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

VOLUME 8, NUMBER 1 January 1995 UNIVERSITY OF MINNESOTA

JOAN GARFIELD,
SECRETARY AND EDITOR
140 APPLEBY HALL
128 PLEASANT ST. S.E.
MINNEAPOLIS, MINNESOTA 55455
E-MAIL: JBG@VX.CIS.UMN.EDU
FAX: (612) 626-7848

New Members

We have eight new members joining the study group. Please add their names and addresses to the list of members in the October newsletter.

Sue Finch, Department of Psychology, School of Behavioral Sciences, University of Melbourne, Parkville, Australia, 3052 e-mail: u1719861@uscvc.ucs.unimelb.edu.au

Carolyn Keeler, University of Idaho, Boise Center, 800 Park Blvd., Boise,Idaho 83712 USA, e-mail:keeler@idui1.csrv.uidaho.edu

David Kuhn, Dept. of Psychology, DePaul University, 2219 N. Kenmore, Chicago, IL 60614 USA e-mail: pgrddak@hawk.depaul,edu

Jan Gunnar Moe, AAlesund COllege, Fogd Greves vei 9, N-6009 Aalesund, Norway e-mail: jangunnar.moe@mrih.no

Karen Swenson, George Fox College, 1408 Coffey Lane Apt A. Newberg, Oregon 97132, USA

Ross Taplin, Mathematics Programme, Murdoch University, WA 6150, Australia e-mail: taplin@zed.murdoch.edu.au

Neil Thomason, History and Philosophy of Science, University of Melbourne, Parkville, VIC 3052, Australia e-mail: phinrt@lure.latrobe.edu.au

Phil Vahey, EMST, 4533 Tolman Hall, University of California at Berkelye, Berkeley CA 94720, USA e-mail: pvahey@violet.berkeley.edu

Corrections to Membership List

Please add the following updates or corrections to the membership list in the October newsletter.

Meral Aksu e-mail: aksume@tutor.fedu.metu.tr

Carmen Batanero e-mail: batanero@goliat.ugr.es

James Corter e-mail: jec34@columbia.edu

Patricia Elmore email: ga1117@siucvmb.siu.edu

Iddo Gal 3910 Chestnut Street, Philadelphia, PA 19104-3111

Ann Aileen O'Connell Room 100, College of Education, University of Memphis, Memphis, TN 38152 USA e-mail: oconnell ann@coe.memphis.edu

Ching-Fan Sheu e-mail: csheu.psy.depaul.edu

Research Roundtable for 1996

Please be sure to note the call for papers for the **IASE Roundtable Conference** which appears at the end of this newsletter. Feel free to share this information with interested colleagues.

Research Papers at ICOTS 4

A collection of some of the research papers from the **Fourth International Conference on Teaching Statistics** will soon be available. If you are interested in purchasing a copy of this collection, please send me a message via e-mail or by Fax, so I will know how many copies to have made. This collection contains the full-length, unedited papers, whose titles and abstracts are listed below (in random order). The estimated cost is about $20 (US).

Truran, John
University of Adelaide, South Australia
"Children's Intuitive Understanding of Variance"

This paper discusses the important pedagogical question of by how much experimental probabilities need to deviate from subjective or symmetric probabilities before children consider revising their subjective probabilities. Many children believe that common random generators like coins and dice are subject to mystical of physical powers, or to be inherently opposed to a child's wishes. Even 9% of Year 11 students have be found to believe that a six is the least likely outcome from tossing a die. Providing experiences which encourage children to revise their opinions is difficult. One reason for this difficulty arises from the mathematics of the situation. There are 2500 tosses of a coin necessary to obtain a relative frequency of between 0.48 and 0.52 with 95% confidence. This makes it very difficult to attempt a classroom confirmation of any theory.

Forbes, Sharleen
Ministry of Maori Development, Wellington New Zealand
"Assessing Statistics Learning"

The traditional assessment of students' learning in statistics courses has followed the model used for mathematics and many other subject areas; that is time constrained written examinations. In New Zealand a large proportion of statistics assessment is still of this form. In order to determine whether this is the most appropriate form of assessing statistics learning consideration needs to be given to the following:

- fundamental differences between the content of statistics and other courses,
- the skills required of statistics learners,
- the purpose(s) of assessment, and
- whether particular forms of assessment advantage or disadvantage some groups of learners.

