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

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1. NOTES AND COMMENTS

This has been a very busy and productive summer. During the PME 21 Conference (Lahti, Finland), our Stochastics Teaching and Learning Working Group started to work and many plans have developed for the forthcoming conferences in South Africa (1998), Israel (1999) and Japan (2000). Another important meeting point was the 51st Session of theInternational Statistical Institute (Istanbul, Turkey), where the new1997-99 Executive Committee met for the first time. We are including information from these and other conferences with statistical education component this summer. Joan Garfield is planning to collect some of the more relevant papers at these conferences and distribute copies to interested people.

I am receiving periodical help from John Truran, Joan Garfield, Juan D. Godino and other members in collecting and reviewing the information included here. I am very grateful to all of them, as well as to Andy Begg, Iddo Gal and all the new members who have helped me to prepare this particular issue of the newsletter.

This time I offer additional references to the section on "Subjective perception of randomness" included in the July Newsletter. I have recently been asked for bibliography concerning combinatorial reasoning and its development. Therefore, I will include a basic set of references on Research on Combinatorial Reasoning in January 1998 Newsletter. Please send me any references you would like to include in this special section, as well as suggestions for topics in which you are interested.

The newsletters are available from the Journal of Statistics Education Information Services (http://www2.ncsu.edu/ncsu/pams/stat/info/infopage.html) as well as from our own web page at the University of Granada (http://www.ugr.es/~batanero/).

If there are any corrections or additions to the newsletter, please post them to all members on the list by using the e-mail address alias: stated_list@goliat.ugr.es

2. NEW MEMBERS

Jose Carrillo Yanez

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Jose has carried out a Ph. D. in Philosophy and Education at the University of Sevilla, on the mathematics teachers' conceptions about problem solving (using ethnographic research). He is member of PME working group on professional development, chaired by Nerida Ellerton, and is contributing with a chapter to the book on the subject to be published by Kluwer. He is also coediting a book with Luis C. Contreras about "Matematica espanola en los albores del siglo XXI"

(Spanish Mathematics at the beginnings of the XXI century).

Theodore Chadjipadelis

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Theodore Chadjipadelis, an Associate Professor in the department of Education of the University of Thessaloniki, was awarded his Doctorate by the University of Thessaloniki, where he has worked since 1980. He has been elected Head of the Department of Education for the period 1/9/97-1/9/99. He attends many conferences in Greece and abroad. Theodore Chadjipadelis is a member of the board of the Greek Statistical Institute and of the following institutions: board of the National Session of the Association of Balkan Statisticians, Greek Mathematical Society, International Association for Statistical Education, Hellenic Political Science Association, Greek Operational Research Society and Political Studies Association of the UK. His main areas of interest are applied statistics, modelling electoral behaviour, urban and regional planning, statistics in education. He has about 40 publications in major statistical and political journals in Greece and abroad. Among others he has co-ordinated or participated in the following projects:

Single European market and regional development in East Macedonia and Thrace, funded by Stiftung Volkswagenverk and carried out in co-operation with the Institute of Geography, University of Munster, Germany.

Strategic priorities for the technological modernisation of the Greek industry, funded by the General Secretary of Research and Technology, Greece.

Regional Technology Plan in Central Macedonia. Scientific and technical support for the RTP in Central Macedonia, funded by the European Commission (DG XVI) in the framework of the Article 10 Innovative Actions.

Technology and competitiveness of a regional productive system, funded by the Ministry of National Education, Greece.

Technopoles and science parks: European experience and implementation in Greece, funded by the General Secretary of Research and Technology, Greece.

Strategy for the development of Democritus University of Thrace, funded by Region of East Macedonia and Thrace, Greece.

Innovation centre in Andalusia Technology Park, funded by the European Commission.

Ilona Mathijsen

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Ilona is a Ph.D. student at the University of Maastricht (The Netherlands), Department of Methodology and Statistics. She is doing research on the cognitive effects of different instructional methods in the domain of statistics. One focus is the effect of collaborative learning (according a problem-based learning model of the University of Maastricht) and how it contributes to the problem-solving skills of students. Her main interest is cognitive psychology and its contributions to the teaching and learning of statistics.

Susan Mathews

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Susan is a mathematics educator in a mathematics department, where she has been working for two years now. Her research interest have been in algebraic problem solving, especially the appropriate use of computers to help with problem solving, so her extension to the use of computers for understanding data analysis and graphing seems to be natural.

She is just getting started in reading the literature on statistical education. However she has been working with 4th and 6th graders and their use of the software Data Wonder. Using this, her pupils have created graphs using data of interest to them (pet weights) and then have interpreted the graphs without formal prior instruction. In this research, she asked questions about the differences between what children could read from different kinds of graphs to determine if they could understand histograms (as providing information differently from bar graphs). Although she has not yet formally analysed the data, she was pleasantly surprised by how much understanding the 4th graders (9-10 years old) brought with them from their everyday life experiences.

