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

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WHO ARE WE?

Are you wondering who belongs to this study group and where they live and work? Since I haven't published a list of members and their addresses for several years it seemed like a good time to do so. At the end of this newsletter is a list of everyone who is currently on my mailing list along with their email addresses (if I had them) Please note that each time I have published such a list in the past I have received messages about errors and changes in addresses. So be warned: this list may not be entirely accurate. I will include a list of corrections and additions in the next newsletter. In order to do this, I ask everyone to send me an email or FAX message soon after you read this newsletter, sending me one or more of the following pieces of information:

- Confirmation that your regular and email addresses are correct and complete
- Corrections/additions if your address is incorrect or if information is missing
- Intentions to attend the Fourth International Conference on Teaching Statistics to be held in Morocco this summer so that I may plan a gathering or meeting for members.
- Information on a recent paper or presentation that I have not mentioned in the newsletter that would be of interest to the study group
- Notification that you want to be removed from the list, or if you know of someone who should be on the list and isn't. (Sometimes people forget to tell me they wish to remain on the list when I send out a query, and I drop their names from the mailing list.)

I look forward to hearing from each of you!

The Research Program: ICOTS 4

The last newsletter included a list of the invited papers for ICOTS 4, Session 5: Research on teaching and learning statistics and probabilistic concepts. Since then, Claude Gaulin has organized an additional invited paper session which will take the form of a panel discussion. The title of the session is "Research Issues related to Green's Test of Probability Concepts". The panelists and their topics are:

"International Comparative Study Concerning David Green's Test"

Claude Gaulin (Laval University, Quebec City, Canada)
Julianna Szendrei (Budapesti Taritokepzo Foiskola, Budapest, Hungary)
Maria do Carmo Vila (Univ. Federal de Minas Gerais, Belo Horizonte, Brazil)
Jose Antonio E. Damasceno (Univ. Federal de Mato Grosso, Cuiaba, Brazil)

"Green's Test vs. a Test used by Fischbein: Comparative Results"

Juan Diaz Godino, Univ. of Granada, Spain

"Development of Probability Concepts: A Re-analysis of Green's Data

John Izard, Australian Council for Educational Research, Australia

There will also be nine or more contributed papers, including:

"Introducing Box and Whisker Plots"
John Carr and Andy Begg, University of Waikato, NZ

"Population, Measurement, and Variable:
Three Basic Conceptual "Inductors" of Statistical Thinking"
Humberto, Mayorga and Luisa Fernanda Jimenez
Universidad Nacional de Colombia

"The Role of Constructivism in Statistics Education"
Larry Lesser, Austin, Texas, USA

"A Synthesis of the Research Literature on the Learning and Teaching of Data Analysis Concepts and Skills"
Carol Joyce Blumberg, Winona State Univ, MN, USA

"The Success of Graphic Models to Visualize Conditional Probabilities"
Wolfgang Bea, Roland Scholz
Universitaet Karlsruhe, Germany

"Assessment Issues in the Teaching of Statistics"
Megan Clark, Victoria University, NZ

"About Dimensionality of Probabilistic Thought"
Lina Sanchez and Gladys Beltran,
Universidad Nacional de Colombia, Bogota, Colombia

"Challenging and Building on Students' Intuitions about Probability: Can we Improve Undergraduate Learning"
Maxine Pfannkuch and Constance Brown
University of Auckland, NZ

"Students' Understanding of Computer-based Simulations of Random Behaviour"
Peter Wilder
Bedford College of Higher Education, UK

I am still planning to organize invited papers into groups by topics followed by a discussant who will summarize and comment on the papers. Please let me know if you are interested in serving as a chair or discussant for any of the invited or contributed paper sessions.

ARTICLES BY MEMBERS

Proportions, Probability and Other Matters, by **Flavia Jolliffe**, presented at IASE, Perugia, Italy, 1993.

The October newsletter of this study group included an abstract of a Research Report in *Teaching Statistics* by Jolliffe, describing a joint study with Fay Sharples and data collected during 1989 and 1990 at the University of Waikato (NZ) and Brunel University (UK). This paper reports on a follow-up study using a modified set of questions involving understanding of proportions and probabilities. Results are compared to the earlier study.

Addressing Misconceptions in Learning Power Analysis
By Yu Chong Ho, Tom Pensabene and **John Behrens.** Presented at AERA, Atlanta, GA, 1993

This article describes problems in understanding and applying the concept of statistical power in social science research and the use of a dynamic computer-based simulation to identify students misconceptions related to power.

