NEWSLETTER OF THE INTERNATIONAL STUDY GROUP
FOR RESEARCH ON LEARNING PROBABILITY AND STATISTICS

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## AN APOLOGY

I know this newsletter was promised in May, and I know I promised to send an updated member address list. Unfortunately, these promises are unfulfilled. Due to a very busy spring and an abundance of news, this is being sent at the end of June, and once again has no room left for a list of our ever-growing membership. Please be patient and if you need a particular address (regular or e-mail) just let me know and I'll forward it to you.

## THE JOURNAL OF STATISTICS EDUCATION: SOON TO BE A REALITY!

This new journal will soon be a reality. The following information describes how to subscribe and how to submit manuscripts.

**SUBSCRIPTIONS to JSE** may be obtained free of charge. Two types of subscriptions are available.

Subscribers to "jse-announce" will receive announcements of new issues of the JSE, including a table of contents, abstracts of articles, and instructions on retrieving journal materials.

Subscribers to "jse-talk" will also receive these announcements, but will in addition become part of an on-line electronic forum devoted to discussions relevant to the JSE. These subscribers are encouraged, but of course not required, to participate in the discussion.

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JSE will publish high-quality articles on a variety of topics related to the teaching of statistics, for instance, results of controlled experiments on pedagogical methods, case studies and anecdotal reports, review and opinion articles, discussion of the impact of new technologies and new methods of assessment on statistics education. The journal will also publish reviews of software, books, and teaching materials; reviews should

be descriptions of an instructor's experiences actually using a particular book or piece of software with students. Articles which make innovative use of the electronic medium are encouraged. Articles submitted to the journal will be reviewed by three referees.

**Submission of manuscripts** via e-mail is preferred, but materials on diskette or paper can be accommodated. The electronic format of the journal requires that articles follow certain formatting conventions; consult the Guidelines for Authors before submitting materials to JSE. The Guidelines for Authors may be obtained by sending e-mail to archive@jse.stat.ncsu.edu with the one-line message (no subject is needed): send jse/author.guide. Guidelines may also be obtained by writing to E. Jacquelin Dietz, Department of Statistics, Box 8203, North Carolina State University, Raleigh, NC 27695-8203.

## ANNOUNCEMENT AND CALL FOR PAPERS: ICOTS 4

The International Statistical Institute (ISI) and Morocco's l'Institut National de Statistique et d'Economie Appliquee (INSEA) announce the **Fourth International Conference on Teaching Statistics (ICOTS 4)**, to be held in Marrakech, MOROCCO, from 25 to 30 July, 1994.

The program will include invited lectures, contributed papers and working groups. Names and addresses of the organizers of the different sessions are given below. Those interested in contributing a paper or taking part in a working group should contact the organizer of the session before December 30, 1993. After that date, and until May 31, 1994, additional paper proposals may be sent to the chairman of the Programme Committee, Prof. Yves Escoufier, Universite Montpellier II, Science et Technique du Languedoc, Place E Bataillon - 34095, Montpellier Cedex 5, FRANCE.