Christian Rivera

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Christian's basic training is Mathematics Education and he has got a Master in Statistics He

teaches Mathematics at the College of Statistics in the University of Los Andes, Venezuela. He is currently working on the design of school environments for teaching mathematics which favour new didactic practices based on constructivism and information processing. He is also trying to include quality control and processes control tools to increase developing thinking through co-operative learning. He is trying to define the mathematical profile adequate to statistics students, including not only knowledge of mathematical concepts, but strategies in solving problems, willingness to co-operative work, etc.

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Jose Ramon's interest on statistics started in 1976 when he published a book on Biostatistics, subject which he has taught at the University Complutense (Madrid) for many years. He has also taught in-service courses to secondary teachers on probability, statistics and graphics calculators. He has attended some conferences on statistics education, including ICOTS IV.

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3. CHANGES IN E-MAIL ADDRESSES

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Gerald R. Fast: fast@vaxa.cis.uwosh.edu.

CORRECTIONS

Please note that the articles by Menon, Bourke, Ellerton, etc, included in the testing hypotheses section in the July Newsletter should be Mathematics Education Research Journal Vol 5, No.1,1993 instead of 1997.

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4. NEWS FROM IASE (INTERNATIONAL ASSOCIATION FOR STATISTICAL EDUCATION)

The International Association for Statistical Education is pleased to announce the results of the election of officers for the 1997-1999 period. The newly elected Executive Committee assumed office at the General Assembly of the Society, which took place in Istanbul, during the ISI 51st Session. The officers are:

President: M. Gabriella Ottaviani (Italy)

President- Elect: Brian Phillips (Australia)

Vice-Presidents:

Carmen Batanero (Spain)

Joan Garfield (U.S.A.)

Michael Glencross (South Africa)

Lionel Pereira-Mendoza (Singapore).

All the new officers are member of our study group, and therefore, we will be happy to receive feedback from members, and to provide information about IASE to those of you who are not members. IASE hopes to serve as the primary professional society for those with a strong interest in statistical education. IASE is successfully functioning as a professional society, and it has attracted many institutional and personal members to whom it provides meetings and publications.

The ICOTS (International Conferences on Teaching Statistics) meetings in particular are notable as a venue for discussing on statistical education with participants of the most varied backgrounds. Other meetings include IASE Round Tables Conferences, IASE scientific meetings and IASE share within ISI ordinary sessions.

IASE members receive ISI publications, as well as the IASE Review. They may subscribe at a reduced rate to statistical journals, for example Teaching Statistics, wich includes IASE matters, and obtain special prices for IASE publications. There is also a complementary offer of a free copy of the book "The assessment challenge in Statistics Education" for people subscribing in 1997.

More information is available form the ISI Permanent Office (E-mail: isis@cs.vu.nl) or from the IASE web site (http://www2.ncsu.edu/ncsu/pams/stat/info/iase/menu.html).

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5. PUBLICATIONS BY MEMBERS

BIEHLER, R. (1997). Software for learning and for doing statistics. _International Statistical Review_, 65(2), 167-189.

The community of statisticians and statistics educators should take responsibility for the evaluation and improvement of software quality from the perspective of education. The paper develops a perspective, an ideal system of requirements to critically evaluate existing software and to produce future software more adequate both for learning and doing statistics in introductory courses. Different kinds of tools and microworlds are needed. After discussion of general requirements for such programs, a prototypical ideal software system is presented in detail. It is also illustrated how such a system could be used to construct learning environments and to support elementary data analysis with exploratory working style.

DAVIS, G. (1997). Teaching with Minitab and SPSS in a business school environment _Maths&Stats Newsletter_.

Statistics courses for students in business employ statistical software packages in the teaching, learning and assessment of statistics. The choice of software packages is dependent upon the students' degree course and the perceived standard package within the world of employment. This article discusses the issues raised in teaching statistics to non-pecialists with the aid of Minitab and SPSS.

GARFIELD, J. (1997). Teaching data analysis to primary teachers. _The Statistics Teacher Network_, 45, 1-2.

 The author describes a short summer course she has developed to provide primary grade teachers with the fundamentals of descriptive statistics. The article describes the use of news media, computer technology, group projects, and video to provide precollege teachers with a fundamental understanding of statistics and its applications.

Gnanadesikan, M., SCHEAFFER, R. L., WATKINS, A. E., & Witmer, J. A.(1997). An Activity-Based Statistics Course. _Journal of Statistics Education_, 5(2).

