the objective of the Programme. By now 29 persons already indicated they wish to be involved.

Within the framework of the ISI World Numeracy Programme, national activities are favored which aim at spreading quantitative skills as well as the development of statistical science and scientific data collection practices. An ideal combination of academy statisticians and official statisticians has been organised by Luigi Biggeri in Italy. Under the auspices of the Italian

Statistical Society (SIS) and the Italian National Statistical Institute (ISTAT) a Conference has been organised on "The Statistical Culture Diffusion" (Rome, 26-27 November 1997) which addresses school teachers, media and journalists, national and local government officers. In particular, after a general session on the importance of statistical culture, there will be a round table on "Statistics and the media" and two sessions are scheduled about teaching statistics at school and the importance of statistics for national and local government. For information contact: Luigi Biggeri [biggeri@stat.ds.unifi.it] or Maria Gabriella Ottaviani [ottavian@pow2.sta.uniroma1.it].

Scientifical Issues

Education in Evidence in the International Statistical Review

The second 1997 issue of the ISI flagship journal, which all IASE members receive, opens with an article by David Moore-IASE President from 1993 to 1995.

In "New Pedagogy and New Content: the Case of Statistics" David emphasizes that statistical education now takes place in a new social context. The reform of the way of teaching the mathematical sciences in general along with the changing nature of our discipline demand that statisticians who teach beginners should become more familiar with research on teaching and learning and with changing educational technology. The spirit of contemporary introductions to statistics should therefore be very different from the traditional emphasis on lectures and on probability and inference.

Following the article are discussions from a well distinguished group of people, most of whom are well known to IASE membership: J. Garfield, A. Hawkins, R. Hoerl, G. Hahn, N. Doganaksoy, J. Kettenring, J. K. Ghosh, R. L. Scheaffer, J. M. Tanur. It ends with David Moore's comment.

This issue is highly recommended as essential reading for anyone involved in statistical education

News of IASE Sessions in the ISI's 51st Biennial Meeting

Istanbul, 18-26 August 1997

Research on Teaching and Learning Statistics

Two papers were presented at this invited papers session, organised by J. M. Shaughnessy (USA) and chaired by Yasar Ersoy (Turkey).

Dani Ben-Zvi, from the Weizmann Institute of Science, Israel, gave one of the keynote addresses, entitled "Learning statistics in a technological environment". He argued that topics in data handling have began to play a more prominent role in mathematics curricula in many countries, and computer-based technologies, namely computers and graphics calculators, have

the potential to transform the data handling curriculum. In this context, he described the statistical curriculum developed for middle school (grades 7-9) in Israel, using an interactive computerised environment based on the PCAI (pose, collect, analyse, and interpret) and using a spreadsheet for the analysis. In the presentation, several aspects of the learning environment such as patterns of student statistical thinking in a technological environment, and data handling as part of the mathematics curriculum were illustrated.

The theme taken up by Carmen Batanero and L. Serrano from the University of Granada, Spain was "The meaning of randomness for secondary school students and implications for teaching probability". They stressed that randomness has received various interpretations at different periods in history, and even 1990s. In the presentation of paper, the complexity of the meaning of randomness from the mathematical point of view was first analysed, and philosophical controversies associated with it were then outlined. Secondly, the results of a research from a wider study with 277 secondary school students in two age groups (14 and 17 year-olds) were discussed and interpreted as well as suggesting the implications for teaching of probability.

Anne Hawkins, Director RSS Centre for Statistical Education, the University of Nottingham, UK, and IASE past-president, was the discussant of the session. She outlined the main points in the invited talks, and expressed her personal views and suggestions on teaching and learning of probability and statistics. Concerning Dani's talk, Anne commended the use of open-ended problem solving with a "purpose", and emphasised the iterative nature of applying statistical process which were described by Dani as "possible" research paths. Concerning Carmen's talk, Anne stated that "random" means different things to different people, and it may mean different things to the same individual on different occasions. She argued that perceptions of "chance", "luck", and "random" or unpredictable events seem to be quixotically linked to subjective beliefs about degrees of personal control over events and their causation. Finally, she expressed the common view of participants that we were happy to accept that statistical education should be interpreted in a constructivist way, but ask ourselves what characteristics of educational process will ensure that appropriate learning occurs.