While this paper raises issues related to the first three points above, the major focus is on the last. Performance in the national examinations sat by secondary school students in New Zealand is analyzed for gender and ethnic differences in two different forms of assessment: project based internal assessment and traditional written examination.

Biehler, Rolf
Universitaet Bielefeld, Germany
"Probabilistic thinking, statistical reasoning and the search for causes: Do we need a probabilistic revolution after we have thought data analysis?"

My interest is in the relation between probability and statistics (data analysis) with regard to teaching and learning. Ideas for teaching (exploratory) data analysis with no preparation in probability emphasize, among other things, finding relations in sets of variables, identifying relevant variables, interpreting data with regard to sources of variation, possible explaining factors and causes. Probability is often introduced as an antithesis to deterministic situations. Some empirical research even blames children for looking for causes where there is "really" randomness. There is other research taking positions against stochastics.

Lipson, Kay
Swinburne University of Technology, Australia
"Understanding the role of computer based technology in developing fundamental concepts of statistical inference."

Traditional courses in statistics generally approach inference from a theoretical probability based perspective. Since the mathematical backgrounds of students is often not strong, many courses use computer based simulations to empirically justify ideas which are too complex or too abstract for most students. However, eventually, students must move from the empirical to the theoretical understanding of the concept if they are to apply these ideas to traditional inference methodologies. This paper questions the effectiveness of some of these strategies, and discusses how computer based technologies may be used effectively to bring together theoretical and empirical perspectives.

Truran, Kath
University of South Australia
"Children's Understanding of Random Generators"

This paper discusses the premise that young children do not perceive accurate relationships between the behaviour of different, but related random generators. Data for this preliminary study has been collected from suburban primary school students aged from 7-12 years, who were questioned about their perceptions of the behaviour of dice, coins, raffle tickets, and a range of different and unusual random generators in identical situations. The findings indicate that children predict different results depending for example, on whether tickets rather than dice are used in a game. Their predictions appear to be based on the observation

of the physical differences between dice and raffle tickets. Owing to the size of the preliminary study no tests of significance have been carried out and results are given in simple percentages.

Godino, J.D., Batanero, M.C., and Cañizares, M.J.
University of Granada, Spain
"A Comparative Study of Two Instruments for Evaluating Primary Probabilistic Reasoning"

Here we approach the complex nature of probabilistic reasoning, even at its most basic level, and its evaluation through written tests. We also present the conclusions of a theoretical and experimental study of two tests designed to evaluate primary probabilistic intuitions, reaching the conclusion of the need for them to be mutually complementary in order to improve the validity of their content, both for including items from the different components of probabilistic reasoning and from the universe of task and contextual variables.

Pfannkuch, Maxine and Brown, Constance
Mathematics Education Unit & Department of Statistics
The University of Aukland, New Zealand
"Building on and Challenging Students' Intuitions about Probability: Can We Improve Undergraduate Learning?"

Students in our first year probability and statistics course typically experience problems in leering formal probability. They also often fail to grasp the logic behind confirmatory methods. The premise of this paper is as follows: to enable students to understand and be comfortable with inferential (or even exploratory) statistics, they must be allowed to (1) experience the omnipresence of variation and (2) experience probability as a means to describe and quantify that variation. A pilot study to investigate the understanding of variability and probability of a small group of students enrolled in the 1994 course is described. These students have a strong tendency to think deterministically (especially in real world settings); they have little understanding of variability and its relationship to sample size; and they are generally unable to reconcile their institutions with the formal probability they are taught. There were some initial indications that allowing students to experience variation personally made them more aware of their over-emphasis on casual explanations of variability. Lastly, it appears that students' awareness about probabilistic thinking can be raised be actively challenging and discussing their tacit intuitive models about chance.

Glencross, Michael J.
University of Transkei, South Africa
Laridon, Paul E.
University of the Witwatersrand, South Africa
"Understanding of Probability Concepts Among South African Children"

During the period 1991 to 1993 a new junior high school curriculum was introduced in many South African schools. This curriculum is fairly strongly constructivist in design. A study of probability was included for the first time in any ordinary South African curriculum, this being at the standard 7 (Grade 9) level. The approach is initially experimental but continues into the more formal presentation in terms of sample spaces. This situation presented the researchers with an opportunity of looking at the unschooled understanding of probability concepts amongst South African children before the curriculum was actually implemented. Data were also collected once some of the children had been taught about probability according to the new curriculum. It was anticipated that analysis of results would enable the researchers to identify prevalent misconceptions; to ascertain the effects of the teaching of probability according to the new curriculum; to compare the intuitive understanding of various groups (male and female, urban and rural); to offer suggestions for teaching on the basis of the findings and to compare the intuitive understanding of South African children with that of children from other countries such as Britain, Canada, and Brazil. In this paper we look at the pre- and post- testing done in a selection of schools in the Johannesburg region and, for the Johannesburg and Umtata samples, present and innovative analysis of data from a selection of items from the instrument used.

