Statistical Education Research Newsletter

International ASSOCIATION FOR STATISTICAL EDUCATION
http://www.cbs.nl/isi/iase.htm

Editor:

Carmen Batanero
Departamento de Didáctica de las Matemáticas
Facultad de Ciencias de la Educación
Universidad de Granada, Spain
E-mail: batanero@goliat.ugr.es

Associate Editors:

M. Gabriella Ottaviani
Dipartimento di Statistica Probabilitá e Statitstica Applicata,
Universitá degli Studi di Roma "La Sapienza", Italy
E-mail: Mariagabriella.Ottaviani@uniroma1.it

Chris Reading
School of Education
Faculty of Education, Health and Professional Studies
University of New England, Armidale, Australia
E-mail: <creading@metz.une.edu.au>

John Truran
Private Practice
PO Box 157, Goodwood, South Australia 5034, Australia
E-mail: truranjk@ozdemail.com.au

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1. Notes and Comments

A New Northern Hemisphere Summer is over in which we had the opportunity to meet many colleagues and enlarge our knowledge about statistics education at the conferences with statistics education components held in different geographical areas. It is always a very rich experience to share our ideas and receive feedback from other colleagues from countries far away our own, even for a reduced number of days, before spreading again all around the world and returning to our usual work. We are including information about the IASE Statistical Literacy Conference and the IASE Invited Paper Meetings at the ISI-53 Conference in Seoul and the STRL Forum in Armidale, Australia, as well as about other past conferences in Brazil, France, Italy, New Zealand, and the USA.

We look forward to meeting again in the forthcoming conferences we are reporting in this issue and in particular at our ICOTS-6 Conference in Durban, 2002, the main IASE event which is only held once every four years. For the particular case of ICOTS- 6 Maria Gabriella Ottaviani, Brian Philips, Dani Ben.Zvi, Delia North and the other members of the IPC and Local Committees are doing their best to make this event a great success for all participants. It is still time to submit contributed papers as well as to have the invited papers being refereed. Refereeing is a constructive and learning process for both authors and referees and, as such, it contributes to increase the quality of our publications and our research. Information about ICOTS-6 and the scientific programme for the conference is included in this issue.

As a result of our recent elections we start a new IASE period and welcome the new Executive Committee (see report below). We are pleased still to have the help of the past president, Brian Phillips, and we have increased by one the number of Vice-presidents in order to continue our work and take over new tasks and initiatives. We thank all the members of the past Committee for their dedication and work for the association, which has been reported in this and past issues of our newsletter and other IASE publications. We also thanks and welcome the new members as well as other people at the IASE who are willing to contribute their work for the improvement and enlargement of our association in the next two years.

A main problem that needs to be solved if we want statistics education to evolve towards a mature discipline is the training of researchers. Since we all have different academic backgrounds and experience and work in different areas (statistics, education, mathematics education, psychology…) each of us needs to complement his/her knowledge before starting a thesis or supervising another person's thesis or other research in statistics education. This is often hard, since there are no specific Doctoral or Masters' programmes in statistics education and in programmes in other areas such as Education or Mathematics Education, there is not always a person who is willing to supervise research in statistics education.

In spite of this, many people have managed to overcome these difficulties. Several years ago they started a research in statistics education, which lead to a thesis, a research line or a research group at their departments or countries. A short paper by Joan Garfield serves to start in this newsletter a thematic issue on the training of researchers, which will be followed in SERN 3(1), January, 2002 by a series of short notes by other statistics educators from around the world with a varied background and experiences and a final synthesis in SERN 2(2). The aim is to reflect on the many different paths that can lead to statistics education research, to share solutions for problems that might be common and to encourage new people who want to become a statistics education researcher. If any of you want to contribute your experiences with a short note for this special issue, please contact Carmen at <batanero@ugr.es>.

You may have noted that Joan Garfield is temporally leaving our editorial board. She is having some health problems and needs to reduce her workload. We thank Joan for all her dedication to the IASE and her work on this newsletter in the past years and wish her a quick recovery, so that she can enjoys her new positions and responsibilities (see note in the brief news section).

We are glad to welcome Chris Reading, from the University of New England, Armidale, Australia as a new member of our editorial board. She is Co-chair and Local Organizer of the Second International Reserch Forum and she is preparing a detailed report about this conference and about the PME-25 for the January 2002 issue. People volunteering to help us in editing specific sections or in sending information fror the newsletter are welcome.

Note: The whole Newsletter is located at the web site: http://www.ugr.es/local/batanero/sergroup.htm

2. IASE Executive Committee 2001-2003

We are glad to report the result of the election for the IASE Executive for 2001-2003. There was a large participation (over 150 ballots received) and all the candidates received a great support. They will be working for the IASE in the next two years and will be very happy to receive your feedback and answer any questions you might have. The new Executive is listed below.

President: Carmen Batanero, Spain, <batanero@goliat.ugr.es>

President-Elect: Chris Wild, New Zealand, <wild@stat.auckland.ac.nz>

Past President: Brian Phillips, Australia, <bphillips@swin.edu.au>

Vice-Presidents:

Dani Ben-Zvi, Israel, <dani.ben-zvi@weizmann.ac.il>

Carol Joyce Blumberg, USA, < cblumberg@winona.edu>

Lisbeth Cordani, Brazil, <lisbeth@ime.usp.br>

Gilberte Schuyten, Belgium, <gilberte.schuyten@rug.ac.be>

Susan Starkings, UK, <starkisa@vax.sbu.ac.uk>

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3. Sharing Experiences in the Training of Researchers: Recent PhD's in Statistics Education

Joan B. Garfield, <jbg@tc.umn.edu>

Statistics Education is a relatively new discipline that is growing in interest and activity. People conducting research in statistics education come from a variety of different areas and often have very different backgrounds, coursework, and training. Over the past year I became interested in learning more about graduate students in the USA who have decided to pursue degrees in statistics education. I conducted e-mail interviews with eight current doctoral students and recent PhD's whose dissertation research focused on statistics education. I wanted to learn about their coursework, their training in research methods, and the topic of their dissertation study. I was also interested in finding out the nature of their experience designing and completing a degree that focused on statistics education. These eight individuals shared with me their reflections on the process of earning a doctoral degree in statistics education and offered advice to future graduate students interested in pursuing this path.

Through word of mouth and personal contact, I obtained the names of these eight individuals who had recently graduated or were in the dissertation process, and all agreed to be interviewed. Each individual has a different story about how they came to be interested in statistics education, how they designed a program that would allow them to develop the expertise needed to do a dissertation in this area, and how they were able to complete the requirements and overcome obstacles along the way.

Most of the people interviewed came to statistics education because of their experience teaching statistics. Many expressed their enjoyment teaching statistics, but also expressed a concern over difficulties students have learning statistics, solving statistical problems, and using statistical thinking, which led them to study and pursue research in this area. Only one person chose this area because of her advisor's research interests. Two people indicated that they specifically planned to teach statistics at the college level and thought that this degree would best prepare them.

These eight individuals entered graduate programs in statistics, mathematics education, or educational psychology programs. Based on their experiences, it appears to be somewhat easier to design a statistics education focus within a mathematics education department than in other departments. Many students outside of mathematics education either had to combine programs (e.g., statistics and education) and have co-advisors, or switch advisors to find one that approved of a dissertation in statistics education.

One interesting distinction between students in the three different areas has to do with the type of job preparation they receive. Most mathematics education programs are focused on teacher education (i.e., teaching those who will prepare math teachers) while the combined programs of statistics and education are focused on training individuals to be teachers of statistics themselves, typically at the college level. Students in Educational Psychology are prepared to teach quantitative methods (to graduate students in Education) and to conduct research in the area of educational statistics.

The coursework taken by these people varied according to the type of department they were in. For example, students in Educational Psychology programs took mostly courses in that department (e.g., statistics, measurement, and learning) and were less likely to take courses in mathematics education. Students in mathematics education programs appeared to have more varied programs with courses in educational psychology and statistics in addition to mathematics education. Several people found their coursework in psychology or learning and cognition to be the most helpful in preparing them to do research in statistics education, while others noted their coursework in statistical methods was particularly valuable. Most of the students across programs valued preparation in both quantitative and qualitative research methods.

Getting a dissertation topic approved was often a hurdle, and a few students experienced reluctance from their advisor to agree to a focus on a statistics education topic, feeling that this would limit their job possibilities. In the cases where students had co-advisors, getting approvals from two advisors and two departments was often challenging and took extra time. Most of the people interviewed were the first person to design a statistics education program and dissertation. One person commented: "My biggest obstacle was that since no one had done this before I was on my own for a lot of it in deciding what courses I should take and what an appropriate dissertation looked like."

Being connected to the wider statistics education community via meetings and newsgroups has been very helpful to many of the people interviewed. One person commented "I would especially like to acknowledge how wonderful the statistics education community has been about welcoming me into the fold. I have met some terrific people and made some great connections and look forward to continued work with these people."

Others wish there could be more recognition of and validation for statistics education as a legitimate area for study and research. "As more students pursue degrees in statistics education it is important to identify faculty members as advisors who have comfort and expertise in both fields, education and statistics." "While looking for a job, I was asked a few times what exactly a statistics education degree was. I had the most success in answering this question by saying that it was like a mathematics education degree."

Those who have finished degrees are teaching in a variety of settings, and appear quite satisfied with their decision to focus on statistics education. One person remarked, "I am very happy I chose the field I did. My teaching and my research feed off each other, which is very meaningful to me… I'm excited by the 'newness' of the field. There are so many directions in which we can go and I am happy to be near the beginning of that exploration."

Since conducting these interviews I have learned of at least two other USA graduate students, both in departments of mathematics education, who are working on dissertations focused on statistics education. These studies examine middle school or high school teachers' knowledge and understanding of statistics, an emerging area of interest to statistics education researchers. With more formal programs in statistics education beginning to be developed (e.g., at the University of Minnesota beginning in Fall 2002), the statistics education community should begin to provide a more consistent and complete training to prepare and support future teachers and researchers in this emerging discipline.

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4. IASE Members

Mari Murtonen
Centre for Learning Research
Lemminkaisenkatu 14-18 B, 20014 University of Turku, Finland
E-mail: <mari.murtonen@utu.fi>
http://www.utu.fi/~marimur/

Mari is interested in university students' learning of statistics and general research methods. She is doing a research on how knowledge is built up on a complex domain and how beliefs influence learning. She is also interested in conceptual change and the development of expertise.

Mahmoud K. Okasha;
Department of Applied Statistics, Al- Azhar University of Gaza,
P. O. Box 345, Gaza, Via Israel, Palestine
E-mail: <m.okasha@palnet.com>

Professor Okasha has recently accepted the role of IASE National Correspondent and he is willing to contribute to Statistics education in his country and other developing countries and to facilitate research in the subject of Teaching Statistics. His interest in statistics education grew while he was a Ph.D. student before 1987 in the School of Probability and Statistics, Sheffield University - England. Since then he struggled hard to establish the first Department of Statistics in the Palestinian Universities. With very little support and limited resources, the first Department of Statistics has been established in 1995 in Al-Azhar University of Gaza, offering a B.Sc. degree in Applied Statistics and some non-degree training courses. Some 70 students have graduated since then, some have pursued their post- graduate training in American and European Universities, and a few are at present preparing Ph.D. dissertations. He has a plan to improve research facilities and to introduce post-graduate programs in Statistics. If funding is available to cover the expenses, the M.Sc. program and advanced non-degree training courses will be introduced in 2003 followed by a Ph.D. programme in 2005.

His recent publications include three books (in Arabic) on Statistics and other articles on the Application of Statistical methods to data on different issues relevant to our society. These include: *Mathematical Statistics*, Al-Quds Open University, Jerusalem, Course Number 5462, Amman, Jordan, 2001; *Applied Statistics*, Department of Statistics, Al-Azhar University of Gaza, Gaza, Palestine, 2001; *Introduction to Probability and Statistics*, Faculty of Commerce, Al-Azhar University of Gaza and the Palestinian Economists Association, Gaza, Palestine, 1997; On the Estimation of Knowledge, Attitudes and Practice of Family Planning and Their Effects on Women's Health; The Case of The Palestinian Women, Inaugural Euro Conference -Eastern Mediterranean Region of the International Biometric Society; University of Athens, Greece; January, 2001; "Forecasting Water Supply and Demand, The Case of Palestine"; TIES-SPRUCE 2000 Conference, The International Environmetrics Society; The University of Sheffield; UK; September, 2000; "Reallocation and Distribution of Water Resources in the Middle East", The Institute for Economic Development in the Middle East, John F. Kennedy School of Government, Harvard University, USA, 1998; "The Health Insurance System in the Gaza Strip, Potential and Challenges For Future Development", Technical Report, Harvard Institute for International Development, Cambridge, USA, 1997.

Blanca Ruiz Hernández
Instituto Tecnológico de Estudios Superiores, Departamento de Matemáticas
Campus Monterrey, E.Garza Sada 2501 Sur,
C.P. 64849, Monterrey, N.L., México
E-mail: <brruiz@campus.mty.itesm.mx>

Blanca is working at the Instituto Tecnológico de Estudios Superiores, Monterrey, México, where it is possible to study Business, Engineering, Medicine and Agronomy. The Department of Mathematics is responsible for teaching mathematics and statistics, and the majority of lecturers are mathematicians and statisticians, without specific training in mathematics or statistics education. She lately has felt the need to organise working groups on the teaching of several topics, so that for 5 years now a working group on the teaching of Calculus was formed around the Cinvestav (Centre for Advanced Studies on Teaching). This summer she will be organising a working group on the teaching of statistics.

Maria A Sorto
4218 Matthews Lane, Kensington, MD 20895, USA
E-mail: <sortomar@pilot.msu.edu>

Maria was born in Honduras and she is currently a doctoral student in Mathematics education at Michigan State University, where she is also training future mathematics teachers. Her previous background includes, graduated secondary school teacher at the Universidad Pedagógica Nacional de Honduras, Mathematics, BS. University of Texas at El Paso, Statistics, MS. University of Texas at El Paso, Mathematics, MS Michigan State University Mathematics Education. Her thesis is focussed on the training of mathematics teachers to teach statistics. Her supervisor is Dr Senk, and she also receive support from Dr. Joan Garfield, Dr Glenda Lappan, Dr Joan Ferrini-Mundy and Dr Melfi. She is mainly concerned with future primary teachers' conception of averages, and she intends to assess statistics knowledge and the way it is applied to teaching (applied knowledge). Maria has just entered the IASE and accepted the role of

5. Brief News

Joan Garfield's recent nominations and awards

We have recently received some good news about Joan, who have served as IASE Vice-President in the past four years. Joan has been made a Fellow of the American Statistical Association in August 2001 at the Joint statistical Meetings in Atlanta. She also was recently elected Chair of the ASA Section on Statistics Education beginning in 2003 and she was elected president of the AERA Special Interest Group for Educational Statisticians, beginning in 2002.

We hope Joan will recover soon from her health problems and wish her all kind of success in her new responsibilities.

Research on statistics education corner at a Dutch Journal, *Tjaart Imbos, <T*jaart.Imbos@stat.rulimburg.nl>

In trying to operationalise the new role of IASE national correspondent, Tjaart is getting a statistical education research corner in one of the journals of the Dutch Statistical Association (DSA). In that statistical education corner he will summarise on a regular basis what is going on in IASE or reported in SERN, and he will ask his colleagues to give him some input with respect to their plans and projects in our common field of interest.

Training Statisticians in Peru, *Victor Manuel Maehara Oyata <vmaehara@correo.lamolina.edu.pe>*

The Universidad Nacional Agraria La Molina, is located 10 km from Lima, capital of Peru, and in 1962 was the first University in Peru to train statisticians. The first promotion of graduate statisticians dates from 1966 and in 1992; there was a curriculum change so that the students are now also trained in computer science (Statistics and Computer Engineering). The strength of their curriculum is experimental statistics, since the first lecturers in the programme were themselves agronomical engineers with an additional training in applied statistics.

There is a Department of Statistics in charge of training professional statisticians and computer scientists. After finishing their studies, these professionals work in public and private companies and institutions (e.g., health services, marketing, banks or companies. From an average number of 60 students starting their studies each year only 20 of them usually are able to finish.