**Scientific Sessions (Topics and Session Organizers)**

1. *Statistical literacy of citizens and public's view of statistics.*
   Dr. Barbara Bailar, 468 N St. SW, Washington DC 20024, USA
2. *Integrating statistical topics throughout the secondary school curriculum.*
   Murray Hill NJ 07974, USA
3. *Data analysis for the elementary curriculum*
   Dr. David Ospina Botero, Dept of Mathematics and Statistics, Universidad Nacional Bogota, Bogota, COLOMBIA
4. *Hands-on and project-based teaching*
   Prof. Don Bentley, Dept of Mathematics, Pomona College, Claremont CA 91711, USA
5. *Research on teaching and learning statistics and probabilistic concepts.*
   Prof. Joan Garfield, The General College, 340 Appleby Hall, 128 Pleasant St SE, the University of Minnesota, Minneapolis MN 54544, USA
6. *Statistical training for and by consultancy*
   Dr. J.D. Lebreton, CEFE-CNRS BP 5051 - 34033 Montpellier Cedex 1, FRANCE
7. *Teacher training*
   Dr. Anne Hawkins, Univ College & Middlesex School of Medicine, James Pringle House, The Middlesex Hospital London W1N 8AA, UK
8. *Computing and software in statistical teaching*
   Dr. J. Rijpkema, Dept of Math and Comp Science, University of Technology, Den Dolech 2, PO Box 513, 5600 MB Endhoven, THE NETHERLANDS
9. *Learning Statistics at a distance,*
   Prof. G. Saporta, CNAM, Dept de Mathematiques, 292 rue Saint Martin, 75141 Paris Cedex 03, FRANCE
10. *Use of video and multimedia technology for teaching*
    Prof. David Moore, Dept of Statistics, Purdue University, West Lafayette, IN 47907, USA
11. *Teaching statistics for future statisticians*
    Prof. A. Rizzi, via Rodi 24, 00195 Roma, ITALY
12. *Teaching statistics for economic statisticians*
    Dr. Boubakkroui Lhoucinc, INSEA, Post Box 6217, Rabat, MOROCCO

*13. Statistics for employees of a statistical offfice.*
Prof. Diop, CESD-Paris, 3 ave Pierre Larousse, 92240 Malakoff, FRANCE

*14. Teaching statistics for future engineers.*
Prof. A. Lazraq, Ecole Nationale de l'Industrie Minerale, Agdal, rue Elghafiki BP 753, Rabat, MOROCCO

*15. Statistics for social scientists.*
Prof. F. Joliffe, The University of Greenwich, School of Math, Stat & Comp, Woolwich Campus, Wellington St, Woolwich, London SE18 6PF, UK

*16. Statistics in continuing education for employees in industry.*
Prof. Ray Harris, Lancashire Poly Fac of Science, Dept of Math & Stat, Lancashire Polytechnic, Preston PR1 2TQ, UK

*17. Initial and continuing education for statistics in agriculture*
Prof. P. Dagnelie, Statistique et Informatique, ave de la Faculte d'Agronomie 8, 5030 Gembloux, BELGIUM

*18. Initial and continuing education for statistics in medicine.*
rof. N. Victor, Inst fur Med Dukumentation, Stats u Datenverarbeitung, Im Neuenheimer Feld 325, 6900 Heidelberg, GERMANY

*19. History of statistical teaching*
Prof. J.J. Droesbeke, 69 ave Stuart Merril, B1190 Bruxelles, BELGIUM

*20. Statistical project competition*
Dr. Shir-Ming Shen, Dept of Statistics, University of Hong Kong, Pokfulam Road, HONG KONG

**Working Groups: (Topics & Organizers)**

*1. The statistics curriculum: towards the year 2000; preliminary Arabic-speaking working group.*
Manmohan S. Arora, University of Bahrain, Dept of Mathematics, PO Box 32038, BAHRAIN

*2. The statistics curriculum: towards the year 2000; preliminary French-speaking working group.*
Prof. D. Dakunha-Castelle, 129 ave du General Leclerc, 91120 Palaiseau, FRANCE

*3. The statistics curriculum: towards the year 2000; prliminary English-speaking working group.*
Prof. P. Holmes, 87 Furniss Ave, Dore, Sheffield S17 3Qn, UK

*4. The statistics curriculum: towards the year 2000; plenary discussion group.*
Prof. Luigi Biggeri, Dipartimento Statitistico, Universita degli Studi di Firenze, v Le Morgagni 59, 50134 Firenze ITALY

*5. Development of Arabic educational software in statistics*
Prof. A. Skalli, Ecole Mohammadia d'Ingenieurs, ave Ibn Sina BP 765 Agdal, Rabat, MOROCCO

*6. Development of French educational software in statistics*
Prof. Annie Morin, Irisa Campus Univ de Beauliieu, ave du General Leclerc, 35042 Rennes Cedex, FRANCE