Estepa, A.
University of Jaen, Spain
Batanero, C.
University of Granada, Spain
"Judgments of Association in Scatterplots: An Empirical Study of Students' Strategies and Preconceptions"

In this paper an experimental study of students' strategies in solving a judgment of association in scatter plots is presented. The classification of these strategies from a mathematical point of view allows us to determine concepts and theorems in action and to identify students' conceptions concerning statistical association in scatter plots. Finally, correspondence analysis is used to show the effect of task variables of the items on students' strategies.

Jimenez, Vallecillos A.
Department of Mathematics, University of Granada, Spain
Holmes, P.
Centre for Statistic Education, Sheffield University, England
"Students' Understanding of the Logic of Hypothesis Testing"

Significance testing is one of the most controversial subjects in research and also one of the most misunderstood topics in the learning of statistics. In this paper we present the results from a theoretical and experimental study concerning University students' understanding about the logic of statistical testing. The theoretical study discusses epistemological issues concerning Fisher's and Neyman-Pearson's approach to hypothesis testing and their relationship to the problem of induction in experimental sciences.

The experiment sample included 436 students from 7 different university mayor. Some of these students had a theoretically oriented course in statistics, such as those reading Mathematics, whereas others had a practically oriented course in statistics, such as those reading Psychology. The item presented in this paper is part of a larger questionnaire, which includes 20 items, and refers to the kind of proof provided by the results of a test of hypothesis. Following the analysis of these students' arguments, we identify three main conceptions: a) the test of hypotheses as a decision rule which provides a criterion for accepting one of the hypotheses; b) the test of hypothesis as mathematical proof of the truth of one of the hypotheses and c) the test of hypothesis as an inductive procedure which allows us to compute the "a posterior" probability of the null hypothesis.

Watson, Jane M.
University of Tasmania, Hobart, Australia
"Instruments to Assess Statistical Concepts in the School Curriculum"

This paper will document four instruments devised to assess student understanding of statistical concepts. Two are intended for large scale administration and two are for individual interviews.

Greer, Brian; Ritson, Rene
Queen's University , Northern Ireland
"Readiness of Teachers in Northern Ireland to Teach Data Handling"

Data handling has recently been introduced in the United Kingdom as a major component of the mainstream school mathematics curriculum. A survey of teachers in Northern Ireland showed that they are generally not well prepared to teach the new material, particularly probability.

Lecoutre, Marie-Paule
Université de Rouen, France
"Cognitive Models and Problem Spaces"

As part of study on the natural interpretations of probability, experiments about elementary "purely random" situations (with dice or poker chips) were carried out using students of various backgrounds in the

theory of probability. A prior study on cognitive models which analysed the individual data of more than 600 subjects had shown that the most frequent model used is based on the following incorrect argument: the results to compare are equiprobable because it's a matter of chance; thus, random events are thought to be equiprobable "by nature". In the present paper, the following two hypotheses are tested: 1) Despite their incorrect model, subjects are able to find the correct response. 2) They are more likely to do so when the "chance" aspect of the situation has been masked. An experiment testing 87 students showed, as expected, that there is a way to induce the utilization of an appropriate cognitive model. However the transfer of this model to a classical random situation is not as frequent as one might expect.

Batanero, M.C.; Godino, J.D.
University of Granada, Spain
"The Use of Multivariate Methods to Analyze Students' Stochastic Conceptions"

The theoretical basis of this paper is the modeling of students' conceptions about a specific topic as a qualitative and systematic construct. Following therefrom, a discussion about the role of multivariate analysis for studying the structure of these conceptions and for building explanatory models relating to this structure to task, cognitive and instructional variables. An empirical study of students' intuitive conceptions referring to statistical association is used as an example.

Carr, John; Begg, Andy
University of Waikato, New Zealand
"Introducing Box and Whisker Plots"

Box and whisker plots were introduced to a group of eight students for enrichment and follow-up sessions as part of a project looking at the ideas that 11 and 12-year-olds have about central tendency and dispersion. This paper reports some tentative findings about the teaching and learning of box and whisker plots to middle-school children.