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                                                          Yasar Ersoy
(Turkey)
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Research and Teaching of Probability and Statistics in the Physical Sciences

This Topic was organized as a Panel Discussion and was jointly sponsored by IASE and the Committee for Mathematics and Statistics in the Physical Sciences ("C(PS)^2") of the Bernoulli Society. The organizers were Ed Waymire (Bernoulli Society) and David Vere-Jones (IASE), with panel members Erhan Cinlar (USA) and Colleen Cutler (USA).

To provide a framework for the discussion, Panel members had been provided with a series of questions and responses Ed Waymire had previously sent around his Committee. These questions were:

(i) What are some of the major physical problems requiring probabilistic and statistical methods?

(ii) What are some of the past major accomplishments to employ probability and statistics?

(iii) What are some of the most important methods used in modern research?

(iv) Where is probability and statistics being provided today?

(v) How should probability and statistics training be provided tomorrow for physical scientists (as well as our own students with such interests)?

Discussion centred around the issues raised by the last three questions. The discussants noted some differences in attitudes between physical scientists (and some engineers) and scientists in other fields. Physical scientists had a strong conviction concerning the deterministic character of the universe and were often reluctant to accept the use of probability models.

As for statistics, Rutherford's remark was quoted, to the effect that "if you need statistics, then your experiment has been done wrongly". On the other hand, physicists had made major contributions to the developments in probability, particularly in combinatorial aspects deriving from statistical mechanics. They regarded themselves, probably correctly, as not needing the advice of Bernoulli Society members to solve their problems. Rather, their work provided the mathematical problems on which the Bernoulli Society members could subsequently be employed. "Counter arrogance with arrogance" was one suggestion on how to respond to such attitudes - in other words make equal claims for probability, and the contributions of probabilists in fields such as ergodic theory, random fields etc. Even here, it was noteworthy that the fields likely to be of most interest to the Physicists - methods for handling complex dynamical systems, self-similarity, random cascades etc - would be considered somewhat esoteric by most statisticians.

On the teaching side, apart from the difficulty of finding space for appropriate courses in the crowded timetables of many physical science students, it was suggested that there was scope for even elementary courses, emphasizing modelling and simulation, which would be more likely to interest physical science students than the standard service courses. There was also scope for more specialized courses at graduate level. The route to the heart of the practising scientist, it was suggested, lay through software, or at least the provision of appropriate programming algorithms.

Many physicists and their students were expert programmers but needed help in knowing what statistical methods were relevant and appropriate. It was no good hoping to convince physics students to adopt the attitudes of the statistician; it was necessary to discern how to make the statistics seem relevant and useful to the physicists in their own work.

In brief the discussion was lively, and clearly touched upon issues many of the participants had experienced personally and struggled to resolve. A fuller account will appear in the final volume of the ISI Proceedings.

David Vere Jones
(New Zealand)

Teaching and Training in Statistics through Sampling and Sample Surveys

The following three papers were presented at the invited papers session:

Richard Scheaffer (University of Florida), Discovery of sampling concepts through activities;

Denise Lievesley (University of Essex), The use of data in teaching statistics;

Anne-Marie Dussaix (Ecole Supérieure de Sciences Economiques et Commerciales, Paris) L'Enseignement des sondages à des étudiants de formations différentes: quelques expériences;

Richard Scheaffer discussed the active involvement of the students in:

    (i) measurement processes to examine the source and nature of measurement bias;

    (ii) implementation of the operations of random and purposive sampling;

    (iii) examining detailed reports on real surveys and criticising their shortcomings.

He remarked that sampling is fundamental to much of applied statistics and that it should have a more prominent role within statistical education than it currently has. More attention should be given to design of studies and more emphasis placed on producing good data and recognising bad data in all statistics instruction.

Denise Lievesley (co-author David Chant) stressed the use of real data while teaching a statistics course to beginners. She focused on the ways in which the use of data can enrich the teaching of statistics and discussed the contribution that data archives can play in providing access to a wide range of data from different sources. In particular, the British Social Attitude Survey was used to illustrate some basic concepts of sampling, such as the effect of increasing sample size on the precision of estimates and the effects of clustering. She also emphasised that instructors should encourage students to conduct mini surveys in order to compare their findings with the actual survey results available in the data archive.