*7. Development of English educational software in statistics.*
Prof. Paul Velleman, Dept of Econ & Soc Stat, Cornell University, 358 Ives Hall, Ithaca NY 14853, USA

*8. Plenary discussion group on educational software in statistics.*
Prof. N. Lauro, Instituto di Statistica, Univ. de Napoli, via Partenope 36, 80100 Napoli, ITALY

*9. Activities of professional societies in education and public awareness of statistics.*
Prof. J.K. Ghosh, Stat/Math Division, Indian Statistical Institute, 203 BT Road, Calcutta 700

**For further information, write to:**

**Mr. EL GHAZALI Abdelaziz**
**Chairman of the Local Organizing Committee**
**I.N.S.E.A.**
**P.O.Box 6217, Rabat-Instituts**
**Rabat, MOROCCO**

# INTERNATIONAL ASSOCIATION FOR STATISTICAL EDUCATION: 1st SCIENTIFIC MEETING

**Perugia, Italy Dipartimento di Scienze Statistiche**
**August 23 - 24, 1993**

## Aims of the Conference

This is the first scientific meeting of the International Association for Statistical Education (the new section of the International Statistical Institute), included as a satellite meeting in the programme of the 49th ISI Florence Session. The programme of the Conference has been structured to give opportunities for discussion on important aspects of statistical education: research directions, role of computers and other teaching aids, university and college-level statistical education and training, statistical education in developing countries and training statistical staff in government offices. Attention will be devoted to the future role and policy of the new Association.

**Secretariat of the 1st IASE Scientific Meeting**
**Dipartimento di Scienze Statistiche**
**Universita' di Perugia - Via A. Pascoli C.P. 1315 Succ. 1**
**06100 Perugia (Italy)**
**Fax +39-75-43242 Tel. 39-75-5855242**
**E-mail:STATLI@IPGUNIV.EARN**

## PROGRAMME

Monday, August 23

Chair: D. Vere-Jones (New Zealand)

9:00 Inauguration
9:30 R. Biehler (Germany): Cognitive Technologies for Statistics Education: Relating the Perspective of Tools for Learning and of Tools for Doing Statistics
9:55 C. Konold (USA): Teaching the Logic of Statistical Inference through Resampling Techniques
10:20 E. Lombardo - C. Rossi - A. Zuliani (Italy): The Teaching of Probability and Statistics in Preuniversity Schools: Suggestions for an Interdisciplinary Approach

Chair: L. Rade (Sweden)

11:30 T. Arnold (USA): The Role of Electronic Communications in Statistics Education
11:55 A. Blejec (Slovenia): Using Computers in Teaching Statistics - is it Worth?
12:20 D.S. Moore (USA): Using Video in Teaching Statistics

Tuesday, August 24

Chair: G. Cicchitelli (Italy)

9:00 P. Holmes (UK): Teaching Statistics at School Level in EEC Countries
9:25 H. Nicolov - E. Keogh (Zimbabwe): Statistical Education in Developing Countries and the Problem of ``Marketing" University Graduates

Chair: R. Scheaffer (USA)

10:20 V. Barnett (UK): The Role of Consultancy in University Education and Professional Training in Statistics
10:45 G.W. Kibirige - J. Ntozi (Uganda): Three Decades of Training Government Statistical Staff in Developing Countries: the African Experience
11:10 R. Teekens (Luxembourg): Training European Statisticians: the Experience of the First Two Years and Some Reflections on the Future

Chair: K. Vannman (Sweden)

12:05 G.E.P. Box (USA): What Engineers Need to Learn About Statistics
12:30 L. Rade (Sweden): Simulation and the Student Engineer

Chair: D.S. Moore (USA)

3:00 D. Vere-Jones (New Zealand): The IASE and Problems of Statistical Education in Developing Countries
3:30 Forum on: The Future Directions for IASE

## A NEW ELECTRONIC SUBSCRIBER-LIST: MEDSTATED-RESEARCH

**RSS Research Forum on Statistical Education in the Health Sciences**

Medstated-research is intended to provide a forum for debate and information exchange between those actively engaged, or otherwise interested, in research statistical education in any area and at any level within the health sciences.