Cotts, James W.
Southern Utah University, USA
"Factors Influencing Student Performance in Statistics"

It is almost unarguable that the introductory statistics course is the most widely feared course on most university campuses. Dropout and failure rates are extremely high. Students come into the course with low expectation of success. And I have often wondered and talked with colleagues about this fear and lack of success. Can we identify any factors that affect our students' performance in the "Introduction to Statistics" course? Can we determine "what makes a students statistical clock tick?" Or perhaps more precisely, "what prevents a student's statistical clock from ticking?" Do factors such as *sex. major* (field of study), *class* [freshman (first year), sophomore (second year), junior (third year) senior (fourth year)] or *mathematics background* have a bearing on student performance? For the above factors, no big surprises were found. But another factor, suggested to me by a colleague in the Psychology Department produced a rather stunning result. That factor is the student's dominant **learning style.**

Jolliffe, Flavia
University of Greenwich, UK
"Why ask Why?"

In prior research studies on students facility with proportions, students at tow different universities in NZ and the UK were given short sets of self-completion questions. All questions were followed with "Why do you say this?" and nearly all were open-ended. This paper concentrates on the "Why?" parts of some of the simpler questions and discusses the usefulness of asking students to give a brief reason as to why they had chosen the answer they gave. Responses given by the UK students are used to illustrate points.

Wilder, Peter
De Montfort University, UK
"Students' Understanding of Computer-Based Simulations of Random Behaviour"

This paper is motivated by a concern about the increasingly important role being given to computer-based simulations of random behaviour in the teaching and learning of probability and statistics. Many curriculum developments in this area make the implicit assumption that students accept the computer algorithm for generating random outcomes as an appropriate representation of random behaviour. This paper will outline some reasons for questioning this assumption, and will indicate a need to investigate how students' mental models of random behaviour differ from their understanding of the computer representation of randomness.

Garfield, Joan and delMas, Robert
University of Minnesota, USA
"Students' Formal and Informal Understanding of Statistical Power"

Statistical power is defined as the likelihood that a particular statistical test will correctly determine a false null hypothesis. This idea is usually taught in the context of hypothesis testing and is related to Type 2 error, by showing that power is the complement of Beta, the probability of making a Type 2 error. Textbooks often include a discussion of the effect of different variables on power, such as sample size, alpha level, type of test, and standard error. Our experience teaching statistics indicates that students rarely understand or remember much about power, other than that it involves calculations and formulas. Because we believe that it is important for students to learn to understand the nature of statistical power and think about power in relationship to research, we examined the types of understandings needed to understand power. Different items were written and used to assess students' informal ideas related to power prior to the formal study of statistics and hypothesis testing. In order to assess students' more formal understanding of power (e.g., what factors affect power and how they may be manipulated) students in an intermediate level statistics course were engaged in a learning activity using an interactive software package "Power Simulator." After the test students were given a post test to determine how well they understood the concept and application of statistical power. Results of both tests indicate that power is a very complex concept, that students' responses to particular questions are often influenced by the problem's context and their own ideas or experience with that context, and that students need more experience with programs like the Power Simulator to develop a more solid understanding of statistical power and its application in research.

Bea, Wolfgang, and Scholz, Roland
Universität Karlsruhe, Germany and ETH-Zentrum, VOD, Switzerland
"The Success of Graphic Models to Visualize Conditional Probabilities"

We worked out special training programs for conditional probabilities and compared their success. The programs were based on graphic models to visualize conditional probabilities: the tree diagram, the inverted tree diagram, and the unit square. A program with purely numeric representation was added. Two hypotheses were formulated and tested regarding the long term and short term success of the different training programs. Results support the use of graphic models to visualize conditional probabilities, which appear to induce a more sustainable knowledge. The unit square proved to be superior in terms of long term success.

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

Recent research in New Zealand at the senior secondary school and early tertiary level suggest that the type of assessment used in statistics courses has a marked effect on performance. The research strongly suggest that, in particular, female students perform better in the investigative, open-ended project work used in internal assessment than they do in timed examinations. Within examinations certain student perform better on questions set in a relevant social context than they do in questions with a more theoretical context. The layout of a question was seen to have an effect in some cased. This research has implications for teaching as it indicates that certain contexts make statistics more or less accessible to particular groups of students.