The department is also offering basic statistical training for other types of study such as Agronomy, Zoological techniques, food industry, environmental management, forestry, fishing industries, biology and economy. This year the number of students attending these courses is around 400, from which only 50% pass the final evaluation. The content of this course is as follows:

- Basic concepts: population, sample variables, statistics, parameters;
- Organising data: stem-leaf and box plots; central tendency and variability;
- Probability: basic theorems, conditional probability; independence;
- Random variables. Discrete and continuous distributions, binomial, Poisson, hypergeometric, normal distributions;
- Sampling distributions; statistical inference, point estimation, interval estimation, hypothesis tests;
- Linear regression analysis.

There are now 23 lecturers in the Department, and all of them were trained in the University as statisticians. Although some of them could take courses on Education and general didactics, they are now interested in organising some specific training activities to improve their knowledge of statistics education. The department is trying to establish international links and seeking for cooperation to improve their training system and to increase their members' knowledge about statistics education developments in order to increase the percentage of students who can finish successfully the statistics courses.

Other Universities training statisticians in Peru are:

- In Lima: Universidad Mayor de San Marcos, Universidad Nacional de de Ingeniería,Universidad Nacional Agraria, La Molina;

- In Ancash: (400km al north-east from Lima): Universidad Nacional de Ancash

- In La LIbertad: (520km north from Lima): Universidad Nacional de Trujillo; Universidad Antenor Orrego;

- In Lambayeque: (800km, north from Lima): Universidad Nacional Pedro Ruiz Gallo

- In Piura (950 Km north from Lima): Universidad Nacional de Piura

- In La Ciudad del Cuzco (900 Km South-east from Lima: Universidad Nacional San Antonio Abad

- In Puno: (1200 km. South-east from Lima): Universidad del Antiplano.

Promotion of quality in teaching statistics at University level in Argentina, *Daniel Fernández,* <dfdez@ciudad.com.ar>, *Susana Polo and M. Inés Rodriguez,* <mrodriuez@exa.unrc.edu.ar>

The Ministry of Education in Argentina organised this year a pilot experience to promote quality teaching at University levels with the aim of strengthening the basic disciplines that are common to different specialities at the different Universities in Argentina. The main aim was providing University lecturers with the opportunity to do short stages (1-2 months) in foreign Universiy centres to update their knowledge of new technologies and pedagogical innovations. The main goals were:

- Supporting the updating and transformation of teaching in disciplines with a large number of students, with the aim of favouring teaching and learning with new methodologies oriented to high quality education;

- Supporting institutional mechanisms to ensure the diffusion of the new knowledge received by participants by using courses given by the participants to other colleagues who can benefit from their experience;

- Organising active academic networks which can continue the transfer of pedagogical knowledge to improve the teaching of the discipline at University level.

From a total of 175 projects presented in the competition organised by the Ministry of Education in Argentina, 30 were approved. Three of them were focused on the teaching of statistics:

- *Statistics education and the role of technology in teaching and learning statistics.* Daniel Fernández, Universidad Nacional de Cuyo, Mendoza;

- *Innovative pedagogical project for mathematics teachers' teaching practices.* Maria Inés Rodriguez, Universidad Nacional de Rio Cuarto, Córdoba;

- *Data analysis and probability: Strategies for improving understanding.* Susana Polo, Universidad Nacional de Comahue, Viedma.

Daniel, Susana and Maria Inés received a grant to travel to Granada, where they spent about one and a half months with Carmen Batanero, who acted as a tutor, and with her colleagues. During their stay they attended the courses of statistics education taught by Carmen at the Faculty of Statistics, as well as doctoral courses at the Faculty of Education taught by Carmen, Juan Godino and Angustias Vallecillos. They also met other colleagues at Biostatistics (Faculty of Medicine), Statistics (Faculty of Sciences) and to Antonio Estepa and Francisco T. Sánchez, University of Jaén and participated at the Seminar of Mathematics Education in Huesca where they were able to meet Professor Ives Chevallard, Marseille, Professor André Rouchier, Bordeaux and many Spanish mathematics educators.

This stay was very productive both from the Argentinean and the Spanish participants and served to establish links for future collaborations. When returning to their countries, Daniel, Susana and M. Inés will be able to apply their new ideas to teaching as well as to organise courses where other colleagues can benefit from their experience.

Juarez-Lincoln International Project, *Jorge Luis Romeu,* <jromeu@cat.syr.edu>
On May 29-31 took place at State University of New York at Geneseo the Conference for Instructional Technology CIT2001. As in the previous years, several Mexican professors attended it, under scholarships obtained by the Juarez Lincoln Marti International Education Project (http://snycorva.cortland.edu/~matresearch/). This year's scholars were Profs. M. Ponce, Universidad La Salle, México, City; A. Alcocer, Universidad de Quintana Roo en Chetumal, J. Vargas, Universidad de Guadalajara and L. Luna, Universidad de las Americas UDLA, en Puebla. They presented short but effective Power point overviews of the educational work done in their Campuses.

The Juarez Project obtained additional support from the SUNY FACT Committee, the Instituto Cultural Mexicano in New York, the Executive Director of the Fulbright Association and the US Embassy in Mexico. In addition to providing this international experience both to Mexican as well as to SUNY Faculty, the Juarez Lincoln Marti Project also donated, through these scholars, ten statistics books to each of these Mexican institution libraries.

6. Summaries of Publications by *IASE* Members

Lesser, L. M. (2001). Representations of reversal: exploring Simpson's paradox. In A. A. Cuoco, & F. R. Curcio (Eds.), *The roles of representation in school mathematics* (pp. 129-145). Reston, VA: NCTM. To support NCTM's newest process standard, the potential of multiple representations for teaching repertoire is explored through a real-world phenomenon for which full understanding is elusive if only the most common representation is used. The phenomenon of "reversal of a comparison when data are grouped" is richly explored in numerous ways: table, circle graph, slope & correlation coefficients, platform scale, trapezoidal representation, unit square model, probability (balls in urns), matrix determinants, linear transformations, vector addition, and verbal form. Connections to and implications for research and teaching are discussed.

Schuyten, G., Dekeyser, H., & Goeminne, K. (1999). Towards an electronic independent learning environment for statistics in higher education. *Education and Information technologies,* 4(4), 409-424. This study focuses on the feasibility of implementing independent learning in a traditional university by means of an electronic interactive learning environment. The target group contained students enrolled in an applied statistics course at the Department of Psychology, University of Gent. Three experimental variables were designed: leaning environment, delivery and support. This created five different learning conditions to which subjects were assigned at random. Our results indicate that the cognitive outcomes of students' learning in a computer-based environment are neither fostered nor hindered by attitudes toward computers. The interest in learning about computers affects the perception of structure in the materials. Students with better prior knowledge and having fewer problems with statistics have a better perception of the learning access to the content. In order to construct electronic learning environments, further investigation is needed into students' characteristics interacting with learning environment characteristics and this is currently in progress by our group.

Tsankova, N. (2000). *Statistics Seminar - a Form of an Intensive Education for Business*. Education & Market, National Conference, Sofia, 2000, 402-412. The main aim of this report is to summarise results of a project for the development of teaching style in statistics in undergraduate level in business. We applied flexible learning approaches of statistical education in seminars and made an introductory course in statistics more intensive. Students frequently view statistics as the worst course taken in the university, so we investigated their opinion and tried to change their negative thinking and motivation, by improving computer facilities and making seminars more interesting and useful. Results of an inquiry helped us in our joint work and give us an idea how to solve our problems. Developing of curriculum is based on results of IQ test, which shows high potentiality. We applied and developed methodology for estimation results of intensive education and compared calculated estimation for two years.

Tsankova, N. (2000). Distance education and development of statistical education. In *Internet - a Medium for New Technologies in the Information Society, Third International Conference* (book V, 158-163). Veliko Turnovo. The main problems of statistical education are globalisation and the significance of statistics and statistical data for information infrastructure of society. The new flexible learning approaches, based on IT, are presented like a decision of the problems. Third generation courses of distance education are part of long-life education and are very suitable for development of statistical education. The distance module "Statistics in Internet" is presented like a part of university course in statistics and a guide for statistical training with Internet for users of statistical data and available resources in Internet for the teaching of statistics.

Tsankova, N. (2000**).** National strategy of education in the context of globalisation and statistical education in Universities of economics and faculties*.* In *Quantitative Methods for Economics - classical approach and innovation. International Conference,* 2000, 381-387. National Academy of Economics "D. A. Tsenov", Svishtov. The main problems and recommended activities for developing teaching style in statistics are commented in the paper in the context of transition and globalisation as a part of national strategy of education. Results of inquiry and IQ tests helped in the discussion of main problems and give us an idea how to solve them.

Tsankova, N. (2000). *Statistics in Internet. (The guide for practical training in statistics with available statistical education resources and statistical information in the Metanetwork). PAN-VT.* The booklet is a part of Bulgarian Management Training Institution Development Project of BKHF, with contractor Prof. Nigel Healey, mentor Prof. Stephen Bainbridge (Manchester Metropolitan University, Faculty of Management and Business) and visiting fellow Nadezhda Tsankova (Veliko Turnovo University, Faculty of Economics). Objectives of the project are to develop teaching materials and learning activities for a first level statistics course, to develop and adapt practical examples and cases for use with statistical software. The booklet is a first guide for available statistical education resources in the Internet for Bulgarian students. It is recommended for Bulgarian business students like a. distance module of education and a part of university course in statistics. It is a very useful guide for statistical training with Internet for users of statistical data. First chapter is an introduction to Internet statistical education resources - lists of links, web sites of ISI, NSI, companies offer statistical software, applets. Second chapter introduce statistical information of National Statistical Institute and research agencies. In this chapter are included worked examples and self -assessment question in using available statistical information in Internet to solve problems. Author thinks that this booklet assist in the success of the socialization of statistical information.

Wang, A. L. (2001). Teaching birth and death processes Paper presented at the *International Conference on Recent Developments in Statistics and its Applications,* 26th-28th June 200, Kuala Lumpur, Malaysia, Birth and death processes may be constructed by path analysis. The paths are constructed by considering the birth and death rates, the waiting time and the conditional transition probabilities of the various states. This method, however, is not quite suitable for introducing birth and death processes to undergraduates. An easier to grasp approach has to be used to teach this topic to undergraduates. In this paper, we discuss an approach to the teaching of birth and death processes which builds on undergraduates' mathematical abilities. This approach gives undergraduates an intuitive feel for the mathematical techniques used. Simple examples are then used to illustrate the applications of birth and death processes in real-world phenomena.

7. Recent Dissertations

Brandsma, J. A. (2000). *Data collection and analysis: Examining community college students' understanding of elementary statistics through laboratory activities.* PhD. North Carolina State University. Supervisor: Stiff V. Lee.

Two groups of community college students studying elementary statistics were compared. The control group consisted of 38 students in two classes during the fall of 1998 and the treatment group consisted of 40 students in two classes during the spring of 1999. The treatment group participated in ten data collection and analysis activities in lieu of some teacher-centred instruction. Quantitative results showed that students in the treatment group had significantly better grades on the first of three tests, but none of the selected final examination items. The treatment group also showed significantly greater understanding of one concept of the seven selected scales measured by the Statistical Reasoning Assessment (Garfield, 1998), the importance of large samples (p = .0465). Students encountered this concept many times throughout the semester as they collected data and pooled their results with those of their classmates. The Survey of Attitudes Toward Statistics (SATS) and the STARC-CHANCE Abbreviated Scale (SCAS) were administered to assess students' attitudes and beliefs. No statistically significant differences were determined. Qualitative results indicated that while in some cases the writing of students in the treatment group showed greater depth of understanding, these students were also more likely to exhibit confusion among related topics such as correlation and regression, or confidence intervals and margin of error. Interviews conducted with ten students, eight weeks after the course, indicated that the control group had greater retention of ideas than the treatment group. The data do not indicate that including ten disjoint, constructive hands-on activities into an otherwise traditional course is sufficient to achieve the broad gains in statistical understanding advocated by the reform movements in mathematics and statistics education. The author recommends that sequences of related activities be implemented to help students build on previous ideas and develop connections among concepts. Additional research should be conducted with classes that use integrated, constructive, student-centred activities as the primary classroom instructional tool throughout the semester.

Carvalho Figueiredo, Auriluci (2000). Probabilidae condicional: Um enfoque de seu ensino-aprendizagem [Conditional probability: An approach to teaching and learning]. Pontificia Universidade Católica de Sao Paulo, Brazil. Supervisor: Dr. Benedito Antonio da Silva.

The aim of this work is to introduce conditional probability at University level courses. We prepared, experimented and analysed the results of a teaching sequence following the didactical engineering approach. This teaching sequence is made up of four activities, some of which were adaptations from others by Carmen Batanero and her colleagues. The aim was make students reflect on the circumstances where it is useful to apply conditional probability, the total probability theorem and Bayes' theorem.

To work with these concepts, the activities were organised around the different semiotic representation registers from Duval: natural and symbolic languages; tree diagrams, and contingency tables. This sequence was tested in courses directed towards Mathematics and Computer Science students. The analysis of students' protocols served to conclude that the teaching sequence was effective in helping students overcome difficulties with conditional probability and also served to suggest topics for future research.

Most students were able to distinguish between a conditional probability and a compound probability as well as to distinguish between P(A/B) and P(B/A) when problems were presented in natural language. However many students found difficulties where questions were presented in symbolic language.

Cordani, Lisbeth (2001). *O ensino de estatística na universidade e a controversia sobre os fundamentos da inferencia* [Teaching statistics at University level and the controversy on the foundations of inference]. Ph.D. University of Sao Paulo. Supervisor: Dr. Nilson José Machado.

In general most of the undergraduate courses in Brazil offer a basic discipline in probability and statistics. Beyond the descriptive procedures associated with data analysis, these courses present to the students some inferential techniques, usually linked to the classical (frequentist) Neyman-Pearson school. It is not common to present the inferential aspects from the Bayesian point of view. Everybody knows that both student and teacher have problems with this basic discipline—the student because he or she receives, in general, a mechanical course, without motivation, and with no links to their other disciplines, and the teacher because he or she usually teaches concepts like uncertainty and variability to very naïve students. Added to that, students seem to have some fear (taboo) towards the discipline.

The thesis discusses the first inferential notions presented in this discipline, and examines the question "which inferential approach to the basic discipline of statistics should we teach to undergraduate students?· We have tried to characterise in this work the relationship between statistics and the following aspects: scientific creation in general and empiricism and rationalism in particular; the existence or not of a scientific method; objectivism and subjectivism; the paradigms associated to the classical and the Bayesian schools; learning and some cognitive aspects. We have made some comparison between the inferential approaches and some examples have been presented.

This work suggests that the first program of a basic discipline of probability and statistics should include some epistemological inferential aspects as well as the introduction of inferential statistics by means of both approaches: classical and Bayesian. This action will prevent, at least at the first contact, the members of the Bayesian school from proposing the rupture with the classical school, and also the members of the classical school from maintaining the status quo. In fact, the proposal is of a coexistence of both schools in a first level, because we think it is a teacher's duty to show the state of art the to his (or her) students, giving the possibility of choice (if necessary) for later work.

Coutinho, Cileda (2001). *Introduction aux situations aléatoires dès le Collège : de la modélisation à la simulation d'expériences de Bernoulli dans l'environnement informatique Cabri-géomètre II.* [Introduction to random situations after secondary school: from model-building to simulation of Bernoulli's experiments in the computational environment "Cabri-géomètre II".]. Ph.D. Dissertation. Université Joseph Fourier, Grénoble. Supervisors: Michel Henry and Colette Laborde.

In this research we are interested in the didactic conditions which introduce random situations to pupils at secondary school. We have conceived a learning process centred on modelling real situations, which are limited to the probabilistic context of Bernoulli. The activities proposed to the pupils involve computer-based simulation of random experiments presented within a geometrical framework using "Cabri-géomètre II".

This research is composed of two main parts. In the first we develop the theoretical framework. We introduce new useful concepts at the didactic level, in order to describe and interpret the beginning of learning in probabilistic modelling. In particular, we specify the meaning given to concepts as: *pseudo-concrete field*, *model of Bernoulli's Urn* and *pre-probability*, according to our didactic point of view.

The second part relates to the installation and exploitation of an experimental device: a sequence of activities composing our didactical engineering. In this part, we use our theoretical approach in order to validate this engineering

and to analyse pupils' behaviours when engaged in a work with random situations.

Thomas, C. S (2000). *Understanding of statistical data analysis among elementary education majors.* Ed.D. Montana State University, Supervisor: William D. Hall.