Colleagues wishing to subscribe should send the following e-mail message (no subject required, substituting your first and lastnames as indicated to **mailbase@uk.ac.mailbase;**

**join medstated-research Firstname Lastname**

Because the discipline of statistical education cannot sensibly progress on the basis of anecdote and speculation alone, it is hoped that this electronic network will permit lively discussion which will encourage;

(i) synthesis and critical appraisal of existing research in statistical education which, even if derived from other contexts, may still be of relevance to statistical educators within the health sciences, and

(ii) new research and publication initiatives in the field, and the development of appropriate research methodologies.

It is hoped that this will prove to be a useful move in the direction of resolving some of the unanswered questions related to the who? what? to whom? why? when? and how? of teaching and learning statistics in the health sciences. Please bring this notice to the attention of others who may be interested.

**George Bright** sent copies of three papers recently presented, stemming from work in the TEACH-STAT project. Copies may be obtained by contacting him at: Dept. of Pedagogical Studies & Supervision, Univ. of North Carolina at Greensboro, Grennsboro, NC 27412-5001. Email: brightg@iris.uncg.edu

**Teachers' knowledge of statistics pedagogy.** By George Bright, Sarah Berenson, and Susan Friel. Paper presented at the annual meeting of the Research Council for Diagnostic and Prescriptive Mathematics, 1993.

One primary goal of TEACH-STAT (a three-year project funded by NSF) is to help elementary school teachers in North Carolina learn how to teach data analysis and interpretation more effectively, that is, learn the pedagogy of statistics. A baseline survey of elementary teachers' knowledge indicated that teachers seemed to: have limited views of what should be taught in order for students to understand data interpretation, emphasize isolated bits of knowledge, mainly about graphing; and have little knowledge about teaching important ideas. At the conclusion of a three-week workshop these teachers' view of statistics seemed to have shifted more toward a holistic view of statistics content, with accompanying increases in knowledge of particular pedagogical strategies to address the components of statistics understanding.

**Elementary teachers' representations of relationships among statistics concepts,** by George Bright and Susan Friel. Paper presented at AERA, April 1993.

This study examined ways that elementary school teachers represented their understanding of the relationships among four critical statistics concepts in the North Carolina Standard Course of Study for Grades K-6. Relationships were examined through concept maps that the inservice teachers drew at the beginning of a three-week summer workshop on statistics. The authors conclude that there are very few concepts that teachers universally see as important parts of statistics content and that teachers seem to have poorly developed relationships among the pieces of statistics content they think about.

**Elementary teachers' fixations on graphical features to interpret statistical data.** By Sarah Berenson, Susan Friel, and George Bright. Paper presented at AERA, 1993.

This paper describes a study designed to investigate the following questions:
1. What features of a line plot and histogram to elementary teachers fixate on when interpreting data?
2. What alternataive conceptions do elementary teachers have about the ideas of center or middle of the data, typical, and prediction, when interpreting graphical representations of data?
Fifty-five elementary teachers were given an open-ended, paper and pencil assessment. Results indicate that strong professional development programs are needed to assist elementary teachers in the construction of stable and viable statistical schema.

**Ruma Falk** sent the following papers:

**The Ups and Downs of the Hope Function in a Fruitless Search** by Ruma Falk, Abigail Lipson, and Clifford Konold. To appear in G. Wright and P. Ayton (Eds.) *Subjective Probability*, Sussex: John Wiley Publishers.

Two experiential problems were designed to investigate the nature of probabilistic reasoning in situations where initial uncertainty about the existence of a target object in a finite field of locations, is followed by a systematic search of these locations. These problems along with Bayesian solutions are presented and discussed. After describing how subjects in the study reasoned about the problems, a didactic device is presented that was developed to make the search problem more conducive to resolution. Finally, the authors explore subjects' ability to transfer the lesson learned from the didactic device to the analogous wait problem.