Anne-Marie Dussaix's paper provides some useful remarks on the teaching of a course sampling and sample surveys in business courses. She outlined the content of two statistics courses on survey sampling, one aimed at students of the third year of a three-year statistics degree, the other taught in a compulsory introductory statistics class for students in business. She stressed the importance of projects in both courses.

Giorgio E. Montanari (University of Perugia, Italy), acted as discussant giving valuable comments on the three papers. He also emphasised the role of sampling from finite populations in the teaching of the basic ideas of inference.

The author's rejoinders and the floor discussion closed this well attended and stimulating session.

                                         `Giuseppe Cicchitelli`
`(Italy)`

Bayesian Methods in Statistics Education

In this invited papers session, Jose Bernardo (Spain) presented a paper on the use of multiple choice exams as a means of motivating and teaching Bayesian decision theory to students. In this setting, the student is to state a probability distribution on a set of choices for a question, rather than simply circling the answer they feel is most likely to be correct. For example, if there were 4 choices, then a student who knew nothing about the material being tested would assign a probability 1/4 to each choice, whereas a highly confident student would assign probability 1 to one of the choices and 0 to the other three. When there is an appropriate penalty for wrong

answers, it is optimal for the student to assess his or her probability distribution carefully and to state the distribution frankly-rather than to simply make a guess as to the correct answer-in order to maximize the expected score on the exam. Bernardo noted that students are motivated by the desire for good grades. Thus, the multiple choice scheme he uses provides strong motivation for students to learn how to assess their probabilities. In the most simple case, the student must decide whether a statement is true or false; in Bernardo's scheme, the student must state the probability that the statement is true. Bernardo pointed out that this gives a context in which the student has good reason to learn about expected utility, Bayes's Theorem, and how to make optimal decisions. He said that he has used this teaching method with considerable success. Bernardo discussed how students tend to overestimate their knowledge. He also used Bayes's Theorem to present an analysis of P(the student was guessing given the student marked the correct answer) for the setting in which the student has simply marked one of k choices for a particular question.

The second scheduled speaker for the session was Carla Rossi (Italy). Unfortunately, Professor Rossi was unable to attend the session, due to illness. In her absence the chair of the session, Jeff Witmer, presented a summary of the paper she had prepared. Rossi's paper focuses on emphasizing major ideas and using real-world examples to motivate students. She presents an example from medicine in which a person is being diagnosed for diabetes. Bayes's Theorem is used to change prior odds that the person has diabetes into posterior odds, given the results of two blood tests. Rossi points out that Bayesian reasoning can be taught in a wide variety of settings and at different levels within the education system.

The first discussant of the papers was Tony O'Hagan (UK), who agreed that the use of real examples is important. He offered the view that Bayesian methods should be taught before any presentation of frequentist methods, noting that the Bayesian paradigm is easier for students to understand. He also noted the need for more software, books, and collections of examples that can be used in teaching Bayesian statistics.

Jim Berger (USA) was the second discussant at the meeting. He posed the question of whether a high score on one of Professor Bernardo's exams indicates that the student has a good grasp of the material, or whether it indicates that the student is a good probability assessor. Regarding Professor Rossi's paper, Berger agreed that interpretation of results is very important in statistics education, but warned that many students do need to learn techniques that they can carry out, with the aid of a computer, after taking a one-year course. He also told the audience of his own experience in teaching Bayesian methods along with the usual frequentist methods in an introductory course, an experience that he and his students found to be quite satisfactory.

Most of the audience discussion was devoted to the observation that students are not very good at assessing probabilities; several examples were given to support this assertion. Students need practice assessing probabilities of real events in the world around them, such as someone having diabetes, as opposed to additional work with probability questions about coins and dice.

Jeff Witmer (USA)

Data Centred Versus Mathematics Centred Training in Statistics

In this well attended session, three invited papers were presented.