In the next 10 years, United States elementary, middle, and secondary schools will hire 2 million new teachers to meet rising enrolment demands and replace aging teaching force. Half of United States teachers will retire during the same period. Given these projections and the fact that 21% of US teachers currently have less than college minor in their principal teaching area, the education of preserves teachers must become a national priority. The purpose of this study was to determine to what degree elementary education majors acquire and retain the statistical data analysis content required for elementary and middle school as defined by the NCTM. A test instrument was developed and given to four groups of students (n = 232) at Montana State University-Bozeman. Two-way ANOVAs and multiple regressions were done to determine if independent variables (age, gender, level of high school preparation, number of college math/stat classes taken and enrolment in the Math Option) influenced achievement in statistical data analysis. The overall conclusion was clear: Whatever gains are achieved in the content mathematics classes are lost by the end of student teaching. Consequently, students graduating from the elementary education program do not possess the content knowledge required to meet current professional standards. Neither age nor gender was determined to be statistically significant when trying to explain variability in total achievement or achievement in any of the five subtests. No significant difference in achievement between the students who were enrolled in the math option and those who were not was found. However discrepancies in the data presented by students led the researcher to doubt these results. Multiple regression analysis revealed that the set of independent variables did explain a significant proportion of the variability in achievement. However, even though the findings are statistically significant they are of little practical significance. Recommendations are given for changes in math content and methods courses for elementary education majors. Test instrument is included.

Lee, M. (2000). *A study of academic characteristics of successful and unsuccessful community college statistics students*. EdD. University Of Central Florida**.** Supervisor: Thomas S. Kubala.

The purpose of this study was to investigate the background attributes of successful and unsuccessful students in an elementary statistics course. Seven research questions were formulated to provide focus for the study. In addition to academic data gathered through institutional research, 331 students responded to a mathematics anxiety survey, a statistics attitude survey, and a computer attitude survey. Focus groups were conducted with both students and faculty involved in the study. Statistics attitude positively affects a student's grade in an elementary statistics course. These results are significant for both students and instructors alike. Students should be made aware of their relative standing on the statistics attitude scale. Instructors should strive to improve students' attitudes toward statistics through the use of hands on activities, the use of humour, and giving students various opportunities to enhance their grades. Results also indicated that CPT college level mathematics score, CPT arithmetic score, CPT reading score, Math Anxiety Rating Scale score, and finally CPT algebra score had a positive effect on students' grades in an elementary statistics course. This information could be useful in appropriate placement of students into elementary statistics courses and improving student success in an elementary statistics course.

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8. Around Modelling in Probability. A book by the Commission Inter- IREM for the Teaching of Statistics and Probability

For the past 30 years the IREMs (Instituts de Récherche sur L'Enseignement des Mathematiques) have followed in their work the evolution of primary and secondary school mathematics curriculum and have provided teachers with classroom tools and themes for reflection. The 26 IREMs, organised as a network include national commissions where discussions are held and works are produced. The book: *Autour de la Modélisation en Probabilités,* coordinated by Michel Henry and published in French by Presses Universitaires Franc-Comtoises (ISBM: 2-84627-018-X) is a result of the reflection by the Commission Inter- IREM for Teaching Statistics and Probability in the last 10 years.

Following a change in the programmes in 1991, where there was a proposal to present probability from the frequentist approach, the Commission undertook the task of examining the impact of this proposal on the students' understanding of the underlying basic concepts in the same. The new programmes (2000), which are even more

oriented towards the mastering of the statistics tool, reinforce the need of clarifying the status of probability and the role of modelling.

Fundamental probabilistic concepts are difficult, since, in addition to usual difficulties in mathematics learning, they present a new point of view about determinism in scientific teaching at school level. In addition (and contrary to other mathematical concepts) probabilistic concepts take their meaning in everyday reality from which they take their foundations. Modelling activity is essential, and the introduction of probabilistic ideas presents specific didactical problems. There is also a difficulty for students, which reflects real obstacles in understanding probability concepts, when they need to link them to sensible reality. Even if some combinatorial exercises might seem too hard, when probability theory is limited to a finite set of events (as stated in secondary curricula) the mathematical theory is very simple.

Therefore, taking modelling as a dead-end with respect to an experimental approach to this knowledge, (the frequentist approach), confines students to a formal approach and to ignorance of the social impact of this knowledge. Moreover, a purely axiomatic introduction to probability, as is presented at University level, does not avoid the passage to modelling, from real to formal for those who want to apply this theory in the varied domains where statistics intervenes. All these remarks lead us to revisit some basic notions in the teaching of probability from the point of view of modelling, with a theoretical approach. The chapters in this books try to give the reader some working paths and responses, as well as questions to follow their reflection.

Table of contents (translated to English)

9. Other Publications of Interest

Ainley, J. (2001). Transparency in graphs and graphing tasks: an iterative design process *Journal of Mathematical Behavior,* 19(3), 365-384. The increasingly widespread use of graphs in advertising and the news media for communication and persuasion seems to be based on an assumption, widely contradicted by research evidence in mathematics and science education, that graphs are transparent in communicating their meaning. This paper uses the notion of *transparency* as a framework to explore the design of graphing tasks. Meira's view of transparency as emerging through use, rather than being an inherent feature of instructional devices, is used at two levels: to consider the transparency of computer-based graphs as tools, and to consider the design of pedagogic tasks involving graphing. Examples from classroom observation of a pedagogic approach known as *Active Graphing* are used to illustrate an iterative design process as tasks are shaped in use by pupils and by teachers.

Cajas, F. (2000). Technology education research: potential directions. *Journal of Technology Education*, 12(1) http://scholar.lib.vt.edu/ejournals/JTE/v12n1/cajas.html. Project 2061 of the American Association for the Advancement of Science (AAAS) held a conference to consider what kind of research would enhance the goal of achieving universal technological literacy. Last December, thirty-five participants from science education, technology education, and cognitive science convened to discuss the role of research in technology education. Technology was discussed from a wide perspective, including the relationship between science and technology, the notion of design, control mechanisms, materials, energy, and communication. The overall goals of the conference were to raise consciousness on the needed research and to begin a discussion for a research agenda in technology education.

Doerr, H. M. (2000). How can i find a pattern in this random data? the convergence of multiplicative and probabilistic reasoning. *The Journal of Mathematical Behavior,* 18(4), 431-454. This classroom-based research study examines the thinking of pre-calculus students about multiplicative growth and decay within a probabilistic context, thus bringing together two research strands in mathematics education: students' understanding of exponential functions and students' reasoning about random events. Using a multi-stage approach to model development, a curriculum unit was designed to elicit students' creation of a model or system that could be used to describe and explain the behaviour of an experienced, probabilistic system. The evidence suggests that while the students made sense of the underlying multiplicative structure of the problem situation, many students experienced a conflict between the concept of a pattern and the concept of randomness. Students encountered difficulty in reconciling the deterministic nature of a closed-form analytic solution with the non-deterministic nature of a sequence of random events. These results suggest that there is a need for students to gain experience with non-deterministic models using contexts that provide meaningful empirical data.

Duane, D. P., & Tracy, R. L. (2000). Using beam and fulcrum displays to explore data. *The American Statistician*, 54(4), 289-290. The beam-and-fulcrum display is a useful complement to the box plot. It displays the range, mean, standard deviation, and studentised range. It reveals the existence of outliers and permits some assessment of shape. Embellishments to the beam-and-fulcrum diagram can show the item frequency, and/or a confidence interval for the mean. Its intuitive simplicity makes the beam-and-fulcrum an attractive tool for exploratory data analysis (EDA) and classroom instruction.

Reynolds, A. (2000). Statistical method and the Peircean account of truth. *Canadian Journal of Philosophy,* 30(2), 287-314. This paper looks at the influence of statistical method (specifically the method of least squares and the role of the law of large numbers) upon Peirce's pragmatic elucidation of the idea of truth. The basic logic of the statistical method behind the theory of observational errors, which was used by Peirce to find the best estimates of various natural constants, is described, after which several misconstruals of Peirce's account of truth are dealt with. In the final section I consider the applicability of Peirce's account of truth to questions concerning historical inquiry and the past, and some amendments to Cheryl Misak's development of a Peircean account of truth are proposed.

Riniolo, T. C., & Schmidt, L. A. (1999). Demonstrating the Gambler's fallacy in an introductory statistics class. *Teaching of Psychology,* 26(3), 198-200. Describes a classroom demonstration called the Gambler's Fallacy where students in an introductory psychology statistics class participate in simulated gambling using weekly results from professional football game outcomes over a 10 week period. Explains that the demonstration illustrates that random processes do not self-correct and statistical precision is sample size dependent.

Gibson, W. E., & Darron, C. (1999). Teaching statistics to a student who is blind. *Teaching of Psychology, 26*(2), 130-31. Explains that in order for students to understand statistics, they must develop their spatial and visual skills for manipulating numerical data. Describes the use of an inexpensive, low-tech teaching device that is constructed of modelling clay and cardboard in order to overcome this visual barrier when teaching a blind student statistical concepts.

Cobb, P. (1999). Individual and collective mathematical development: The case of statistical data *Mathematical-Thinking-and-Learning*; 1(1), 5-43. Clarifies how students' mathematical reasoning as acts of participation are analysed in the mathematical practices established by the classroom community. Presents episodes from a recently completed classroom teaching experiment that focused on statistics. Discusses change, diversity, and equity.

10. Complementary Short References

Doerr, H. M., & Tripp, J. (1999). Understanding how students develop mathematical models. *Mathematical Thinking and Learning* 1(3), 231-254.

Murtonen, M., & Merenluoto, K. (In press, 2001). Novices' and experts' knowledge on statistics and research methodology. *Proceedings of the 25th PME conference,* 2001.

Murtonen, M. (2001). Conceptions of research methodology, consistency of conceptions and experienced difficulties on quantitative methods courses. A paper to be presented at the *Students' Conceptions of Research -symposium at the EARLI Biennial Meeting,* 2001, Fribourg, Switzerland.

Murtonen, M. (2001). Expectations on expertise in relation to situational orientations, learning approaches and experienced difficulty in university methodology course. A poster to be presented (accepted) at he EARLI Biennial Meeting, August 28 - September 1, 2001, Fribourg, Switzerland.

Murtonen, M. (2000). Social science students' difficulties in research methodology learning. A paper presented at the Innovations in Higher Education 2000 Conference, 30.8. - 2.9.2000, Helsinki, Finland.

Murtonen, M. (1999). University students' research methodological conceptions. Education-line, http://www.leeds.ac.uk/educol/

Resnick, M., & Wilensky, U. (1998). Diving into complexity: Developing probabilistic decentralized thinking through role-playing activities. *Journal of the Learning Sciences* 7 (2), 153-172.

Watson, J. M., 1999. The media, technology and statistical literacy for all. In: Usiskin, Z. (Ed.). *Developments in school mathematics education around the world* (vol. 4, pp. 308¯322). Reston, VA: National Council of Teachers of Mathematics.

Watson, J. M. (2000). Statistics in context. *Mathematics Teacher* 93(1), 54-58.

11. Internet Resources of Interest

The Better File Cabinet <http://betterfilecabinet.com> is a free searchable database of references to research in math and statistics education (nearly two thousand as of May 2001). The references were collected by the MAA's Special Interest Group on Research on Undergraduate Math Education (SIGMAA on RUME) and by Prof. Joan Garfield. Using the web interface, the references are searchable by author, title, full text, and keywords and there is an ongoing effort to add commentary on the papers.

The site is in a very usable state, but it is still a preliminary beta version. Consolidation and cleaning of the keywords is planned for the near future, as well as a number of other new features. There is also a sister database of calculus problems that will eventually be expanded to other topic areas and integrated into a database containing both

research papers and other educational resources.

Anyone wishing to contribute time, references, ideas, or resources to the project is encouraged to contact Eric Hsu (erichsu@math.sfsu.edu). Eric Hsu, Assistant Professor of Mathematics San Francisco State University erichsu@math.sfsu.edu http://math.sfsu.edu/hsu/

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12. Information on Past conferences

12.1. Conference on Implicative Analysis, Caen, France, 23-24 June, 2000

The proceedings of this conference are now available. The reference is: R. Gras et M. Bailleul (Ed.s), *Actes des Journées sur "La fouille dans les données par la méthode d'analyse statistique implicative, Applications et traitement par C.H.I.C.",* 23-24 Juin 2000, Presse de l'Université de Rennes 1, ISBN 2-9516505-0-7 [Data mining in implicative statistical analysis]

Table of contents:

- R. Gras. *Les fondements de l'analyse statistique implicative* [Foundations of implicative analysis].

- R. Couturier. *Traitement de l'analyse statistique dans CHIC* [Data analysis with CHIC].

- R. Lehn, F. Guillet, P. Kuntz, H. Briand, & J. Philippe. *Felix: Un outil interactif d'aide a la fouille de connaissances s'appuyant sur l'intensité d'implication* [An interactive tool to help data mining supported by implicative strength].

- R. Gras, R. Gras, E. Gasteiger, P.A. Binz, M. Mueller, B. Choppard, & R. Appel. *Classification automatique par l'algorithme genetique dans le cadre de l'identification par enprentie de masse peptidique* [An application of automatic classification].

- P. Orús, & I. Pitarch. *Utilisation didactique des tableaux de données et du logiciel CHIC a l'ecole elementaire* [Didactic use of data sets and the Chic software at primary school level].

- P. Leconte. *La structuration des techniques de gestion des resources humaines. Exploration par la méthode d'analyse implicative* [Structuring human resources management techniques. Exploration with implicative analysis].

- E. Lacasta. L'illusion graphique chel les élèves de secondaire. [Graphical illusion in secondary school level students].

- G. Noél. *Le premier apprentissage de l'egalité étudié par l'analyse des correspondances et l'analyse implicative* [Applying implicative and correspondence analysis to study the learning of identity].

- J. Philippé, T. Teusan, S. Baquedano, & C. Bourcier. *L'analyse implicative dans un contexte d'extraction de connaissances pour la mise au point de systèmes d'aide à la décision en analyse des comportements* [Implicative analysis in the context of data mining as a help to decision making in behaviour analysis].

- Kodratoff. *Extraction de connaissances à partir des données et des textes* [Data mining from data and text].

- M. G. Ottaviani, & S. Zannoni. L'implication statistique et la didactique. L'utilisation d'un outil non symétrique d'analyse de donneés [Implicative analysis and didactics. Using a non symmetrical tool for data analysis].

- D. Lahanier Reutier. *Algorithmes de construction d'implications statistiques entre deux variables quantitatives* [Algorithms to build statistical implication from quantitative variables].

- M. Bailleul. *Mise en évidence de reseaux orientés de representations dans deux études concernant des enseignants stagiaires en IUFM* [Identifying oriented representation networks in two studies on trainee teachers].

- S, Guillaume. A. Khenchaf. *Régles ordinals: Une géneralisation des régles d'association* [Ordinal rules: a generalisation of association rules].

- G. Ritschard, D. Zigued, & N. Nicolayannis. Maximiser l'association par aggregation dans un tableau croisé. [Using aggregation to maximise association in a contingency table].

12.2. Workshop on Teaching Statistics, Rome, Italy, December 6-7, 2000

Gianfranco Galmacci, <glm@stat.unipg.it>

In the past two years a group of Italian researchers carried out a national project on teaching statistics, funded by the Ministry of Universities and Scientific-Technological Research (MURST) and by the Universities of Padova, Palermo, Perugia and Roma "La Sapienza". The project was mainly aimed at studying the effectiveness of different approaches to teaching statistics at every school level: elementary (6-10 years old), intermediate (11-14) and high schools (15-19). After a preliminary study, concerning both teaching approaches used by teachers and available textbooks, it has been realised that statistics has generally been presented by focusing on the main theoretical (mathematical) aspects without considering its practical relevance and the interpretation of results. Then, taking into consideration that understanding of the role of statistics and the introduction of its basic concepts can be made easier by using real data concerning situations in which students are interested, new experimental teaching materials have been prepared using the so called Data Oriented Approach (DOA).