**Significance Tests Die Hard: The Amazing Persistence of a Probabilistic Misconception.** By Ruma Falk and Charles Greenbaum. To appear in *Theory and Psychology.*

The authors present a critique showing the flawed logical structure of statistical significance tests. They then attempt to analyze why, in spite of this faulty reasoning the use of significance test persists. They identify the illusion of probabilistic proof by contradiction as a central stumbling block, because it is based on a misleading generalization of reasoning from logic to inference under uncertainty. They present new data from a student sample and examples from the psychological literature showing the strength and prevalence of this illusion. They identfiy some intrinsic cognitive mechanisms and extrinsic social pressures which help to maintain the illusion, and conclude by mentioning some alternative methods for presenting and analyzing psychological data, none of which can be considered the ultimate method.

**Jane Watson** sent the following papers:

**What research is needed in probability and statistics education in Australia in the 1990s?** by Jane Watson. In B. Southwell, B. Perry, and K. Owens (Eds.) *Proceedings of the Fifteenth Annual Conference of the Mathematics Education Research Group of Australasia* , 1992.

This paper reviews research on learning probability and statistics and related work in developmental psychology in light of the initiative to introduce Chance and Data in the K-12 Australian curriculum. Watson argues that there is an urgent need for research into the understanding of concepts related to probability and statistics to be carried out in Australia, based on the foundation of the literature reviewed. This research would assess responses to tasks in probability and statistics in order to (i) build a cognitive model of student and teacher understanding of the topics, (ii) make suggestions for the introduction and ordering of these new topics in the mathematics curriculum, and (iii) provide assessment procedures for the evaluation of the implementation of the curriculum.

The other two papers, "**Current thinking on items for assessing understanding in chance and data** " and "**Initial considerations concerning the understanding of probabilistic and statistical concepts in Australian students**" are working papers, which may be obtained by contacting Jane at: University of Tasmania, GPO Box 252C, Hobart Tasmaina, 7001 Australia. E-mail:jane.watson@educ.utas.edu.au

**Chris Hancock** offered the following papers:

**Coordination sets and properties when representing data: The group separation problem** by Aaron Falbel and Chris Hancock. Paper to presented at PME, Japan, 1993.

This paper reports on a clinical study of students' productive understanding of database record/field structures. Using a data analysis tool with which they were familiar, students were asked to create a database structure that would allow them to produce a desired graph. A recurring pattern was observed in which subjects produced a set-based structure instead of the required property-based structure.

**Authentic inquiry with data; critical barriers to classroom implementation.** By Chris Hancock, James Kaput, Lynn Goldsmith. In Educational Psychologist, 1992, Vol. 27, 337-364.

These authors explore challenges in achieving authentic inquiry with data in classrooms from the fifth through the eighth grade. They present Tabletop, a prototype computer-based data analysis tool based on animated visual representations, and report on clinical and classroom trials of this tool. Vignettes from clinical sessions illustrate students' understanding of the software interface as well as interacting subtleties of data creation and data analysis. One year of classroom trials is summarized in terms of three important categories of conceptual and cultural prerequisistes for successful implementation: a. reasoning about the aggregate, b. the objectification of knowledge, and c. the pragmatic structure of classroom projects.

Chris's address is: TERC, 2067 Masschusetts Ave., Cambridge, MA 02140. e-mail: chris_hancock@terc.edu

A new member of the study group, **Susanne Lajoie** provided the following papers:

**The use of hypercard for facilitating assessment: A library of exemplars for reifying statistical concepts.** By Susanne Lajoie, Nancy Lavigne, and John Layless. Paper presented at AERA, 1993.

This paper describes an authentic statistics project for eighth graders using computers for both instruction and assessment purposes. A hypercard library of exemplars is demonstrated that reify exemplars of average and above average performance of criteria that students should at excel at when they develop their own statistics projects. Two conditions (text and computer) were developed to test the significance of the library for improving performance. Both conditions demonstrated significant performance gains from pre to post test.