 So that students can acquire a conceptual understanding of basic statistical concepts, the orientation of the introductory statistics course must change from a lecture-and-listen format to one that engages students in active learning. This is the premise underlying an effort of the authors to produce and use a collection of hands-on activities that illustrate the basic concepts of statistics covered in most introductory college courses. Such activities promote the teaching of statistics more as an experimental science and less as a traditional course in mathematics. An activity-based approach enhances learning by improving the students' attention, motivation, and understanding. This paper presents examples of the types of activities that work well in various classroom settings along with comments from colleagues and students on their effectiveness.

MELLISSINOS, M., Ford, J. E., & McLeod, D. B. (1997). Students' understanding of statistics: developing the concept of distribution. Paper presented at the _North American Chapter of the Psychology of Mathematics Education Conference_, Illinois.

 In the past decade, various countries have produced national mathematics education reform documents recommend that students learn to produce, explore and interpret distributions of data meaningfully. The purpose of this study is to expand on what has been learned about student notions of the average as a representation of a distribution. For this paper we report interview data with Jim, a middle school student. We followed the investigation of Mokros and Russell (1995) and their framework for understanding how children develop an understanding of the concept of mean. Jim did not seem to fall clearly into any one of the strategy types identified by Mokros and Russell. His problem solving strategies for finding the mean seem to vary, but at the same time he maintains a consistent interest in making sense of the results of his computations. Jim did not appear to make sense of the mean as a statistical measure of a distribution.

SCHAU, C., & Mattern, N. (1997). Use of map techniques in teaching applied statistics courses. _The American Statistician_, 51(2), 171-175.

 The authors illustrate how mapping techniques such as graphic organizers and concept maps can be used to help students learn the interrelationships among statistical knowledge and concepts. The article discusses the use of mapping techniques for instructional planning, as a learning tool, and for assessment.

VAHEY, P., Enyedy, N., & Gifford, B. (1997). Beyond representativeness: Productive intuitions

about probability. Paper presented at the _Annual Conference of the Cognitive Science Society_. Stanford University, Palo Alto, CA.

Although research has found many flaws in peoples probabilistic reasoning, we have found that middle-school students have many productive ideas about probability. This study examines the probabilistic reasoning used by middle-school students as they used a technology-mediated inquiry environment that was conceptualized and developed to engage students in the task of analyzing the fairness of games of chance. This research demonstrates that students employ productive probabilistic reasoning when participating in this task, and also demonstrates that commonly reported heuristics such as representativeness do not adequately describe student reasoning.

Enyedy, N., VAHEY, P., & Gifford, B. (1997). Design principles for guided inquiry learning environments. Presented at the _HCI International '97: 7th International Conference on Human-Computer Interaction_. San Francisco.

We discuss important aspects of guided inquiry learning environments, using examples from the Probability Inquiry Environment (PIE), a computer-mediated inquiry environment designed to teach middle school students elementary concepts in probability.

VALLECILLOS, A., & BATANERO, C. (1997). Aprendizaje y ensenanza del contraste de hipótesis: Concepciones y errores (Teaching and learning hypotheses testing: Conceptions and errors). _ Ensenanza de las Ciencias_, 15(2), 189-197.

In this paper we present results of a wide evaluation of the learning of hypotheses testing by undergraduates. We point to some difficulties and errors that should be taken into account in the teaching of the topics. Likewise, we describe students' conceptions about the logical structure of hypotheses testing and the level of significance.

WILENSKY, U. (1997). What is normal anyway? Therapy for epistemological anxiety. _Educational Studies in Mathematics_, 33, 171-202.

This paper present two case studies of learners attempting to make sense of the concept of normal distribution- in particular why physical phenomena such as height fall into normal distributions. The notion of epistemological anxiety is advanced as being the source of the difficulties learner have in making sense of normal distributions. The framework of connected mathematics is used to analyse the learners coming to understanding of normal distributions and as a source of therapeutic interventions for the epistemological anxiety.

6. RECENT DISSERTATIONS

Varta Sharma, S. (1997). _Statistical ideas of high school students: Some findings from Fiji_. Ph. D. University of Waikato. Supervisors: Andy BEGG, & Fred Biddulph.

A concern about children's difficulties with statistics and probability and a concern about the lack of research in this area led to this study. Information was gathered about how form five (14 to

16-year-old) Fijian-Indian students construct ideas about statistics. The study focused on descriptive statistics, graphical representations, probability and investigations. The research project consisted of the main study preceded by a pilot study in a New Zealand secondary school with a small sample of 14 to 16 year-olds of differing abilities and ethnic backgrounds. These students were interviewed before and while taking part in a an instructional unit on statistics and probability taught by the class teacher. All the interviews were recorded on audio tape and transcribed for analysis.