The Teaching Units designed for this project begin with a short analysis aimed at acquiring a better knowledge of the class members. Students were guided to set up a questionnaire and a survey to collect their own personal and family information and to obtain the same kind of data tables made available by the Italian National Statistical Institute on a regional basis, so that they could compare their results with the official data. The aim of the project was to study how different teaching strategies (experimental factors) influence the students' learning process. The strategies proposed, always based on DOA, were different depending on the school level: concept mapping and didactic skills for elementary schools, traditional teaching and a Co-operative Learning pedagogical model (CL), for intermediate schools, and finally, traditional teaching, the traditional teaching being integrated with Laboratory activities, and Co-operative Learning plus Laboratory activities, for high schools.

Teachers, after a training of 20-45 hours (depending on school level and strategy) experimented with the various modules in their classes for approximately 20 hours. The students' learning was monitored with tests specifically designed to assess their knowledge and practical abilities. This experiment involved globally 324 classrooms and more than 6000 students in 5 different regions of Italy. In December 2000, a two-day workshop was held in Rome to present the preliminary results of this research. It was attended by 200 persons, mostly teachers involved in the project and post-graduate trainees in education of the University of Rome. Most of the two-day workshop was devoted to presenting and discussing the preliminary results of the research on the basis of the following papers:

- S. Rigatti Luchini, M. P. Perelli D'Argenzio, & G. Moncecchi: *L'insegnamento della statistica nella scuola elementare: alcuni risultati di una sperimentazione in classe* [Teaching statistics at primary school level: results from some classroom experiences].

- M. Milito, & A. M. Parroco: L'insegnamento della statistica nelle scuole medie inferiori: primi risultati di una sperimentazione. [Teaching statistics at primary school level: results from some classroom experiences].

- G. Galmacci , & L. Scrucca: Strategie didattiche per l'insegnamento della statistica: alcuni risultati di una sperimentazione [Didactic strategies for teaching statistics: results from some experiments].

- M. G. Ottaviani: *La valutazione dei corsi di formazione CIRDIS, un'esperienza pluriennale* [Evaluation of a training course in CIRDIS.].

- M. P. Perelli D'Argenzio, S. Rigatti Luchini, & G. Moncecchi: *Didattica per concetti, un insegnamento significativo della statistica nella scuola di base* [Didactics for concepts, a meaningful teaching of statistics in junior schools].

- M. R. Marsala, T. De Caro, & S. Di Leonardo: *Alcune implicazioni psicologiche della sperimentazione* [Some psychological implications of experimenation].

- L. Brunelli, & M. A. Pannone: *Testi di profitto per la verifica dell'apprendimento* [Tests for assessing learning].

- S. Casucci: Analisi pedagogica dei registri di rilevazione del processo didattico con il Cooperative Learning [Pedagogical analysis of recording the didactic process with Co-operative Learning].

- L. Gattuso, & M.A. Pannone: *La sperimentazione come momento di formazione* [Experimenting as a training process].

As well as the reports presented by some teachers (F. Allegrucci, G. Bartolomei, B. Battaglion, S. Bertolazzi, G. Bica, B. Bordoni, G. D'Angelo, C. Fraternali, G. Moscatelli, G. Muti, M. Pietrini, F. Prestana, E. Purificato, M.C. Vitangeli, G. Zanatta, L. Zottarel), the last half-day was devoted to a round-table to promote a wide discussion on the various

problems concerning the teaching of statistics in pre-university schools; invited speakers were:

- Enzo Lombardo – chairman (professor of Statistics, Roma "La Sapienza")

- Luigi Biggeri (professor of Statistics, Firenze)

- Benito V. Frosini (President of the Italian Statistical Society, Milano)

- Giunio Luzzatto (professor of Mathematics, Genova)

- Giuseppe Anichini (Secretary of the Italian Mathematical Society, Firenze)

- Romano Scozzafava (professor of Probability, Roma "La Sapienza")

- Alberto Zuliani (President of the Italian National Statistical Institute, Roma)

Although the results presented during the workshop must be confirmed by further analysis, the most important facts can be summarised as follows:

- Teachers were generally enthusiastic about this experience and students (mainly those who had problems with the most theoretical parts of mathematics) seem to have rediscovered some interest in that discipline.

- High school students who attended modules with Lab activities seemed to reach a better level of knowledge and ability.

- Co-operative Learning made no improvement in the learning process of high school students, while the results for Intermediate schools show that sometimes CL gives better results than DOA, sometimes worse. To interpret these results, we must take into account, first of all, that classroom management following the CL model requires experience which some teachers would not have completely acquired during the training period: we need further investigations to explore this aspect in greater depth.

- A comparison of the achievement tests of elementary school students who followed the concept maps strategy with the tests of those who followed only the DOA didactic approach revealed that, on the whole, the results from traditional DOA teaching are slightly better than those from concept maps teaching. However, some results of more conceptual items are better from pupils that had concept maps teaching.

12.3. Seattle April 10-14, 2001 *What We Know and How We Know.* 82nd Annual Meeting of the American Educational Research Association

Papers presented in the Session on Teaching and Learning of K-12 Statistics: *Chair* :Sonia Faremo, McGill University, *Discussant* :Susanne Lajoie, McGill University

Cai, J. Lo, J. & Watanabe, T. *Intended Curricular Treatments for Students' Conceptual Understanding in U.S. and Asian School Mathematics: A Case of Arithmetic Average*. The results of cross-national comparisons of mathematical performance have received considerable attention by the educational research community as well as the general public. Cross-national studies in the teaching and learning of mathematics provide unique opportunities to understand the current state of students' learning and to explore how we can improve students' learning. One of the findings from the previous cross-national studies is that, in general, U.S. students did not perform as well as the Asian students in mathematics. Because of the complexity of interpreting cross-national differences, we are just beginning to understand the possible factors that may contribute to the differences in mathematics. However, there is little disagreement that the observed performance differences among students in different countries might be attributed to variations in mathematical curricula (McKnight et al., 1987; Schmidt et al., 1996; Westbury, 1992). The purpose of this study is to investigate the intended curricular treatments for students' conceptual understanding in U.S. and Asian school mathematics. In particular, this study investigates how U.S. and Asian curricula are designed to facilitate students' understanding of the concept of average.

Lavigne, N. & Glaser, R. *Variability in Student Representations of Statistics Problems*. The objective of this study is to examine a significant aspect of problem solving in statistics, namely, problem representation. A sorting task is used to determine whether or not problems are represented based on features that reflect principled understanding. For instance, are problems sorted based on surface features of the problem, such as topic or

story line, or deeper structural features that reflect principled understanding of statistical tests, such as purpose and data type? The study extends previous work in this area (i.e., Quilici & Mayer, 1996) by collecting verbal data to examine the nature of performance more closely. Three research questions are posed: (a) are initial representations prior to sorting superficial or principled? (b) are problems during the sorting task represented in a superficial or principled way and do they reflect initial representations? and (c) do the verbal data indicating reasons for sorts correspond to scores representing the extent to which sorts reflect surface or principled understanding?

Polaki, V. *Using Instruction To Trace Basotho Elementary Students' Growth in Probabilistic Thinking*. The current reforms in mathematics education (e.g. National Council of Teachers of Mathematics, 2000) have, amongst other things, expanded the scope of elementary and middle school mathematics curricula to include a range of content domains such as probability. A number of studies (e.g.Tarr, 1997; Jones, Langrall, Thornton & Mogill, 1999) have examined the development of North American students' probabilistic thinking during instructional programs informed by probability thinking frameworks. For instance, Jones et al. observed that the ability to make part-part comparisons played a crucial role in enabling third grade students in their North American sample third to quantify probabilities. Based on these observations, they conjectured that a part-part schema was one of the central conceptual structures that seemed to regulate students' thinking in probability. In a major review of research on the teaching and learning of probability, Shaughnessy (1992) identified a number of research priorities, including the need to determine whether what is currently known about students' probabilistic thinking cuts across cultural backgrounds. Consistent with this perspective, this study investigated growth in probabilistic thinking amongst elementary school children found in Lesotho, Southern Africa during the fall of 1999. In particular, it extended research on the use of cognitive models to inform probability instruction by designing and implementing two versions of a teaching experiment that traced Basotho (people of Lesotho) students' growth in thinking about 1- and 2-dimensional situations involving sample space and probability of an event. Each version was designed to (a) identify and describe the evolution of mathematical practices that the students developed as they tackled probability problems, (b) trace the emergence and evolution of key features of students' growth in probabilistic thinking, and (c) evaluate the effectiveness of each version of the teaching experiment.

Cortina, J. L., Cobb, P., & McClain, K. *Understanding Means and Ratios as Measures*. The long term goal of our research project is to develop an instructional sequence intended to support students' understanding of means and ratios as measures. As a first step in this process, we documented approaches used by students in coping with problems that required them to compare performance of groups of unequal sizes. We were especially interested in students' use of strategies based in reasoning multiplicatively. We hoped to uncover in these strategies and in the underling conceptions of them, bases for developing instruction intended to reorganized their thinking so that they might develop relatively sophisticated understandings of means as measures.

More information from http://www.aera.net/meeting/am2001/call01/index.htm

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12.4. A Symposium in Honour of David Vere-Jones 19-21 April 2001
Victoria University of Wellington

Summaries of papers related to education

Chris Heyde. *Vignettes from the History of Stochastics* .The founding fathers of stochastic processes usually had strong practical motivation, often relating to pressing social issues of their time. The nexus of motivation and discovery will be illustrated through brief vignettes on the work of various individuals, including Graunt (demography), D. Bernoulli (epidemic models), Bienaymé (branching processes), Bachelier (Brownian motion in financial modelling), Markov (Markov chains), Lundberg (Insurance risk models), Erlang (queueing models) and Hurst (long memory processes).

Wilf Malcolm Teaching, Research and Scholarship - A Matter of Degree? The intention of this talk is to reflect and honour David's wider interests over the years in mathematics education and, more especially, in nurturing the academic and scholarly values that belong to the essential life of a university institution. Teaching and research are often described as the primary functions of a university. But the understanding of their nature and the way

they interact with each other has changed in New Zealand and continues to change. In earlier years the teaching functions of a university were pre-eminent. In more recent years a greater emphasis has been placed on the research functions of universities, with institutions describing themselves as `research led', or `research based' or aspiring to be recognised as a `premier research institution'. Contract research in its various forms has become a major activity for many staff. This has led to the identification of `research only' staff positions, complemented interestingly by at least one university currently designating a significant portion of its academic positions as `teaching only'.

In a recent article (*Scholarship: Its Nature and Significance for New Zealand Higher Education, October, 2000*) Neville Blampied of the University of Canterbury and currently President of the Association of University Teachers has called for a closer examination of the way in which research and teaching are linked and interact within the wider framework of the notion of 'scholarship' In doing so Blampied develops the ideas of E.J. Boyer, set out in his 1990 book *Scholarship Revisited: Priorities of the Professorate*, arguing that a deeper understanding of the inter-dependence between teaching, research and scholarship is essential to furthering the current debates about the desirable nature and future of higher education here in New Zealand. In this Symposium Talk I will seek to build upon the ideas of Boyer and Blampied in pursuit of my long held conviction that ``research and teaching come together in scholarship", importantly in the ongoing character of the discipline of mathematics but also in the wider life of the universities. It is not research or teaching alone that should characterise the intellectual life of our universities, but scholarship in which the dual activities of the advancement and enjoyment of knowledge are deeply embedded in human understanding and experience, individually and in society. I believe the professional career of David Vere-Jones exemplifies those values of learning and scholarship that I would wish to see characterise the ongoing life of our universities.

Brian Phillips. The Influence of David Vere-Jones on Statistical Education. David Vere-Jones's interest in mathematical and statistical education was triggered in the early 1960's during his visits to Russia when he met leading mathematicians who were deeply involved in these areas as well as in their own research. Through the 1970's and 1980's David's involvement in education grew in New Zealand where he became influential in the developments in mathematics and statistics teaching, especially at school level. By the early 1990's he had become very involved in the Education Committee of the International Statistical Institute (ISI) and had a key role in the Third International Conference on Teaching Statistics (ICOTS-3) in Dunedin, 1990. This was soon followed by the pivotal role he played in the establishment of the International Association for Statistical Education (IASE). This talk describes the formative influences underlying David's involvement in statistical education and his influence on the growth of the IASE.

More information from: http://www.statsresearch.co.nz/fest/

12.5. IUSSP- International Union for the Scientific Study of Population

Working Group on Teaching

Graziella Caselli, Chair of the WG. Dipartimento di Scienze Demografiche, Università di Roma "La Sapienza" <graziella.caselli@uniroma1.it>

Demography, as with other disciplines which focus on population studies, belongs to the social sciences and their paradigms change in step with changes in society. Major changes during this latter part of the century, already revealing messages regarding what awaits us during the third millennium, should serve to encourage the scientific community to seriously consider the future of teaching in this area.

The scientific scope of the IUSSP WG on "Teaching" should be to encourage activities aimed at defining new guidelines for teaching demography in the future. The new contents of demography should be clearly listed, making some differentiation according to the target group, future demographers on the one hand, and others who in the course of their professional activity need to apply some demographic know-how. At the outset the WG set a number of targets:

- First of all a directory should be drawn up of all the centres where demography is taught as well other subjects which include population topics. A questionnaire, drawn up during the Rome WG meeting, was sent by e-mail and

then by News Letter to all participants as well as to the IUSSP members. The questionnaires should give us information on the number of courses number of hours, the target group, the contents, etc.

- Secondly, teaching manuals and other teaching materials used in the different centres should be obtained, with the intention of analysing the contents and performing a critical-comparative analysis. This would be a good way to begin. An idea of the state of the art is necessary if the contents are to be modified and standardised upwards.

- Both these stages can begin at the same time, and comprise the prelude to a Seminar on teaching, towards the end of the second year of the WG. This seminar should be seen as the third stage of the group's work and led to ensure discussion and proposals for the teaching of demography in the future. It was held in Rabat (Morocco), 15-18 May,2001.

- Finally a special Session on "**Demographic Training in the New Millennium"** is being organised at the XXIVth IUSSP Conference in Brazil, 18-24 August, 2001, by Graziella Caselli the Chair of the Working Group.

Regarding the Seminar let me briefly recall themes underpinning the different sessions: Two sessions on *Demographic Training: Past, Present and future,* with the objective of presenting the evolution of training programmes in different parts of the world with an emphasis on the past and the present. A further two sessions on: *Needs/Demands for Demographers in the Future* aim at exploring the demand for demographers in the future for developing and industrialised countries. The following questions are some examples of aspects that should be considered: How are needs defined? Who should define these needs: employers, former graduates, public sector, private sector, international organisations, etc.? What are future directions: applied vs. fundamental, substantive vs. technical, etc.?. Two sessions on *What Should We Teach? Elements of a Training Strategy*. Here, attention should be paid to different types of training profiles (e.g. professional vs. research) and geared to specific target groups such as students in demography, students in other disciplines, non-demographers dealing with population projects, etc. Programmes should also distinguish between short-term and long-term training. The last two sessions concerned *New Tools for Teaching* and *Identifying Priorities and Synthesis*. The first session consisted of invited contributions presenting specific examples of new tools used in teaching demography: internet, simulation models, problem-solving approaches, etc.; the second session entailed presentations by the reporters of the earlier sessions, followed by a general discussion.

All the papers presented at the Rabat Seminar will be in the IUSSP Web Site www.iussp.org. Some of these will be published in a special issue of *Genus*. The Working Group to coincide with the *Brazil General Conference on Population* should present a report as well as send three experts from the wealthier and poorer countries to illustrate emerging trends in teaching. For the special session titled, "*Demographic Training in the new millennium"*, three invited papers will be presented: *Teaching Demography: Ten Principles and Two Rationales,* by Thomas K. Burch (tburch@uwo.ca); *Rethinking the Teaching of Demography: New Challenges and Opportunities,* by Alberto Palloni and James Vaupel (palloni@ssc.wisc.edu and JWV@demogr.mpg.de); *Why Biodemography Should Be Included in Demography Coursework,* by James Carey (jrcarey@ucdavis.edu).

12.6. SRTL-2 The Second International Research Forum on Statistical Reasoning, Thinking, and Literacy, Armidale, Australia, August 15-20, 2001

Chris Reading, <creading@metz.une.edu.au>

The second in a series of International Research Forums, being offered under the umbrella of the Statistical Education Research Group of the International Association for Statistical Education, is to be held in Australia in August 2001. This Forum is sponsored by the Centre for Cognition Research in Learning and Teaching and the School of Curriculum Studies at the University of New England ; the International Association for Statistical Education and the University of Minnesota. This gathering offers an opportunity for a small, interdisciplinary group of researchers from around the world to meet for a few days to share their work, discuss important issues, and initiate collaborative projects. The topic of the Forum will be Statistical Reasoning, Thinking and Literacy. One outcome of the Forum will be the publication of a book summarising the work presented, discussions conducted, and issues emerging from this gathering.