Journal of Statistics Education

Listed below are the Table of Contents and Abstracts for the Volume 2, Number 2, of the electronic *Journal of Statistics Education.*

Volume 2, Number 2 (November 1994) ISSN: 1069-1898

CONTENTS

ABSTRACTS

Sandra Fillebrown, "Using Projects in an Elementary Statistics Course for Non-Science Majors" (21K)

ABSTRACT: Two of the most common suggestions for improving statistics education are using substantial open-ended projects and using real data sets for statistical analysis. Both recommendations have been incorporated successfully into an elementary statistics class for non-science majors by having the students design, implement, and analyze the data from their own statistical study over the course of a semester. Details of how this implementation was organized as well as a partial list of the students' projects are included.

KEY WORDS: Problem-based learning; Student-generated data; Experiments; Surveys.

Iddo Gal and Lynda Ginsburg, "The Role of Beliefs and Attitudes in Learning Statistics: Towards an Assessment Framework" (61K)

ABSTRACT: While many teachers of statistics are likely to focus on transmitting knowledge, many students are likely to have trouble with statistics due to non-cognitive factors, such as negative attitudes or beliefs towards statistics. Such factors can impede learning of statistics, or hinder the extent to which students will develop useful statistical intuitions and apply what they have learned outside the classroom. This paper reviews the role of affect and attitudes in the learning of statistics, critiques current instruments for assessing attitudes and beliefs of students, and explores assessment methods teachers can use to gauge students' dispositions regarding statistics.

KEY WORDS: Affective issues; Assessment instruments; Anxiety.

Michael Laviolette, "Linear Regression: The Computer as a Teaching Tool" (35K)

ABSTRACT: Computers and software can be used not only to analyze data, but also to illustrate essential statistical topics. Methods are shown for using software, particularly with graphics, to teach fundamental topics in linear regression, including underlying model, random error, influence, outliers, interpretation of multiple regression coefficients, and problems with nearly collinear variables. Systat 5.2 for Macintosh, a popular package, is used as the primary vehicle, although the methods shown can be accomplished with many other packages.

KEY WORDS: Statistical software; Statistical education; Graphics; Model comparisons.

Bruce E. Trumbo, "Some Demonstration Programs for Use in Teaching Elementary Probability: Parts 1 and 2" (37K)

ABSTRACT: Graphical, computational, interactive, and simulation capabilities of computers can be successfully employed in the teaching of elementary probability, either as classroom demonstrations or as exploratory exercises in a computer laboratory. In this first paper of a contemplated series, two programs for EGA-equipped IBM-PC compatible machines are included with indications of their pedagogical uses. Concepts illustrated include the law of large numbers, the frequentist definition of a probability, the Poisson distribution and process, and intuitive approaches to independence and randomness. (Commands for rough equivalents to the programs using Minitab are shown in the Appendix.) --BT

KEY WORDS: Law of large numbers; Poisson process; Simulation; Computer program; Pedagogy.

Ronald L. Wasserstein, "Lotto Luck: A Computer Demonstration for the Classroom" (18K)

ABSTRACT: Students of all ages seem fascinated by the lottery, making it a ready tool for illustrating basic probabilistic concepts. The author has developed a program called "Lotto Luck" for IBM PC compatibles which has been used in over 100 classrooms from grades 6 through 12 and with dozens of college classes and civic groups to demonstrate what happens to the "earnings" of the frequent lottery player over a period of time. We discuss how to use the program and provide information for obtaining the compiled code by ftp.

KEY WORDS: Probability; Lottery; Gambler's ruin.

"Teaching Bits: A Resource for Teachers of Statistics" (34K)

ABSTRACT: This column features "bits" of information sampled from a variety of sources that may be of interest to teachers of statistics. Joan Garfield abstracts information from the literature on teaching

and learning statistics, while Laurie Snell summarizes articles from the news and other media that may be used with students to provoke discussions or serve as a basis for classroom activities or student projects.

Allan J. Rossman, "Televisions, Physicians, and Life Expectancy" (10K)

ABSTRACT: This dataset contains information on life expectancies in various countries of the world and the densities of people per television set and of people per physician in those countries. The example has proven very useful for helping students to discover the fundamental principle that correlation does not imply causation. The data also give students an opportunity to explore data transformations and to consider whether a causal connection is necessary for one variable to be a useful predictor of another.

KEY WORDS: Correlation; Causation; Transformation; Prediction.