Prof C.R.Rao (USA), of course a giant of modern statistics, in his paper on "A Cross

Disciplinary Approach to teaching of Statistics" explained the importance of the role of statistics as the logic and science of solving problems in many other disciplines. He dealt with the education of a statistician and outlined a philosophical approach. Prof Rao's approach is very much data driven which starts from the very beginning of data collection, cross examination of data and exploratory data analysis. Graphical methods and statistical softwares are the less traditional courses which he likes to include in a statistics programme. Prof Rao emphasised that a mathematician without the experience of handling real life data sets (collecting, cross examining, formulating problem through exploring data sets) is not qualified to be statistics teachers.

Prof F. Jolliffe (U.K.), in "How much Theory Should Be Covered in an MSC Conversion Course" shared her experience in designing coursework postgraduate programmes for graduates not majored in statistics. Such conversion degrees have become more and more in demand and students usually have some working experience from which they realised that they need to be better equipped statistically. The curriculum design therefore has to cater for these students who have very different background and might be pursuing the degree with very different expectations.

The two papers, though different, have a common theme that statistics is a very useful applied discipline and statistical training in university must bear this in mind and be able to expose students to analysing real life data with all the headaches that entails.

Prof L K Chan, (University of Hong Kong), on the other hand, talked on the past and present university statistical education in mainland China and elaborated the need and the value of conversion degrees.

The response to this session was very positive with inspiring discussion on data-based, mathematics-based and problem-based statistical training. There was a concern that service courses must be taught effectively. For many students, the general statistics course is the only statistics course they ever take. Ineffective teaching leads to a large unsatisfied group who have a poor impression of the subject which is very critical to our discipline. As statistics teachers we have the responsibility to show the students that statistics is an exciting, challenging discipline and is highly relevant to the modern world. A problem based approach rather than theory oriented course is perhaps much more appropriate.

S. M. Shen (Hong Kong)

Assessment and Measurement in Education

This invited papers session included three papers as follows:

Pedagometrics: Statistical Measurement and Analysis for Improving the Quality of Education by A. Bazargan (Iran)

Indicateurs d'évaluation du système éducatif: l'expérience française by M. Euriat (France)

Linking Statistical Education with the Improvement of Educational Quality by Z. Sarmad (Iran).

Discussants were Richard L. Scheaffer (USA), Shir Ming Shen (Hong Kong) and Rene Smulders (The Netherlands).

Professor Bazargan in his presentation coined the phrase Pedagometrics to cover three areas as follows:

i) methodology of educational research and evaluation, ii) measurement theory, iii) statistical data analysis and policy formulation.

Then he described four definitions for quality in educational systems: input quality, process quality, product quality (output quality) and value-added quality. It was indicated that by applying Pedagometrics major problems of educational systems could be identified and through educational evaluation models judgement on the quality be made. Accordingly, policies could be linked to the results of educational research and evaluation to narrow the gap between the standards (or expectations of the stake holders) and realities of educational systems.

Professor Sarmad reviewed the trend of statistical education in the schools of education and mentioned the need for revitalizing text-books for the purpose. She mentioned that schools of education usually prepare teachers and improving statistical education in the schools of education would have an impact on improving statistical education at all levels of education.

The third paper elaborated on the educational indicators and their use in evaluation of educational systems. Michel Euriat indicated that using indicators as a mechanism would help the systems to be transparent and accountable. He, further, described recent developments within the mechanism of evaluation of the French educational system.

The discussants appreciated the new concept of Pedagometrics and made positive remarks on the three papers.

<div align="right">`Abbas Bazargan (Iran)`</div>

Technology in Teaching Statistics

The invited papers session was organised by two Associations of ISI: IASC and IASE.

In introduction of the session E.-M. Tiit (Estonia) pointed out the development of statistical education and understanding its content. Several decades ago the main problem was to prove that it is necessary to teach statistics at different levels of the education system. The next problem was to decide if, in the course of teaching statistics, the computers should be used. Nowadays both of the previous problems have been solved, and the new problem is - which is the most suitable hardware and software for the most efficient teaching of statistics on different levels of education. That means, the teaching process should be connected with solving tasks of computational statistics, and that is why this meeting was organised.