SRTL-2 Advisory Committee: Dani Ben-Vi, Joan Garfield and Chris Reading are co-chairs assisted by Janet Ainley, Iddo Gal, John Pegg and Brian Phillips.

List of presentations

- Bill Mickelson and Ruth Heaton. Reasoning about data and distribution through the statistical investigations of a third grade classroom.

- Mike Shaughnessy. Conflict Between Students' Personal Theories and Actual Data: The Spectre of Variation.

- Graham Jones. Statistical Reasoning Used by Elementary and Middle School Students When They Analyse and Interpret Data.

- Jonathan Moritz. Conflicting representations of statistical association.

- Arthur Bakker. From Data via 'Bump' to Distribution.

- Chris Reading Variation' from a Student's Perspective.

- Rolf Biehler Assessment of students' statistical competence in computer supported statistics courses.

- Maxine Pfannkuch Statistical investigations: Year 7 and 8 students' reasoning with multivariate data.

- Pat Thompson Conceptual issues in understanding sampling distributions and margins of error.

- Jane Watson Comparing Two Data Sets: Reasoning and the Influence of Cognitive Conflict.

- Katie Makar Secondary Teachers' Statistical Thinking about Comparing Two Groups.

- Mark Earley Methods for Assessing and Researching Student Reasoning About Sampling Distributions.

- Bob delMas, Joan Garfield, Beth Chance Validating types of reasoning out sampling distributions.

- Dani Ben-Zvi Students constructing global views of data and data representations.

12.7. IASE Invited Papers Meetings at the ISI, 53rd Session

Seoul, Korea, 22–29 August, 2001

It will be a great pleasure for Korean statisticians to host the 53rd Session of the International Statistical Institute(ISI) which will be held in Seoul from 22 to 29 August 2001 under the auspices of the Korean Government and the National Statistical Office (NSO), the Korean Statistical Society and Korean Statistical Association.

Detailed Information on the conference may be found at http://www.nso.go.kr/isi2001

IASE Sessions: There are seven sessions to be organised by the IASE alone, with another four being jointly organised with other sections. Lionel Pereira-Mendoza lpereira@nie.edu.sg is co-ordinating our section of the programme.

IASE Organised SESSIONS

55. Forum: IASE and Statistics Education in Developing Countries* Organizer: Maria-Gabriella Ottaviani, <ottavian@pow2.sta.uniroma1.it>

1. Youri Ivanov. *Selected aspects of education in statistics in Russia*. During the last ten years the system of education in the field of statistics in Russia has undergone noticeable changes as a result of economic reforms, changes in the institutional set up, in organization and methodology of official statistics. These changes have had a profound impact on the educational programs (curriculum) in statistics, on the textbooks, on the contents of lectures and practical exercises suggested to students at the seminars , on more intensive use of modern information technologies in educational process. Statistical education in Russia was always and still is an integral element of the system of higher economic education. At the present time statistics is taught at the universities and at the institutions with economic orientation such as economic academies, universities, institutes and colleges. It is also taught at the institutes with so called humanitarian orientation such as, for example, Juridical Institute or the Institute of History

and Archives and so forth; mathematical statistics is taught in many non-humanitarian institutes. In this paper we describe the types of students, courses taught, type of teaching, and major current limitations and shortcomings of the present system of statistical education in Russia.

2. Ana Silvia Haedo. *An overview on the teaching of statistics at schools and university in Argentina.* In this work we present a panorama of the teaching of statistics in Argentina. Starting the teaching of statistics at primary and secondary school levels involves a problem of preparation of teachers. The use of statistics at different domains and the increasing need of specialists has led to the creation of continuous education and Masters degrees in different Universities since 1973.

3. Munir Ahmad. *on fifty years of university and pre-university teaching of statistics in Pakistan*. In 1947, at the time of Pakistan independence. The first All Pakistan Education Conference was held at Karachi which recommended that primary education would be free and compulsory for all children till Class-VIII. In 1959, the National Education Commission was set up and again recommended that the primary education would be free and compulsory. Many new schools were opened and teachers appointed. Female teachers were encouraged. The primary education was organised by district councils instead of local bodies. For this purpose, union councils that were responsible for finances and management, were established. In 1970, new education policy was framed and again elementary education for children of age 11 years and less were made universal. It was intended that universal and free education whould be achieved by 1984. About 3800 school rooms were constructed and about 2,25,000 elementary teachers were appointed. During 1974, all schools were nationalised but when the progress of school education was monitored, it was found that less than 25% of the target could be achieved. With the change of Government in 1977, privatisation of schools was proposed. About 5000 mosque schools and 13000 new primary schools were opened. In 1990, two education policies were announced viz. Education Policy 1990 and Education Policy for the period 1998-2010. In view of the Government's education policies we describe the development of statistics and statistical education in the last 53 years in Pakistan.

4. Koffi N'Guessan. *L'Ensea, 40 ans au service de la formation statistique en Afrique.* [40 years of developing statistics in Africa] Statistical training is recent in francophone Africa. Statistical training schools opened in the 60s and 70s. Three schools provide training in statistics: ISSEA in Yaoundé, DSD in Dakar and ENSEA in Abidjan. ENSEA provides 4 levels of degree programs: "Ingénieurs Statisticiens Economistes" (ISE), "Ingénieurs des Travaux Statistiques" (ITS), "Adjoints Techniques de la Statistique" (AD) et "Agents techniques de la Statistique" (AT). Apart from classic training, ENSEA also offers a continuing education program with specialised courses aiming to recycle professionals, enhance and update their knowledge in statistics. It also develops research activities on various topics covering economic, demographic and statistical fields. Its graduates work in priority for public institutions but the private sector is more and more recruiting them in order to enhance its statistical apparel.

56. Undergraduate Level Statistics Programmes Organizer: Shen Shir Ming, <smshen@hkuspace.hku.hk>

1.   Ann-Lee Wang. *Introducing Markov chains models to undergraduates*. Learning Markov chains models requires some knowledge of probability theory, calculus, matrix algebra and a general level of mathematical maturity. While trying to understand Markov chain models, students usually encounter many obstacles and difficulties. In this paper, some suggestions regarding the teaching of introductory Markov chains models to undergraduates are discussed.

2. Tony W.K. Fung. *Teaching undergraduate statistics using forensic examples.* Statistics plays an important role in forensic science. For example, the setting of hypotheses is crucial for explaining the evidence, and the conditional probability can be easily demonstrated by the so-called prosecutor fallacy. In this talk, ideas of mean, standard derivation, coefficient of variation, expected value, prior probability, Bayes theorem and graphical methods are illustrated using forensic examples.

3. Susan Starkings. *The pre-requisite knowledge required by students starting data analysis classes at university*. Many of the students joining the Data Analysis classes at South Bank University have adopted statistical culture and it is often because of previous mathematical/statistical experiences. The social science students are often mathematically weak and do not respond very well to using traditional textbook techniques. However, by careful instruction these students can cope with the material being presented to them. The use of good quality software, sympathetic teaching and appropriate material can not only enhance the learning experience but also enable the students to understand the need for the statistics classes. Most tutors expect the students to have a minimum mathematical competency level. This is often not the case and at South Bank University extra sessions to bring the students up to this level of mathematical competency has been required. This paper be will threefold namely (i) to state the pre-requisite mathematical knowledge required; (ii) how this knowledge can be taught and (iii) the

educational implications for other subject disciplines.

4. C. R. Rao. Developing the curriculum of undergraduate courses in statistics: Indian and American experiences. Statistics as it is understood, studied and practised today runs the whole gamut of natural and social sciences, engineering, technology, economic affairs, medicine, law, the arts and literature. In most of these activities, while there is a need for well-trained consultants with advanced statistical knowledge, the need for ordinary workers to be comfortable with interpreting data and logical analysis done by a computer will increase greatly. So there is a need for a good diploma programme with an emphasis on applied statistics and real-life data-analysis. Some suggestions for developing such a programme are presented, based on the experience of the author and others in India and the USA.

- Discussants: J.L. Rosenburger

57. The Future of Statistics Education Research Organizer: Joan Garfield, <jbg@maroon.tc.umn.edu.

1. *Carmen Batanero, & Juan D. Godino. Developing new theoretical tools in statistics education research.* In this paper an ontological and semiotic model of statistics and mathematics activity is described, which has been developed along the 10 last years at the University of Granada. A research agenda in statistics education based on this model will be illustrated with examples from research carried out on textbook analysis, problem solving, questionnaires development, and teaching experiments.

2. *Flavia Jolliffe. An international survey of research in statistical education.* Statistical education research is an emerging discipline and as yet there are relatively few outlets for publication and presentation of results. In consequence some researchers feel isolated, and finding out about research activities is partly a matter of chance. Undertaking and publishing the results of an international survey to find out who is doing statistical education research, and the details of their past, current, and planned research in this area, will provide a useful resource for other researchers and for teachers of statistics. The results will give an indication of the directions in which current research is moving and, perhaps, of where research is needed in the future. This paper will describe such a survey.

3. *Beth Chance, & Joan Garfield. New approaches to gathering data on student learning for research.* The last decade has seen a strong emphasis on active learning, use of real data in the classroom, and innovative uses of technology for helping student learn statistics. A recent survey in the United States (Garfield, 2001) documents that many tertiary teachers of statistics courses have made changes toward these goals. Now more than ever, more research is needed on the effects of these instructional methods and materials on student outcomes. In assessing students' conceptual understanding, reasoning abilities and attitudes, and their development, alternative methods of gathering student data are needed that move beyond traditional forced response test items. This presentation will present and critique additional methods for obtaining information on how students develop an understanding of statistics based on classroom research and videotaped student interviews/observations.

- *Discussants - Gilberte Schuyten and Maria-Gabriella Ottaviani.*

58. Research on Teaching Statistics at School and University Levels. Organizer: Susan Starkings, <starkisa@sbu.ac.uk>

1. *Silio Rigatti Luchini, Maria Pannone, & Anna Milto. New strategies for teaching statistics at school.* The authors carried out a teaching experiment in which the research was aimed at creating a model for statistical introductory courses. They refer to this model as Data Oriented Approach (DOA). The DOA is based on the hypothesis that working with real data reflecting a real life phenomenon favours greater understanding of statistical methods and helps to develop students' interests in the subject. The Italian Ministry of University and Scientific Research supported the work. The research was carried out by four Italian Universities namely Universities of Rome, Padua, Perugia and Palermo and involved 145 teachers and 2129 pupils from primary schools (age 6-10), 86 teachers and 1514 pupils from lower secondary school (age 13-14) and 107 teachers and 2500 pupils from secondary school. The research team identified the statistical content on which the experiment would be carried out at the three school levels. Training programmes were developed to prepare the teachers to use the experimental materials. Preliminary and post course tests on the student's ability was administered. The authors present the procedures carried out and the respective findings of this interesting experiment.

2. *Dani-Ben Zvi, & Abraham Arcavi. Developing expert' points of view on local-global approaches to data and data representation.* The paper reports on a study, carried out in Israel, on the learning process of seventh grade students working through a carefully designed statistics curriculum in a computerised environment. The study was

divided into two parts. Part I looks in detail at ways in which two 13 year old students begin to make sense of data and data representations. For Part II an assessment task of 80 students was undertaken, two weeks after the end of the course. The authors propose a description of what it may mean to learn exploratory data analysis and draw educational implications.

3. *James Nicholson, & Gerry Mulhern. Supporting statistics teaching and learning at A-level: Using computer based materials.* This paper looks at the use of using Information and Communications Technology (ICT) in schools as a vehicle for delivery of the curriculum. In the United Kingdom the Government has attached a specific priority to the use of ICT. The authors advocate that there is very little empirical evidence identifying whether or not the use of ICT improves the quality of teaching and learning in the classrooms. Teachers and students have tried out statistical materials using ICT, which have been developed. Revisions to the materials have been made after discussions with respective parties. The paper outlines the realistic benefits of using ICT in conjunction.

- *Discussants: Flavia Jolliffe.*

59. Undergraduate Statistics Education in Non-Statistics Degree Programmes Organizer: Elisabeth Svensson, <elisabeth.svensson@esa.oru.se>.

1. *Indrayan. Teaching statistical principles and methods in medicine.* Biostatistics is undesirably perceived as a mathematical science. It is now time to reorient the subject so that it enjoys its rightful place into medical disciplines instead of being treated as an alien subject. The following is a brief outline of the plan of teaching this subject that can be very convincing to medical undergraduates as the one that fulfils their medical need.

2. *Kerstin Wiklander. Teaching statistics in pre-clinical and pharmaceutical departments.* Both people in the industry and students with other main subjects than statistics often need statistics without having the adequate qualifications to use it. The statistics needed is often so complicated that it can be difficult to bring to them the necessary tools when their education and background is not suited for this. For example, their knowledge and skill in mathematics may be insufficient. How can they, in spite of this, be trained in statistical thinking, models and methods after their needs and on their terms? Some experiences on this important and difficult problem will be discussed

3. *Carol Joyce Blumberg. Is there life after introductory statistics?* Different types of classes and projects that non-statistics majors can and should have at the undergraduate level that go beyond introductory statistics will be discussed.

- *Discussants: P K Ito.*

60. Continuing Statistics Education in the Workplace Organizer: Carol Joyce Blumberg, <cblumberg@winona.edu>

1. *Kenneth J. Koehler, & W. Robert Stephenson. Statistical education outreach = unlimited learning. The* Department of Statistics at Iowa State University began a distance education initiative in 1994. This initiative includes the delivery of courses in the practice of statistics to off campus students at over 20 companies. As part of this initiative, courses leading to a Master of Science in Statistics are presented to students at General Motors, 3M and the Mayo Clinic. This paper discusses this distance education initiative including its successes and shortcomings. Difficulties encountered by students and instructors are presented. Suggestions for avoiding these difficulties are given. Performance of students, on and off campus, is evaluated and compared.

2. *Elizabeth A. Taylor: taylor_elizabeth@bls.gov The Challenges for Providers of International Statistical Training.* Providing statistical training to groups composed of representatives of different countries poses many challenges. The U.S. Bureau of Labour Statistics has been conducting international seminars since 1945. This paper discusses the challenges that we encounter. It presents some of the ways in which we deal with the challenges and our thoughts on what further we must do in order to make the training as effective as possible.

3. Maarten Boon. *Recent E-Learning initiatives related to the international training in official statistics.* The United Nations Statistical Institute for Asia and the Pacific (UN-SIAP) in Japan has the mandate to train governmental officials of developing countries in the UN-ESCAP region in all aspects related to the production and analysis of official statistics. The Institute organises courses in its own premises and in overseas locations. Recently the Institute started an initiative to develop an E-learning system in order to expand the effectiveness of its limited resources. The paper describes the specificities of the international training environment of the Institute and the potentialities of E-learning within this system. Reference is also made to the European project 'Virtual Library for Computer Assisted Training in Statistics'. SIAP appeals to the international community to assist the Institute in its

efforts to realise a successful implementation by participating in global networked cooperation. By combining electronic source material and international expertise related to (courses in) official statistics we may jointly contribute to human capacity building in official statistics in developing countries.

- *Discussants: Rene H. M. Smulders and Ryoichi Shimizu*

61. Postgraduate Training of Statisticians. Organizer: Gilberte Schuyten, < Gilberte.Schuyten@rug.ac.be>

1. Seymour Geisser. *Observations on graduate programs in statistics II*. In this paper I review predictions, some that came to pass and others that did not, that I had previously made regarding those issues and events that would influence university graduate programs in Statistics. I also discuss past and current research and their potential for entry into the statistical canon.

2. Brian Phillips. *Report on the IASE Round Table Conference on The Training of Researchers in the Use of Statistics.* In August 2000 a Round Table meeting was held in Tokyo on The Training of Researchers in the Use of Statistics. The IASE, the ISI, the Institute of Statistical Mathematics and the Japan Statistical Society sponsored it. There were 48 participants, including professional and official statisticians, lecturers, researchers and statistics educators, and represented different countries of the five continents, as well as developed and developing countries. The meeting was run under five main topic areas: a). Training researchers in particular statistical topics; b). How technology affects the training of researchers; c) Needs and problems in training researchers in specific areas; d) International experiences in the training of researchers, and e) Consultation as a teaching and learning process. After the conference, the authors revised their papers and Carmen Batanero as Editor has produced a book, which is now available from the ISI. As the Editor says in the introduction: "It is hoped this will serve as a starting point for other lecturers, researchers and statistics educators to reflect on the statistical training of researchers in empirical sciences, to change their teaching approaches, to improve the interest to collaborate in applied research and to start new didactical research on some of the problems described." This talk will outline some of the issues discussed at this meeting.