**New ways to measure skills of problem solving, communication, reasoning, and connectedness.** By Susanne Lajoie, Nancy Lavigne, John Lawless, and Steven Munsie. Paper presented at AERA, 1993.

The same authentic statistics project for eighth graders is described, but this paper focuses on new forms of assessment which pertain to problem solving, communication, reasoning, and connectedness. Multiple mediums of assessment were used, such as paper and pencil tests, audio and video tapes, and computer screen recordings, in an attempt to provide valid indicators of learnng.

Susanne's address is: McGill University, Dept. of Educational Psychology, 3700 McTavish St., Montreal, Quebec H3A 2T6, Canada. e-mail: cysl@musica.mcgill.ca

**Clifford Konold** has a new paper of interest:

**Teaching probablity through modeling real problems.** To be published in the *Mathematics Teacher.*

Konold describes a lesson that exemplifies an alternative approach to teaching introductory probability. In this approach, students learn to apply probability models to real-life situations and estimate probabilities through conducting simulations. This activity involves modeling the policy instituted in China to limit a family to one child, and models what would happen to the population if the Chinese were allowed to continue to have children until one son was born.

Cliff also has a new list of available papers written by the Probability and Statistics Research Group at SRRI. To obtain this list, send him an e-mail message at konold@srri.umass.edu or write to him at SRRI, Hasbrouck Lab, University of Massachusetts, Amherst, MA 01003.

## Articles of Interest in *Teaching Statistics*

**The Analysis of Experimental Data: The Appreciation of Tea and Wine.** by Dennis Lindley. *Teaching Statistics*, Spring 1993.

A classical experiment on the tasting of tea is used to show that many standard methods of analysis of the resulting data are unsatisfactory. A similar experiment with wine is used to show how a more sensible method may be developed.

**Computers in the Statistics Curriculum**, by John Higgo. *Teaching Statistics*, Summer 1993.

This article is a condensed version of a comprehensive report Computers in the Mathematics Curriculum (1992). This paper discusses the role of computers in teaching and learning statistics (e.g., how they affect learning styles and the role of the teacher), and raises issues about how the school curriculum should change and what research is needed on the use of computers.

Also in the summer issue of *Teaching Statistics* is a **Research Report** of the work of Carmen Batanero and colleagues at University of Granada. The Spring 1993 issue contained a report on Research in Israel, featuring the work of Ruma Falk and Maya Bar Hillel.

## New Working Group on Statistics

**The National Center for Research in Mathematical Sciences Education** at the University of Wisconsin has formed a working group on the learning and teaching of statistics. Tom Romberg is chairing the group, whose charge is to examine ways that descriptive and inferential statistics and probablity can effectively be integrated in the pre-college mathematics curriculum. Its goal is to plan a statistical education program that will develop students who are able to use statistics to understand real world phenomena, to interpret data summaries and displays of information, and to be critical of claims and arguments based on data. The group will summarize current knowledge and strategies about the learning and teaching of statistics and carry out a research program that addresses these areas.

## INFUSING STATISTICS INTO ELEMENTARY MATHEMATICS TEACHING

A comprehensive project at TERC, in Cambridge, Massachusetts, is working with teachers in several states to incorporate statistics into the elementary mathematics curriculum. In collaboration with the State Departments of Education in Vermont, California, Indiana, and Mississippi, TERC is developing and implementing inservice training to accompany *USED NUMBERS*, an exemplary elementary statistics curriculum developed by TERC and published by Dale Seymour. The inservice materials and training will help teachers build a foundation of data analysis skills and learn effective ways of teaching these skills. The project will also provide much-needed student assessment strategies to support teachers as they undertake this non-traditional area of the mathematics curriculum. (From the newsletter: *About TERC 1993*, distributed by TERC Communications, 2067 Massachusetts Avenue, Cambridge, MA 02140.

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