In the session there were three invited lecturers:

Patrick Dassonville (France) "Presentation of a CD-ROM for learning correlation and PCA". The presentation using new multimedia technology was carried through at high technical and professional level. The main goals of the product named PRAME were an overall architecture allowing students to choose the model of learning and a 'multimedia style' stimulating the imagination of students. The dynamic combination of oral comments, simulations and graphic animations makes the product attractive for students. The report of P. Dassonville was very emotional, he gave oral English explanations to the background multimedia presentation in

French;

Brian Phillips (Australia) "Research on the role of technology in teaching and learning Statistics". The author gave a survey of development of using the software in statistical education, showing the myths and misconceptions concerning the effect of technology in statistics education, highlighted the ways of thinking and their relationship with technology and, at last, gave a survey of different presentations of the role of technology in statistics education. The report of B. Phillips was illustrated with good photos and documentation demonstrated via computer projector;

Kimmo Vehkalahti & Seppo Mustonen (Finland) "Survo as an environment for statistical research and teaching". The statistical system SURVO has a long history caused by developing needs of statistical computing in Finland. The system has used in its development an editorial approach, the working with Survo is like working with word processor and spreadsheet with extended capabilities in various directions, forming an advanced working environment for statistician of any level - starting with a young pupil up to high level expert or researcher.

In discussion three invited discussants participated

Maria-Gabriela Ottaviani (Italy) mentioned that in the interaction among statistics, computer sciences and teaching statistics two main lines can be regarded: one of them, more technical, linked the production of teaching aids, and the other focusing the problems of teaching and learning. Both these lines were discussed at the session.

Zaven Albert Karian (USA) pointed several striking themes that emerge from the papers of this session. One of them is the presence of a rich variety of pedagogic applications of technology. Another is the willingness of authors to take advantage of recently developed technologies (CD-ROM of Dassonville, Internet Web pages by Mustonen).

Agostino di Ciaccio (Italy) says that we should consider with more interest the use of multimedia CD-ROM jointly with a link to INTERNET, but asks - "will the teachers be capable to adopt those new technologies which, in the next years, will be proven effective in teaching". Many teachers are not willing to change their traditional methods.

Allmut Hoermann(Germany) applied to participate in free discussion to stress the importance of the subject and to highlight some new aspects of the problem.

Ene-Margit Tiit (Estonia)

Statistical Literacy I

This contributed papers session on statistical literacy has shown that the education system has become aware of the problem of statistical teaching. Consequently, this new awareness leads to an evolution of statistical education because it is linked to different experiences given mainly by teachers in statistics.

A first set of experiences is that the students understand less and less about statistics because there are more and more subjects taught and in the same way there are many new statistical tools and statistical methods. To help the students who have difficulty, the professors use laboratory workshops and cooperative learning methods (grouping of students in different fields), make

teachware so that the students understand random process, or write books on the way to look at data, to analyze the data and to write up a statistical analysis, so that a lay person can understand it.

The second experience is a corollary of the first one. Indeed, some students in psychology, in history, have little mathematical knowledge, so the teachers in these fields must give a course without formulae letting students understand the elementary concepts. For instance, statistical analysis of a univariate distribution is carried out comparing data with a theoretical distribution and using different distances.

A third set of experiences is relative to the gap between what is taught in statistical classes and real applications. This gap leads to students who do not understand immediately the foundations of what is taught statistics (why?, where?, how?). A proposed solution consists in the students' participation in sample surveys from beginning to end with aid of the professors.

The fourth experience is highly linked to previous one. Indeed, utilization of statistics in the workplace is usually difficult because the new employees do not have sufficient confidence to apply appropriate statistical methods on their data and the «old employees » who have not had statistical training but know their data, do not know which statistical method is suitable to apply. In these cases, the firms give internal statistical courses to link statistical methods with their data and use statistical software as appropriate.

The last set of experiences concerns primary school. It is evident that the pupils are not used to reading and understanding a graph or to present appropriate statistical tables and graphs of data. To solve this problem, the interventions in schools are more and more asked to explain to teachers and pupils the way in which statistics can play a leading role.

Finally, the questions and answers, which were debated during this session, have shown that this new awareness, given at the beginning, tends toward the same wish for all participants: to manage so that Statistics is understood and liked by a lot of people, so that it becomes a natural means to solve problems.

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