3. *Yuki Miura(Japan): miura@parkcity.ne.jp*

- *Discussants: Raoul Depoutot and Els Goetghebeur*

Joint IASE Sessions

10. Technology in Statistical Education (Joint with IASC) Organizer: Tae Rim Lee, <trlee@av9500.knou.ac.kr>

1. *Jung Jin Lee and Gunseog Kang. An educational software for the design of experiments.* This paper introduces a software called the Information Statistics Provider (ISP), which has many modules on teaching statistics as well as data processing. The ISP is a GUI oriented, interactive, and user-friendly system with multiple sheets. This paper focuses on modules of the Design of Experiments, which show the design sheets of an experiment and enable a post-analysis.

2. Marta Bilotti Aliaga. *Information is not knowledge: the information revolution*. Thi aim of this paper is to discuss the advantages and disadvantages of an introductory statistics course at the information revolution age. What we teach should correspond to our time and fit our students' life and the society needs. In good teaching students should become aware of the fact that information cannot replace knowledge.

3. *Naoko Sakurai, Michiko Watanabe. Kazunori Yamaguchi, Akinobu Takeuchi, Katsuyuki Suenag, Hiroshi Yadohisa, Chooichiro Asano. Interactive education system for learning statistics on the Internet* Recently, it has been seen in both the academic and business world that the global abilities demanded of students and working people have begun to change with dizzying rapidity. Particularly in the social science departments the need for integrated statistical ability, data analysis and information processing has been growing intensively. On the other hand, the recent surprising coverage of computer networking, technology and multimedia capabilities have brought a great impact and change to education systems in every department and university. Large demands for abilities in statistical data analysis especially in economics, commercial science, psychology, pharmacology or any other social science section have been extending the dimension of statistics education. In addition, easier transfer of various kinds of data than before through computer networks has led to increased needs for this phenomena. In this paper we make a proposal concerning statistics, econometrics and statistical data analysis education of broad outlook with new smart media technology in order to help both teachers and students teach and learn the skills for these tasks effectively. Concretely we have developed an educational system whose contents include the interactive texts,

electronic book reading with precise searching tools and statistical program libraries, which can interface with Microsoft Excel. We will show the concept and the outlook of this system.

- *Discussants: Masakasu Murakami and Joongkweon Shon*

10. Women's Contributions to Leadership in Statistical Education. Joint with CWS. Organizer: Martha Aliaga, <Aliaga@Umich.Edu>

1. Tae Rim Lee. *The Role of the Internet in statistical education.* This paper reviews the background of web-based courseware for teaching statistics and examines the effectiveness of this type of instruction for schooling. Using web-based statistics courses students showed higher course completion and student performance. And it appeared that more than 70% of the students were satisfied with various aspects of the web-based courses. It was found that physical access to the environment, content design strategies and online activities seemed to be the most important factors affecting the effectiveness of web-based instruction

2. Pilar L. Iglesias, & Gloria Icaza. *Leadership research in teaching and learning statistics in Chile.* This article aims to discuss several methodologies which have been used in various research projects on teaching statistics to primary school teachers, students, and the public in general. We emphasise the role of women in teaching statistics at university, professional and secondary levels.

3. *Shyamala Nagaraj). Women's role in shaping future directions in statistical education.* This paper briefly considers the role of women in shaping future directions in statistical education. First, we discuss the need for statistics in a global-information world, and then look at women's participation in this new world. This is followed by a review of the role of women in statistics, as students, teachers, workers and professionals. Some suggestions for improving the position of women in statistics are then considered. The paper concludes with some implications for the future role of women.

4. Elsa C. Servy. *Statistical education at the National University of Rosario, Argentina.* An appraisal from the gender point of view. The purpose of this communication is to share with the audience my experience in the task of heading the School of Statistics, at the University of Rosario, Argentina. I hope that from this particular case, we will be able to ponder on the common problems of those that have chosen a non traditional profession like that of Statistician, and a challenging job such as Education is, and have to deal with both in the sociological environment framed by our condition of being women.

- *Discussants: Mary H. Regier, & Mary Gray*

14. The Role of Official Statistics in University Curriculum* Joint with IAOS (IAOS to organise) Organizer: Reiner Staeglin, <rstaeglin@diw.de>

1. Erkki Pahkinen, & Risto Lehtonen. *Masters' programmes in statistics as a platform for cooperation between university and official statistics.* Official statistics is not a university discipline but cuts across and borrows from several university disciplines, including Statistical science, Sociology, Economics and Computer science or Informatics. Although the universities have no departments or faculties for Official statistics, in some countries there exist special programs, usually at the Master's level, geared to Official statistics. The Joint Program in Survey Methodology (JPSM) in the USA is an example, with a mixed Statistical science and Behavioural science content. A more clearly Mathematical/Statistical orientation is found in Finland's Master's program in Statistical systems (MPSS), run jointly with Department of Mathematics and Statistics, University of Jyväskylä, and Statistics Finland. We discuss in this paper the MPSS as a platform for co-operation between the university and the National Statistical Institute (NSI).

2. Sibylle Schmerbach. *Official statistics in Gernan university education.* Today, in Germany. Official Statistics define their role as a double function: a) as an authority, being a part of public administration that contributes to planning and controlling politics, b) but at the same time also as a scientific institution outside of universities, whose methods and products are part of science and research and increasingly as a service institution, that provides an "information infrastructure" about all elements of society to the entire society. The current public impression of the role of official statistics as a provider of an very important "public good" doesn't correspond with its great importance. Only complete confidence in the methods of working and full acceptance of its products can change the situation. Confidence and acceptance are caused by knowledge about the contents and working principles of official statistics. At universities of the Federal Republic of Germany, official statistics are mainly taught in connection with economic statistics. Only a quarter of German universities offer courses of official statistics in their curriculum, nearly half of

them are fundamental and half of them are on an advanced level with different credits per course. At the Humboldt-University of Berlin, in the Department of Economics official statistics in connection with economic statistics are an important part of advanced level curriculum. Lectures, seminars and workshops give a different impression of the relationships between official statistics, science, politics and society. Future activities should be to include contents of the work of official statistics as mentioned in curriculum of all German universities, first of all in curriculum of economic departments. Internships and studies for the students in statistical offices should support this process.

3. Carmen Feijo. *An approach to the teaching of social accounts in the Brazilian university curricula.* In Brazil the university curricula impute great importance to official statistics as it is part of the minimum curricula of several courses. However, the discipline is not very praised among students and teachers, as there is not a satisfactory design to tackle such a wide subject. Textbooks in Portuguese are either out of date or exclusively oriented towards macroeconomic discussions without explaining the building of the macroeconomic aggregates. This paper proposes that the Social Accounts course should be offered centred in the System of National Accounts, 1993 as the main organising system of the production of statistics. The final aim of the course would be to develop skills in reading and interpreting official data about relevant aspects of social and economic life of a country or region. In this sense students should be better trained to do empirical research.

15. Education and the Internet & Effective Structures for the Net* Joint with IAOS (IASE to organise) Organizer: Brian Phillips, < bphillips@swin.edu.au>

1. Larry Weldon. *Statistical education with official statistics on the Internet.* In this paper I address the question "How should the modern developments in official statistics, and the explosion of use of the internet, affect statistical education?" The increasing importance of official statistics for business, government, and education, needs recognition in our assessment of what topics are "basic" for statistical education. Similarly, the internet has greatly increased the feasibility of easy communication of huge data sets at all levels of summary: Not only does this provide an opportunity for enriching application examples, it also increases the importance of certain tools associated with large data sets, and raises problems of data management that expand the boundaries of the discipline statistics. I will suggest how these issues could be responded to in basic statistics courses. I will also allude to the potential for online statistical education, which makes use of official statistics via the Internet.

2. Photis Nanopoulos*. Distance learning: Eurostat's activities.* An important development of the educational and training activities today is the so-called distance learning. It successfully replaces in some cases traditional teaching at schools. This is defined usually as "the formal educational process where the majority of the instruction occurs when the learner and instructor are not in the same place and are often separated by time". In spite of the large number of courses available there were not appropriate courses for official statistics. For this reason Eurostat has stimulated research in this domain. Two projects oriented to this aim are CATS and VL-CATS.

3. *Carl Lee. Classroom experiences in using the Net for teaching.* The constructivism learning theory suggests that people learn better by actively participating in the process of learning. In order to involve students into the participatory learning process, the interaction among students, and between students and instructor in a classroom setting becomes very critical. The Internet technology can play an important role in increasing this interaction, in addition to distributing instructional material or well defined data sets. The underlying idea is to create a learner-focused environment for students to participate in the process of learning. This participation is usually conducted at a local level. Through the interactive online hands-on activity system, students and instructors can actually conduct their activities locally and share them globally. A Web database is developed to gather the data collected from local classroom hands-on activities. Classes from different institutions can participate in the same hands-on activities and share the locally collected data through the web database. These will include activities using data from the Bureau of Statistics and various in-class hands-on activities. The database will continue to grow. The data collected will be useful for undergraduate students to conduct some longitudinal studies to compare students' responses on these activities along the years.

4. John Pidgeon*. Educational Use of Official Statistics in Australia and Vietnam*

- *Discussant: Ada Van Krimpen(The Netherlands):akin@cbs.nl*

13. Forthcoming Conferences

32nd European Mathematical Psychology Group Meeting
September 25- 29, 2001 Lisbon, Portugal

The 32nd European Mathematical Psychology Group Meeting will be held at the Faculdade de Psicologia e de Ciências da Educação, Universidade de Lisboa (FPCE-UL), Lisbon, Portugal, and is jointly organized by the Laboratório de Estatística e Análise de Dados (LEAD/FPCE-UL) and the Associação Portuguesa de Classificação e Análise de Dados (CLAD).

Information: Laboratório de Estatística e Análise de Dados (LEAD), Faculdade de Psicologia e de Ciências da Educação da Universidade de Lisboa (FPCE-UL), Alameda da Universidade , 1649-013 Lisboa, Portugal. E-mail: empg2001@fpce.ul.pt . Web page : http://correio.cc.fc.ul.pt/~cladlead/EMPG01.html

Chair: Prof. Dr. Helena Bacelar-Nicolau, LEAD / FPCE-UL , <hbacelar@fc.ul.pt>

Mathematical Psychology concerns the development of quantitative models and theories, and testing them against empirical data. Mathematical Psychology draws upon mathematical and statistical methods, computer simulation, and formal logic to develop theories e.g. perception and sensation, psychophysics, memory and learning, decision making, problem solving and thinking, motor behavior, emotion and motivation, and social behavior.

The first EMPG meeting was held in Paris in 1971. The preceding EMPG meetings were organized in Padova (1996), Nijmgen (1997), Keele (1998), Mannheim (1999) and in Graz (2000). Following the success of these meetings, it was decided in Graz to organize the 32nd European Mathematical Psychology Group Meeting in Lisbon, Portugal. In the EMPG-2001 all topics of Mathematical Psychology are welcome.Particular attention will be paid to the following:

- Response Time Models for Elementary Cognitive Processes;
- Models of Preference and Choice Behaviour;
- Foundations of the Theory of Measurement;
- Testing and Comparison of Quantitative Models;
- Neural Network Models;
- Models in Visual Perception;
- Knowledge Space Models;
- Teaching and Training Mathematical Psychology in an Interdisciplinary and International Context, as well as interdisciplinary related areas.

Introductory Course on "Mathematical Psychology and Data Analysis", September 25th, 2001

- Introduction to Psychological Decision Theory, Christoph Micko, University of Braunschweig, Germany.
- An Introduction to Response Time Modeling: Some Case Studies, Hans Colonius, University Oldenburg, Germany.
- Introduction to Multidimensional Scaling, Luc Delbeke, Katholieke Universiteit Leuven, Belgium.
- Cluster Analysis Models in Psycholog,Helena Bacelar-Nicolau, Universidade de Lisboa, Portugal.

Workshop: Teaching and Training Mathematical Psychology in an Interdisciplinary and International Context. **Organizer:** H. Bacelar-Nicolau

- Teaching Bayesian Methods as a Therapy Against the Misuses and Abuses of Null Hypothesis Significance Tests. Bruno Lecoutre, Université de Rouen, France.
- What is the message for mathematical psychology in the different ways mathematics is taught and learnt in different cultures? Alan Rogerson, Poznan, Poland.

- Teaching Mathematical Psychology: interuniversity co-operation through European funded programmes Luc Delbeke, Univ. Leuven; Francesca Cristante, Univ. Padova, Christof Micko,Univ. Braunschweig.

- Teaching Mathematical Psychology: We Are Our Own Worst Enemy. James Towsend, Indiana University, USA.

European Workshop on the Teaching and Diffusion of Statistics
Instituto Balear de Estadística, Palma de Mallorca, October 10-11, 2001

The General Direction of Economy of the Balear Islands Government (Spain), through the Balearic Institute of Statistics is organising a two-days European Statistics Workshop on "The teaching and diffusion of statistics", to be held in Palma de Mallorca, in October 10-11, 2001.

Conference topics:

- Experiences in the diffusion and teaching of statistics.

- Statistics and the wider society. Statistical literacy.

- Attitudes towards statistics.

- Multidimensional databases and diffusion of information. Diffusion of statistics in small areas.

- Teaching of statistics at different educational levels: contents, learnng obstacles, training teachers.

- Statistical training for business and professional work.

- Teaching resources: software, multimedia, Internet

- Statistical consultancy as a teaching device.

 More information is available from the Institute (phone: 0034 971 176755), e-mail (ibae.caib.es) or, from the conference web page: http://www.caib.es/ibae/esdeveniment/jornades_10_01/main.html

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Universidad de Matanzas Camilo Cienfuegos, Cuba, COMAT`2001
V Evento Internacional de Matemática y Computación, 12- 16, November 2001

Information from Prof. Ramón J. Almeida Fernández: almeida@cdict.umtz.edu.cu

Topics
- Educational technology.
- Mathematics at primary and secondary school level
- Teaching mathematics at University level in Natural and Biological Sciences, Techniques, Pedagogy, etc.
- Postgraduate mathematics
- Teachers training

EARCOME 2002 - SEACME 9, June 2002

The second ICMI-EARCOME (East Asia Regional Conference on Mathematics Education) is to be held in Singapore in June 2002. This conference, also designated as the Ninth Southeast Asian Conference on Mathematics Education or SEACME 9, has been officially recognized as an ICMI Regional Conference. It will be hosted by the National Institute of Education, Nanyang Technological University, Singapore and the Association of Mathematics

Educators, Singapore. Information can be obtained from EARCOME 2002, Division of Mathematics, National Institute of Education, 469 Bukit Timah Road,Singapore 259756, Republic of Singapore <earcome2@nie.edu.sg>.

The Sixth International Conference on Teaching Statistics

Durban, South Africa,7 - 12 July 2002

IPC Website: http://www.beeri.org.il/icots6

LOC Website: http://icots.itikzn.co.za/

GENERAL REQUIREMENTS TO ICOTS-6 AUTHORS

The invited and contributed papers of ICOTS-6 will be published by ISI and IASE as a CD-ROM and on the Internet and it will also be available in printed form to those who want to pay for a copy. A full description of all details for preparing ICOTS-6 papers is available in the ICOTS-6 IPC website (http://www.beeri.org.il/icots6/) under "Announcements". Authors have the option of a full paper *refereeing process* for those who desire it. The refereeing process provides a mechanism for peer review and critique and so contributes to the overall quality of ICOTS-6 scientific program. More details about the refereeing process, as well as the general authors' instructions, can be viewed on the Website. All papers, which meet the instructions to authors, will be published in the proceedings. Furthermore, those which also meet the refereeing process, will be identified as having satisfied the refereeing process. Two sample papers can be found in the "Sample papers" section of the Website.

SUBMISSION OF PAPERS

- All papers should be submitted in both *electronic and hard copy form* to your Session Organizer by the dates given below.