"Inconsistencies in Students' Reasoning about Probability" by **Clifford Konold**, Alexander Pollatsek, **Arnold Well**, Jill Lohmeier, and Abigail Lipson
This paper which was mentioned in an earlier newsletter is now in print!
Journal of Research in Mathematics Education, November 1994.

Abstract: Students were asked to select from among four possible sequences the "most likely" to result from flipping a coin five times. The majority of students correctly answered that the sequences are equally likely to occur. This result suggests, as does performance on similar NAEP items, that most secondary school and college-age students view successive outcomes of a random process as independent. However, in a follow-up question, subjects were also asked to select the "least likely" result. Only half the subjects who had answered correctly responded again that the sequences were equally likely, the others selected one of the sequences as least likely. This result was replicated in a second study in which 20 subjects were interviewed as they solved the same problems. These results suggest that the percentage of secondary school students who understand the concept of independence is much lower than the latest NAEP results would lead us to believe, and, more generally, point to the difficulty of assessing conceptual understanding with multiple-choice items.

Papers presented at PME

Four research papers on teaching and learning statistics were presented at the fifteenth annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA) held last fall in California. **Cliff Konold**'s paper " "Understanding the Law of Large Numbers" was already mentioned in the October newsletter. The others are:

"The Development of Elementary Teachers' Statistical Concepts in Relation to Graphical Representation. by Sarah Berenson, Susan Friel, and **George Bright.**

Abstract: The objectives of this research were to determine if there were patterns in elementary teachers' development of statistical ideas. Center of the data and typical of the data were the two concepts studied. Comparisons of teachers' responses before and after instruction were made to determine areas of fixations and ideas about measures of center. Before instruction teachers tended to fixate on large graphical features. After instruction teachers focused on measures of center, particularly the median, to explain their ideas of center, rather than graphical features. More teachers focused on data intervals after instruction to explain typical in the histogram, but these ideas were not stable over the two graphs. We conjecture that fixations and stability are two factors in determining the statistical conceptual development of elementary teachers.

Statistics Knowledge of Elementary Teachers
By **George Bright**, Susan Friel and Sarah Berenson.

Abstract: This study examined 56 elementary school teachers' knowledge of statistics before and after a three-week statistics workshop. Content knowledge was assessed through a paper-and-pencil instrument of twelve, open-ended statistics questions; responses were scored holistically. Understanding of relationships among four critical statistics concepts (selected from the state curriculum) was assessed through analysis of concept maps. Performance on eleven of the statistics questions improved significantly. Teachers' written responses improved in completeness and clarity. Teachers included more of the four concepts in their second concept maps and showed more relationships among the four concepts. There were not dramatic increases, however; concepts were still viewed mainly as independent. Future instruction for teachers needs to deal more explicitly with relationships among statistics concepts.

Young Children's Interpretations of Chance Situations
By **Kathleen Metz**

Abstract:
Research literatures offer discrepant views concerning what understanding of chance entails, its relation to thinking probabilistically, and the nature of alternative interpretations. This study capitalized on the technology of videotapes to closely examine children's interpretations within tasks involving randomness and a qualitative level of differential probabilities. The author worked individually with 12 kindergartners and 12 third graders in their exploration of four different spinners. Two independent coders analyzed all of the tapes for manifestations of interpretation. Codings across 258 data points resulted in a 82% inter-rater reliability. Understanding of chance followed understanding of probability. Chance apart from probability was rare. However, probabilistic reasoning without chance was common, in the sense that children held strong or absolute expectations about outcomes based on relative distribution of colors in the immediate spinner.

Other Publications of Interest

Lionel Pereira-Mendoza informed me that the proceedings from the Round Table on Introducing Data Analysis in the Schools (held in the summer of 1992 in Canada) is now available and can be ordered through the International Statistical Institute in the Netherlands. The email address for ISI is: isi@cs.vu.nl

The Stat-File Project

In the last newsletter I mentioned the STAT-File project which consists of developing an electronic data base of the research literature on teaching and learning statistics. I am working on this project jointly with Susanne Lajoie at McGill University. We now have over 600 papers on our data bases and will be combining them into one file that will be available for review. Thanks to those who already volunteered to review the list. It should be ready in the next few months.