Other Publications of Interest

The **International Association for Statistical Education** has published the Proceedings of its first scientific meeting, held at University of Perugia, Italy in August 1993. Many members of this study group presented papers at that meeting, some have been described in previous newsletters. Papers are divided into sections on *Statistical Education at the School Level*, *Teaching Probability and Statistics at the University Level*, *Computers, Video and other Tools in the Teaching of Probability and Statistics*, *Education Programmes and Training in Statistics*, and *Issues in the Teaching of Probability and Statistics*. Also included are separate papers on *The IASE and Problems of Statistical Education in Developing Countries*, and *Updating Teaching Methods in Probability and Statistics*, and a list of abstracts of posters presented.

I recently acquired a two-volume *Handbook for Data Analysis in the Behavioral Sciences*, edited by Gideon Keren and Charles Lewis, published in 1993 by Lawrence Erlbaum. The volumes are titled "Statistical Issues" and "Methodological Issues". The book on statistical issues is divided into the following parts, each part containing several chapters by different authors: Analysis of Variance and Multiple Regression, Bayesian Statistics, Categorical Data and the Analysis of Frequencies, and Other Topics, which include Exploratory Data Analysis, Graphical Data Analysis (a wonderful chapter by Wainer and Thissen), Uses of Computers in Psychological Research, Computer Simulations, and Time-Series Experiments.

The volume on Methodological Issues has sections on Models and Measurement, Intuitive Statistics (with a paper on the perception of randomness by Bar-Hillel and Wagenaar, Hypothesis Testing, Power and Effect size, and section on other methodological issues.

PLEASE SHARE WITH INTERESTED COLLEAGUES

Call for Papers

IASE Roundtable Conference

The **International Association for Statistical Association (IASE)** is sponsoring an invitational roundtable conference to be held at the University of Granada, Spain on July 23-27 1996. The topic of this roundtable is *"Research on the Role of Technology in Teaching and Learning Statistics,"* in the context of elementary, secondary, or college level instruction.

Although the IASE is providing some financial support for the conference, participants will be expected to pay a portion of the cost of lodging and food, as well as their transportation expenses. For a very limited number of participants from developing countries, some support for transportation will be available. All participants will receive a complete set of papers and a copy of the conference proceedings.

This will be a small "working conference" of about 24 participants, consisting of presentations, software demonstrations, and discussions. It is expected that presentations will be grouped into the following categories:

1. Exemplary software for teaching statistics and probability

Demonstrations will be given of exemplary software used to help students learn statistics and probability. Presenters will also discuss the design and purpose of a particular software program, the research on which it is based, as well as evaluative information on the effectiveness of the particular program in helping students learn topics in probability or statistics.

2. How technology changes the teaching of statistics and probability

Presentations will focus on the how the use of computers, graphing calculators, and multimedia have changed or should change the nature of statistics instruction. Papers may be grouped into different educational levels (e.g., K-6, Secondary School, College).

3. What can be learned from research on the impact of technology in helping students learn statistics

Presentations will highlight empirical research involving the use of technology in statistics courses at different educational levels.

4. Questions to be addressed regarding the role of technology in statistics education

These papers will examine unresolved issues involved in the use of technology in improving student learning, and outline the types of research studies that need to be conducted in the future.

Submission of Proposals

If you are interested in participating in this roundtable conference, please submit the following information by **April 1, 1995.**

1. Name, address, and affiliation.

2. E-mail address and/or FAX

3. Short description (no more than one page) of your proposed presentation and how it fits into one of the four categories described above. These abstracts will be evaluated by members of the program committee. Proposals will be favored that describe the careful study and evaluation of particular uses of technology in a specific educational context. We are not seeking papers that offer anecdotal information on one teacher's use of a particular software package.

4. Will you need some financial support to attend the conference? If so, please give details.

Based on the review of proposals, invitations will be distributed by July 1, 1995.

Submit proposals via mail, FAX, or E-mail to:

Joan B. Garfield, Program Chair
University of Minnesota
140 Appleby Hall
128 Pleasant St. S.E.
Minneapolis, MN 55455

Phone: 612-625-0337
FAX # 612-626-7848
E-mail: JBG@vx.cis.umn.edu

Newsletter of the International Study Group for Research on Learning Probability and Statistics

Joan Garfield, Editor
The General College
University of Minnesota
140 Appleby Hall
128 Pleasant St. S.E.
Minneapolis, MN 55455
USA