- Send manuscripts, disks (if you do not have E-mail), Author's Checklist, and signed warranty statement(s) (see Website) to your Session Organizer.

- Closing date for papers (invited and contributed) to reach your Session Organizer:

   Draft version: Oct. 1, 2001 (optional)

   Final version: Nov. 1, 2001 (if to be refereed)

   Final version: Jan. 1, 2002 (if not to be refereed).

- Late manuscripts will not be published.

- The editors reserve the right to reject papers that do not conform to the guidelines or to return papers to authors for re-submission.

If you have any further questions, please contact Brian Phillips, the ICOTS-6 Proceedings Editor, at <bphillips@swin.edu.au>.

ICOTS-6 Scientific Program (Updated regularly at the web site)

Plenary Sessions

1. (Opening address). The Importance of Numeracy and in Particular of Statistics Literacy for South Africa. John Volmink.

2. Preparing for Diversity in Statistics Literacy: Implications for Statistical Institutions, Researchers, and Educators. Iddo Gal, & Scott Murray.

3. Statistical Literacy vs. Statistical Reasoning, and Thinking: How are they Related, and how are they Different? Joan Garfield.

4. Teaching, Learning and Assessment: Complementary or Conflicting Categories for School Statistics? Peter

Holmes.

5. International Forum on Statistics Literacy. Helen MacGillivray, Chair Luigi Biggeri, Lisbeth Cordani, Pali Lehohla & Jessica Utts.

6. (Closing address). 1982-2002 From the Past to the Future. Maria-Gabriella Ottaviani.

7. (After dinner speaker) What Can Cheap Computing Offer Statistics Literacy? George W. Cobb

Topic 1. Statistics Literacy, Brian Phillips & Iddo Gal.

Session 1A. Frameworks and Studies in Statistics Literacy, Iddo Gal.

1. A Coherent Fabric of Statistics Literacy. Andrew Ahlgren.

2. Three Kinds of Statistics Literacy. Milo Schield.

3. Analysis of Data from a Nationwide Psychological Project Involving Coin-tossing Predictions. David Green.

4. Profile for Statistical Understanding. Chris Reading.

Session 1B. Statistics for the Citizen, Brian Phillips.

1. Educated Citizens Should Know About Statistics and Probability. Jessica Utts.

2. Promoting Statistics Thinking amongst Secondary School Students in the National Context. Philip J. Boland.

3. DNA "Fingerprints" and their Statistical Analysis in Human Populations. Marie Phillips.

4. Observational The Public's Understanding of Health Statistics: The Case of Congenital Anomalies. Beverley Botting.

5. Probability and Game Shows. Mike Fletcher.

6. What Creativity: Statistics and the Dead Sea Scrolls. Don Bentley.

Topic 2. Statistics Education at the School Level, Jane Watson.

2A. Innovative Ideas for Teaching Statistics in Elementary School, Dave Pratt.

1. Young Children's Probabilistic Thinking.Jenni Way.

2. Ratios and Rates in the Learning of Statistics. Jose Luis Cortina.

3. Building Understandings of Randomness: 6-8 Year-old Children's Exploration in Sample Space. Efthymia Paparistodemou, & Richard Noss.

4. Children's Interactions with Digital Representations of Random Phenomena. Hollylynne Stohl Drier.

2B. Innovative Ideas for Teaching Statistics in Secondary School, Gail Burrill

1. Wizardry or Pedagogy?: What is the Driving Force in the Use of New Technology in Teaching Statistics? James Nicholson & Gerry Mulhern

2. Data Driven Activities: Teaching Statistics Through Mathematics. Jeff Witmer.

3. Teaching Statistics for Critical Thinking. Hanan Innabi.

4. Linking Data Analysis and Probability. Patrick (Pat) Hopfensperger.

5. Secondary Statistics in Hong Kong, Louisa Lam.

2C. Research on Teaching Statistics at the School Level, Pat Thompson.

1. Teachers' Conceptions and Constructions of Pedagogical Representations in Teaching Statistics: A Case of Arithmetic Average.Jinfa Cai.

2. Concept Mapping on Statistical Education at Primary School Level: Italian Research. Silio Rigatti Luchini, Maria Pia Perelli D'Argenzio, & Gianfranco Moncecchi.

3. Can Grade 3 Students Learn about Variation? Jane Watson.

4. Instructional Models for Teaching Statistics across the Currículo. Susanne P. Lajoie.

5. Constructing Meanings for Data Representations. Dani Ben-Zvi.

6. Research in Teaching and Learning Statistics: Connections to the Classroom. Gail Burrill.

7. The Role of Teachers and Students in Shaping Materials in a Development Project. James Nicholson & Gerry

Mulhern.

8. Representations and Concept Attainment in Inferential Statistics. Steven Coddington.

9. Data Analysis, Concepts of Variable, and Correlation in a High School Statistics Course. Patrick W. Thompson.

2D. Innovative Statistics Curriculum Development and Research Projects at the School Level, Dani Ben-Zvi

1. CensusAtSchool 2000: Creation to Collation to Classroom. Doreen Connor.

2. Statistics at School Level in South Africa - the Way Forward. Delia North & Maria-Gabriella Ottaviani.

3. The Effects of Some Teaching Techniques on Learning Statistics. Gianfranco Galmacci & Anna Maria Milito.

4. How Far Can We Go in the Statistics Curriculum Development at the Secondary School Level to Reach Successfully the Objective?. Annie Morin.

5. An Emergent Model as the Backbone of an Instructional Sequence on Data Análisis. Koeno. Gravemeijer, Paul Cobb, & Kay McClain.

6. Lessons to be Learned from Curriculum Development in Statistics.Peter Holmes.

2E. Sociocultural Aspects of the Learning of Statistics at the School Level, Paul Cobb.

1. Learning, Identity, and Statistical Data Análisis. Paul Cobb, & Lynn Hodge.

2. Sharing Ideas and Statistical Learning: The Role of Peer Interactions in School Context. Carolina Carvalho, & Margarida Cesar.

3. Are Statistical Meanings Contingent on Setting? The Case of Nursing. Celia Hoyles, & Richard Noss.

2F. Local Teachers Sessions, Vishnu Naidoo, & Jackie Scheiber.

Topic 3. Statistics Education at the Post Secondary Level, Gilberte Schuyten & Allan Rossman.

3A. Statistics as a Service Subject in First Level Courses, Beth Chance.

1. Statistical Consulting with Undergraduates - a Community Outreach Approach. Brian Jersky.

2. Elementary Statistics International Travel Lab Component. Robert A. Leslie.

3. Community-Based Learning: Motivating Encounters with Real-world Statistics. Rob Root & Trisha Thorme.

3B. Statistics as a Service Subject in Second Level Courses: Teaching Regression Models, Joachim Engel.

1. Interpretation of Regression Output: Diagnostics, Graphs and the Bottom Line. Wesley O. Johnson.

2. Interactive Java-based Tools in Regression Análisis. Todd Ogden.

3. Compact and Slim Teaching of Statistical Education using Graphics of Statistical Software. Shuichi Shinmura.

4. Regression and Correlation - an Intuitive Approach. Manfred Borovcnik.

3C. Statistics for Future Statisticians, Ann Cannon.

1. The Evolution of an Applied Statistics Undergraduate Degree. Christine Straker.

2. Meeting the Perceived Needs of statistical Education with Available Manpower and Resources. Ann-Lee Wang.

3. The American Statistical Association's Undergraduate Statistics Education Initiative. George W. Cobb.

3D. Statistics and Research Designs: An Integrated Approach, Glenys Bishop.

1. Experimental Research in a Statistical Concepts Course, Alice M. Richardson.

2. Teaching Statistics and Research Methods in an Virtual Learning Environment. Hans van Buuren.

3. Preparing Agriculture Students for Research and Development Projects. Parinbanu N. Kurji.

3E. Statistics Learning with Cases/Projects, Roxy Peck.

1. Case Studies in the Mathematical Statistics Course. Deborah Nolan.

2. Statistical Investigations - Drawing it all Together. Flavia Jolliffe.

3. Survey Sampling: Learning by Doing. A Twenty Years Graduate Level Teaching Experience. Jean-H Chauchat.

4. Projects for Advanced Undergraduates - Leaving the Script Venid. Margaret Mackisack.

3F. Bayesian Statistics, Dalene Stangl.

1. Teaching Introductory Statistics from A Bayesian Perspective. Jim Albert.

2. Teaching Bayesian Statistics to Undergraduates: Who, What, Where, When, Why, and How. W. M. Bolstad.

3. Maieutic, Laboratory-Based Approach to Teaching Probability Theory and Its Applications to Measurement Uncertainty. Giulio D'Agostini.

4. Software for Teaching Bayesian Statistics. Hedibert Lopes.

5. Technological Options for Incorporating Bayesian Methods into the Undergraduate Currículo. Thomas Short.

6. The Role of Exchangeability as a Basic Concept in Introductory Courses on Bayesian Statistics. Pilar Iglesias & Sergio Weschler.

3G. Nonparametric Methods, Noel Veraverbeke

1. The Teaching and Practical Implementation of the Non-parametric Bootstrap. Cornelia J. Swanepoel.

2. A Sort Introduction to Nonparametric Curve Estimation. Ricardo Cao.

3. Visual Basic Applications and Spreadsheet for Teaching Estimation of Nonparametric Density and Regression Functions. Federico Palacios-Gonzalez.

4. Tests for Interaction in a Two-way Layout: Should They Be Included in a Nonparametrics Course? Thomas Hettmansperger.

3H. Teaching Consultancy Skills to Statisticians, Gabriella M. Belli.

1. Statistical Consulting at Colombian Universities: A Challenge Still to be Faced. David Ospina, & Luis A. Lopez.

2. Teaching Consultancy through Direct Experience in Research Projects: The Approach of the Department of Biostatistics at the University of North Carolina at Chapel Hill. Shrikant I. Bangdiwala, M. Lourdes Amarillo, Chulaluk Komoltri, Sergio R. Munoz , M. Nelcy Rodríguez, Julio M. Singer, & Suresh Ughade.

3. Statistical Consultancy in a South African University: Using a Research Resource Centre to Empower Social Science Researchers. Andile Mji, & Michael Glencross.

4. Tae Rim Lee.

3I. Statistics for Future Teachers, Graham Jones & Zakayo Msokwa.

1. A Statistics Course for Elementary and Middle School Teachers. Mike Perry & Gary Kader.

2. A Data-Oriented, Active Learning, Post-Calculus Introduction to Statistical Concepts, Methods, and Theory. Allan J. Rossman, & Beth Chance.

3J. Statistics for Future Health Care Professionals, Tom Short , & Amita K. Manatunga.

1. Making Statistics Relevant for Undergraduate Nurses. Peter Martín, & Robyn Pierce.

2. From Testing to Decision-making: Changing how we Teach Statistics to Health Care Professionals. Dalene Stangl.

3. Usage of Medical Journal Articles in Biostatistical Training for Residents. Reena Deutsch.

4. Intensive Short-Courses in Biostatistics for Fellows and Physicians. Walter T. Ambrosius, & Amiita K. Manatunga.

3K. Sampling for Surveys, Alan Welsh.

1. Lynne Stokes

2. Ray Chambers

3L. Multivariate Statistics, John Harraway.

1. Multivariate methods for ecology and environmental science. Marti J. Anderson.

2. Hierarchical Linear Models for the Analysis of Longitudinal Data with Applications from HIV/AIDS Program Evaluation. Ann A. O'Connell.

3. Making Multivariate Interesting and Fun For Students. Joe F. Hair, Jr.

3M. **Hypothesis Testing**, Alan McLean.

1. NHT in Psychology: Throwing the Baby out with the Bath Water? Michael Granaas.

2. Statistacy, Vocabulary and Hypothesis Testing. Alan McLean.

3N. Teaching Categorical Data Análisis, M.J.Campbell.

1. Teaching Categorical Data Análisis. Alan Agresti

2. Teaching Statisticians and Applied Researchers Statistical Methods for Analysis of Data from Rating Scales. Experiences from Joint Research Courses in Rating Scale Data Analysis. Elisabeth Svensson.

3O. Statistics for the Actuarial Syllabus, Iain MacDonald.

Topic 4. Statistics Education/Training and the Workplace, Carol Joyce Blumberg , & Rene H.M. Smulders.

4A. Making Statistical Consulting and Technical Co-operation More Effective. Jean-Louis Bodin.

1. New Challenges in Training for Statistical Development in Developing Countries. Ben Kiregyera.
2. M. Lamine Diop, & M. N'guessan Koffi.
3. On Promoting Statistical Consulting in Statistics Education/Training. James H. Matis.
4. New Challenges in Training for Statistical Development in Developing Countries. Ben Kiregyera.

4B. The Role of National and International Statistics Organizations in Improving Statistical Knowledge in the Workplace, Marcel Van den Broecke.

1. Statistics in the Working Place in the Developing Countries of the ESCAP Region; Challenges for the Management of the National Statistical Organizations. Maarten Boon.
2. The Role of Eurostat in the Exchange of Statistical Knowledge between Statistical Offices and Central Banks: the CMFB Experience. Bart Meganck.
3. Role of American Statistical Association in Statistics Education. Madhuri S. Mulekar, & Madge Haven.

4C. Training of Official Statisticians, Denis Farrell

1. A New Qualification for Statistical Clerks in National Statistical Offices, Bradley Payne, Peter Holmes, & Neville Davies.
2. Ellen Bastiaens-Krabbe.
3. Experiences and Challenges in the Training of Official Statisticians. Pilar Martin Guzman.
4. Teaching the System of National Accounts - The Ukrainian Experience. Ruslan Motoryn.

4D. Distance Learning. Lea Bregar, Irena Ograjensek, & Bettie Basson

1. Requirements and Structure of Web-Based Courses for the Workplace. Simone Borra, Agostino Di Ciaccio.
2. Statistical Education and the Workplace: Present State of Affairs and Future Challenges. Lea Bregar, & Irena Ograjensek .
3. From Online Learner to Online Teacher. Sharon Copeland-Smith.
4. Experiencing Statistics at a Distance. W. Robert Stephenson.
5. Just-In-Time Network-Based Statistical Learning: Tools Development and Implementation. Lea Vermeire, An Carbonez, & Paul Darius.
6. Models and Metaphors in Internet-based Learning. Johannes Cronje.

4E. Using Official Statistics in Teaching, Sharleen Forbes.

1. The Italian Census at School. Prof. Lombardo, Cristiana Conti.
2. Making census count in the classroom. Lesley Hooper.
3. PANEL DISCUSSION: Children's Censuses: Their Role in Official Statistics and in Statistics Education. Doreen Connor, Cristiana Conti, & Sharleen Forbes.
4. Use of Official Statistics in Teaching University Geography Students. Enrica Aureli.
5. Teaching Official Statistics in an Irish University Statistics Department. Patrick Murphy.
6. The Israel Diploma in Official Statistics - a Case Study of Interaction Between Official Statistics and University Teaching. Gad Nathan.

4F. Statistical Training and Education of Lawyers, Judges, Doctors, Researchers, and Other Professionals, Elisabeth Svensson, & Kamanzi-wa Binyavanga.

1. Teaching Statistics to Medical Doctors Through research Methods: A case of medical Education Research in Iran. Abbas Bazargan
2. Cramming for Court: Teaching Statistics to Litigators. Mary Gray

3.   Statistical Training for Doctors. Mike Campbell

4G. Preparation and Training of Workers in the 21st Century, Albert P. Shulte

1.   Statistics - Driving Success or Blocking the Road? Stephen A. Zayac, P.E.

2.   Statistical Education and Training for the Workers of the Public Administrations: Objectives, Issues and Strategies. Luigi Biggeri , & Alberto Zuliani

4H. Educating Managers, Executives, Politicians, Government Officials and Other Decision Makers, Theodore Chadjipadelis

1.   Using Statistics as a Tool in Political Research: The Case of Electoral Behaviour. Theodore Chadjipadelis.

2.   Statistics Education for Future Managers: Needs, Obstacles, Possible Solutions. Corinne Hahn, & Patrick Dassonville.

3.   International Statistics for Public and Private Decision Makers: New Tools to Improve the OECD Communication Policy. Enrico Giovannini.

4I. Statistical Training and Education in Environmental Settings, María Virginia López , & María del Carmen Fabrizio

1.   What Statistics do Environmental Scientists and Managers Need to Know? Bryan F. J. Manly.

2.   Role of Statistics in the Education of Agricultural Science Students. Katarina Cobanovic.

3.   Teaching Statistics to Geography and Geology Students. John H. Schuenemeyer.

4J. Practical Training in the Workplace for Tertiary and Postgraduate Students, Katherine Taylor Halvorsen

1.   Dr. William Parr. The Executive Education Program for Managers and Engineers at the University of Tennessee.

4K. Training of Institutional Research Professionals,Amanda Lourens

1.   Statistics and the Practice of Institutional Research. Gerald W McLaughlin

2.   Promoting Statistics Literacy: New Opportunities for the Training of Institutional Research Professionals. Linda Hewitt

3.   Training Institutional Research Professionals: Teaching a Statistics Course in Six Hours or Less, The Art of Teaching. Mary Ann Coughlin.

4.   Intriguing Facets of Institutional Research. Pieter Vermeulen.

4L. Informal Gathering of Those Interested in Statistics Education/Training in the Workplace, Carol Joyce Blumberg , & Rene H.M. Smulders.

Topic 5. Statistics Education and the Wider Society, Helen MacGillivray

5A. Relationships with Mathematics Education, Brian Greer

1.   David Vere- Jones

5B. Teaching Statistical Thinking for Use in the Wider Society, David Griffiths

1.   Statistical Thinking for Effective Management J. A. John, & D. G. Jonson

2.   Statistical Thinking Models. Chris Wild

3.   Brian Greer

5C. Statistics Education in and for the Economic World of Business and Government Policy-Making, Eric Sowey

1.   The Official Statistician - Teaching Values and Techniques to Statisticians and the Community. Richard Madden

2.   Making Statistics More Effective in Schools of Business. Jon Cryer

5D. Statistics Education and the Statistical Profession, Neville Davies

1.   Continuing Professional Development and Government Statisticians. Pali Lehola.

2.   Brian Phillips

3.   Neville Hunt

5E. Statistics Education and the Engineering World,Helen MacGillivray

1. "What does this have to do with us?" - Teaching Statistics to Engineers. Richard Wilson

2. Stephen Vardeman

3. James Moody

5F. Statistics Education and the World of Information Technology, Gianfranco Galmacci

1. Interactions between ICT and Statistics Education. Mike Fuller.

2. A New Environment For Educational Data Análisis. Webster West.

3. Distance education on the World Wide Web and the use of modern technology: How can we gain from interaction between them? Petter Laake.

5G. Statistics Education and the World of Life and Health Sciences, Petter Laake

1. Julie Cliff. Epidemiology of konzo: How can studies of the aetiology of the disease be utilized for teaching purposes?

2. Theodore Colton

3. Educating statiticians for work in epidemiology: Can we find the correct balance between general statistical ability and particular skill? Ivar Heuch.

4. Using health sciences examples in the basic statistical concepts course. Dennis Pearl.

5. Teaching biostatistics in South Africa by distant education: Experiences from an exchange program between the Medical University of South Africa and the University of Massachusetts. Penelope Pekow. Penelope Pekow.

5H. Including Social Issues in the Teaching of Statistics, Jacky Galpin

1. The Getting of Wisdom: Educating Statisticians To Enhance Their Clients' Numeracy, Eric Sowey

2. Does statistical education include social issues? Jacky Galpin.

3. Educating people to understand social issues such as gun violence through data. Swapna Mukhopadhyay.

4. Panel discussion on Social Issues in Statistics Education

Topic 6. Research in Statistics Education, Carmen Batanero, & Joan Garfield

6A. Developing Statistics Education Research, Mike Shaughnessy

1. Creating Cognitive Conflict in a Controlled Research Setting. Jane M. Watson

2. Assessing and Fostering Children's Statistical Thinking. Graham A. Jones, Cynthia W., Carol A. Thornton, & Edward S. Mooney

3. Assessing and Tracing the Development of Basotho Elementary Students' Probabilistic Thinking. Mokaeane V. Polaki

4. Mathematics Teachers' Professional Knowledge Of and About Probability. Tova Kvatinsky & Ruhama Even

5. Is Stochastics Research Influencing Classroom Practice? John Truran

6. Aspects of Students' Understandings of Variation. Mike Shaughnessy

6B. Theoretical Models of Statistical Knowledge, Thinking, Reasoning and Learning,Maxine Pfannkuch, & Chris Wild

1. Studying the Median: A Framework to Analyze Instructional Processes in Statistics Education. Juan D. Godino

2. Statistical Thinking Models. Chris J. Wild & Maxine Pfannkuch

3. A Framework on Middle school Students' Statistical Thinking. Cynthia W. Langrall & Edward S. Mooney

4. How Students Experience Learning Statistics and Teaching. Peter Petocz & Anna Reid

6C. Technology and Research in Teaching and Learning Statistics, Erica Morris.

1. The Role of Computer Based Technology in Developing Understanding of the Concept of Sampling Distribution. Kay Lipson.

2. Introduction to the Normal Distribution in a Course of Data Analysis: Specific Meaning Induced by the Use of Computers. Liliana Tauber & Victoria Sanchez

3. The Re-education of Psychology: Technology and Research for Statistical Reform.Geoff Cumming

6D. Studies of Assessment in Statistics Education. Susanne Lajoie

1. Addressing Cognitive and Situational Complexity in the Instruction and Assessment of Statistical Reasoning. Sharon J. Derry, Joel R. Levin & Rand J. Spiro

2. Investigation Questions and the Path to Statistical Understanding. Nancy C. Lavigne Susanne P. Lajoie

3. Statistics Assessment in Multidisciplinary Contexts. Susanne P. Lajoie Andrew Chiarella

6E. Teachers' Training, Conceptions and Beliefs, Lisbeth Cordani

1. Probability and Statistics in Elementary School: a Research of Teachers' Training. Celi Aparecida Espasandin Lopes Anna Regina Lanner de Moura

2. Teacher's Beliefs about Usefulness of Simulation with Educational Software Fathom in order to Develop Concepts of Probability in Statistics Classroom. Ernesto Sanchez Sanchez

3. Teacher's Training in a Statistics Teaching Experimentation Linda Gattuso, & Maria A. Pannone.

4. Investigating the 'Data Sense' of Preservice Teachers Tim Burgess

6F. Research into Teaching and Learning Statistics at Tertiary Levels,Flavia Jolliffe

1. Modelling Students' Learning of Introductory Statistics. Dirk Tempelaar

2. University Students' Understanding of Concepts Relating to Research Design and Introductory Statistics. Erica Morris

3. Choosing to Study Independently - When is it a Bad Idea? Glenda Francis

4. Results from a Clinical Trial in an Introductory Statistics Course: Evaluating the Effect of Multimedia Presentations on Student Learning and Attitudes- Sterling Hilton

6G. Research into Teaching and Learning Probability, Antonio Estepa

1. It's Not Enough to Know the Formula. Carolyn A. Maher, & Regina D. Kiczek

2. Introducing the Study of Random Situations and their Model Building Process to 14-15 Years Old Students. Cileda de Queiroz Silva Coutinho (France)

3. Teaching Probability and Statistics to 10 Years Old Children. Marie Berrondo-Agrell (France)

4. On the Use of Paradoxes in the Teaching of Probability. Talma Leviatan

6H. Round Table Discussion: Major Problems and Directions in Statistics Education Research. Joan Garfield & Carmen Batanero Chair: Joan B. Garfield

1. J. Michael Shaughnessy

2. Carmen Batanero

3. Discussant: M. G. Ottaviani

Topic 7. Technology in Statistics Education, Laurence Weldon

7A. Java-Based Instructional Packages, Doug Stirling

1. Java Applets and Multimedia Catalogues for Statistics Education. Hans-Joachim Mittag

2. Applets for Experimenting with Statistical Concepts. Paul Darius

3. Interactive Content in Web Pages Teaching Statistics. Doug Stirling

7B. Computer-Based Demonstrations of Statistical Phenomena, Andrej Blejec

1. Erich Neuwirth

2. Using Dynamic Graphics for Teaching Statistical Concepts. Mervyn G Marasinghe

3. Teaching Statistical Concepts with Simulated Data. Andrej Blejec

4. Hands-on Survey Research in a Virtual Environment. Peter Theuns.

7C. Using Technology for Statistics Education in Engineering, David Bacon

1. Statistical Process Performance Monitoring: A Multi-disciplinary Training Challenge. Elaine Martín, & Julian Morris

2. Technology, Elucidation, Statistical Thinking and Engineering Students, Helen MacGillivray

3. Teaching Experimental Design to Engineers, Douglas C. Montgomery.

7D. Using Graphics Calculators in Statistics Education, Kay Lipson

1. Simulation as a Tool to Develop Statistical Understanding. Gail Burrill.
2. Simulating Experiments with the Graphics Calculator TI83Plus. Guido Herweyers
3. What Topics/Skills do Students Need in a Calculator. Ibrahim Wasir
4. @tNet, an Internet Based Software for Teaching Introductory Statistics. Gilbert Saporta (France)

7E. Statistics Education and the Internet, Joe Wisenbaker

1. News - groups and Teaching Statistics. Are they useful?.Jenny Pange.
2. The Effect of Web-Assisted Instruction on Motivation and Achievement in an Introductory Statistics Course. Renee L. Cambiano, George S. Denny, & Jack B. De Vore.
3. Landscape of Learning Data Analysis. Arthur Bakker.

7F. Research-Based Design and Use of Software for Teaching Statistical Concepts, Cliff Konold , & William (Bill) Finzer.

1. Technology, Statistics, and Subtleties of Measurement: Bridging the Gap between Science and Mathematics. Tim Erickson.
2. Designing Statistical Software: Lessons from StatPlay. Sue Finch.
3. Is Research-based Development of a Commercial Statistics Learning Environment Possible? - The Fathom Experience. Bill Finzer
4. Challenges in Designing Data Analysis Software for Young Students. Cliff Konold.
5. Interactive Visualizations of Statistical Relationships: What do We Gain? Andee Rubin.

7G. Software Tools Designed for Statistics Education, Rodney Carr

1. New Opportunities to Visualize the Teaching of Probability and Statistics. Douglas Butler.
2. High School Stats Made Easy...Owen Giles, & Siva Ganesh.
3. A Data Analysis Tool that Organizes Analysis by Variable Types. Rodney Carr.
4. Using Fathom to Promote Dynamic Explorations of Statistical Concepts. Robin Lock.

Topic 8. Other Determinants and Developments in Statistics Education, Philip J. Boland (Ireland)

8A. Learning Factors in Statistics Education, Robert delMas

1. The Issue of Motivation and Expectation in the Introductory Statistics - Obstacles and Opportunities. Carl Lee. Maria Meletiou, Howard K. Wachtel, & Aklilu Zeleke.
2. Using Short Stories to Teach Statistics. Livia M. D'Andrea, & Charley Waters.
3. Comparison of At-Risk and Traditional College Students in Introductory Statistics. Robert C. delMas.
4. Examining the Interplay Between Constructivism and Different Learning Styles. Jacqueline B. Miller.

8B. Data Analysis and Statistical Learning, Kay McClain

1. Kay McClain.
2. Richar Lerher
3. Cliff Konold.

8C. History of Stochastics Education, John Truran

8D. Gender and Cultural Factors in Statistics Education, Rosa Giaimo

1. Learning Statistics and Survey Methodology in A Corporate University Setting. Tyra Dent Smith, & Sandra T. Duckett.
2. Gender and Cultural Factors in Statistical Education. Malati Pochun.
3. The State of Gender Statistics in Russia Today. Olga Vershinskaya.

8E. Projects and Poster Competitions in Statistics Education, Jerry Moreno

1. The Benefits of Fitting the Statistical Poster Competition into the Curriculum. Linda Quinn.

2. Final-year Business Students Experiences of Data Analysis in Projects. Loi Soh Loi

3. Data Analysis Talent Award: A Giant Leap!. Saleha Habibullah

4. Pedagogic Issues Required for Successful Statistical Project Competitions to be Implemented. Susan Starkings.

8F. The Mass Media and Statistics, Shen Shir Ming

1. Statistical Literacy and the Media. Martin Podehl

8G. Teaching Statistics to Second-Language Students. Mbulaheni Nthangeni

1. Statistics Teaching Enhanced by Teamwork - a Multicultural Experience in South Africa. Renette J Blignaut-

2. Understanding of Basic Probability Concepts among First Year University Students. Michael Glencross, & Andile Mji.

Topic 9. An International Perspective on Statistics Education. Vitalis Muba

9A. Statistics Eduation in Portuguese-speaking counries, Helena Bacelar-Nicolau

9B. Statistics Education in African Countries, Fayez Mina

1. An Experimental Approach for Teaching Statistics in Egyptian Schools. Reda Mosad El-Said

2. Problems of Probability. Vivien Budge (South Africa)

3. Teaching Statistics in Kenya. John W. Odhiambo

4. Is It Reasonable to Teach Statistics without Probability or Probability without Statistics? Jules de Tibeiro

9C. Statistics Education in Spanish-speaking Countries, Teresita Teran

1. Teaching Statistics in Secondary School. An Overview: From the Curriculum to the Reality. Elena F. de Carrera

2. The Research on Stochastic Education in the Ibero-American Countries. Antonio Estepa

3. The Development of Statistics in the Structure of the Argentine National Educational System.Teresita Teran

4. The Importance of Official Statistics in the Teaching of Statistics. Nora Lac Prugent

5. Informatics Technology as a Pedagogic Resource in the Universities. Elda Gallese

6. The Economy of the Intangible and the Preference of Statistic Contents in the Accounting Teachers. Elda Gallese and others

Topic 10. Contributed Papers, Susan Starkings

Topic 11. Posters, Andrew I. Dale, dale@scifs1.und.ac.za

IPC Chair
Maria-Gabriella OTTAVIANI
ottavian@pow2.sta.uniroma1.it

International Organizer
Brian PHILLIPS
bphillips@swin.edu.au

IPC Scientific Secretary
Dani BEN-ZVI
dani.ben-zvi@weizmann.ac.il

VISIT-ME 2002 .Vienna Int'l Symposium on Integrating Technology into Mathematics Education, 10-13 July 2002, Vienna, Austria

Topics include:

- CAS-based curricula
- CAS-supported teaching methods
- Assessing with technology
- Dispensable and indispensable skills, abilities, and competencies
- CAS as pedagogical tools for visualization, trivialization, experimentation, concentration ...

- New classroom examples using CAS
- The next generation: PeCAS = Pedagogical CAS

More information from: b.kutzler@eunet.at

Website: www.kutzler.com/visit-me-2002.htm

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at the undergraduate level Crete, Greece, July 1-6, 2002

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- EDUCATIONAL RESEARCH: Results of current research in mathematics education and the assessment of student learning. Access and equity.
- TECHNOLOGY: Effective integration of computing technology (Calculators, Computer Algebra Systems, WWW resources) into the undergraduate curriculum
- INNOVATIVE TEACHING FORMATS: Innovative ways of teaching undergraduate mathematics, such as cooperative and collaborative teaching. Writing in mathematics; laboratory courses.
- CURRICULA INNOVATIONS: Revisions of specific courses and assessment of the results. History of mathematics; innovative applications; project driven curricula.
- PREPARATION OF TEACHERS: Trends in teacher education. Changing needs of teachers.
- MATHEMATICS AND OTHER DISCIPLINES: The effects of changes in the teaching of mathematics on other fields. The needs of client disciplines; interdisciplinary courses.
- DISTANCE LEARNING: Distance learning technologies (networking, tele-education) for teaching and learning mathematics. Current hardware and software delivery media; educational materials. Visions for the future.

More information from Ignatios Vakalis, Dept of Math/Computer Science, Capital University, USA, <ivakalis@capital.edu>. Web page: www.math.uoc.gr/~ictm2

PME 26, Norwich, UK, July 21-26, 2002.

The PME 26th conference will be held in Norwich, United Kingdom, at the campus of the University of East Anglia (see http://www.uea.ac.uk), from July 21st to July 26th, 2002. We are delighted to be hosting PME 26 at the University of East Anglia (UEA) in the U.K. UEA is on the outskirts of the medieval cathedral city of Norwich in Norfolk and is accessible by air, rail and road. Built in the 1960s UEA is a modern university surrounded by beautiful parkland. We offer high quality, en suite accommodation on campus and range of conference rooms of all shapes and sizes! Norfolk also offers a wide range of leisure and cultural activities.

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