In the pilot study students used a variety of strategies for dealing with questions presented to them. Existing models developed for investigating students' thinking in statistics education were not completely satisfactory for describing these pilot results. so Shaughnessy's model was adapted to explain the data in the main study.

The main study explored from a constructivist perspective, the strategies the students used and the sense that each made of the learning activities. The data revealed that many of the students held beliefs and used strategies based on proper experiences which partially inhibited the students' development of statistical ideas- these included superstitions and beliefs about both animate an inanimate objects. Some students based their reasoning on their non-mathematical in-school experiences, and on their cultural experiences which included religious and everyday experiences. Further difficulties arose when students interpreted a task differently from that intended and when some task words carried a mathematical meaning different from the usual everyday meaning.

The results of the study confirm a number of findings of other researchers. For example, the commonly documented biases and misconceptions such as representativeness and equiprobability were evident. The thesis adds another bias, called the unpredictability bias, to the list discussed in the literature. An analysis of the explanations provided for the probability and investigations tasks indicate that students tended to assume random events to be unpredictable by nature. It is also possible that students who said they did not were also influenced by the unpredictability bias. It was found that despite a month teaching statistics and probability, the students continued to base their thinking on their biases, beliefs and previous experiences. The results suggest that while constructivist approaches such as cognitive-conflict and activity-based approaches might be effective in producing conflict for some students, they may not counter the influence of very strong belief systems.

Many students who appeared according to the statistical approach on one problem seemed to use the non-statistical approach on another and showed evidence of using the partial-statistical perspective on yet a third. Different problems seemed to induce students to use different approaches. Some students, however, used different types of reasoning on the same problems. Inconsistencies in students' reasoning may have resulted from conflicts among their beliefs and from learning rules and procedures without understanding. Overall the students seemed to generate links with other domains while attempting to solve the statistical problems. Both anticipated an unanticipated learning occurred as children tried to generate links between the different domains

7. NEW BOOK ON QUANTITATIVE LITERACY

Iddo GAL (iddo@research.haifa.ac.il) sends the following information:

The College Board has just published a book (edited by Lynn Steen) that may be of interest to people in the field of adult numeracy, entitled "Why numbers count: Quantitative literacy for tomorrow's America."

The book contains 17 brief essays (6-12 pages each, total 190 pages) that discuss in a scholarly yet very accessible way a range of needs, dilemmas, problems, and directions pertaining to the future of "realistic" math education. Here are some of the chapter titles: "Civic implications of quantitative literacy", "Understanding the news", "National indicators of quantitative literacy", "Thinking quantitatively about science", "Solving problems in the real world", "Numeracy: imperatives of a forgotten goal", "Organizing mathematics education around work", "Mathematical competencies that employers expect", "Defining and measuring quantitative literacy", and more. Some chapters contain examples for functional or media-related mathematical tasks.

The book was created mainly to stir debate and start a dialogue among those involved in K-12 math education (including parents, policy makers, school principals, teachers, academics, etc.), yet most of the points raised are just as relevant for adult numeracy educators, program administrators, workplace literacy teachers, etc, and all others who worry about "creating" informed citizens and workers who can function and adapt in a changing world.

In soliciting chapters, the College Board sought to put together diverse perspectives on the [educational and other] implications of the "relentless quantification of society", and on the rapidly developing situation where people in ALL walks of life are caught "in a rising tide of massive amounts of both vital and insignificant information presented in quantitative form", as part of work and play, civic and political lives.

There are several reasons why this book may be of interest to people involved in adult numeracy: It can serve as informative background readings for participants in staff development efforts or local "study circles". It can inform those who want to become better acquainted with topics such as "situated" instruction, the math-related implications of the SCANS recommendations and its influence on current school-to-work projects, the meaning and implications of results from the National Adult Literacy Survey (NALS) that pertain to quantitative literacy skills, and related topics that together shape the terrain of mathematics education in the U.S. and in some cases in other countries in both K-12 and adult contexts.

The book may also serve as a good reference for those of us in need of "ammunition" to be used in discussions (or arguments?) with employers, parents in family literacy programs, planners in local community colleges, or in dialogues with educators from the K-12 community.

More information is available form Iddo Gal or from the website: http://www.collegeboard.org.

8. CONTENT AND PEDAGOGY FOR INTRODUCTORY STATISTICS

The Volume 65, number 2 of the _International Statistical Review_ (August, 1997) includes the following paper with discussion:

MOORE, D. S. New pedagogy and new content: The case of statistics. (pp. 123-137).

Statistical education now takes place in a new social context. It is influenced by a movement to reform the teaching of the mathematical sciences in general. At the same time, the changing nature of our discipline demands revised content for introductory instruction, and technology strongly influences both what we teach and how we teach. The case for substantial change in statistics instruction is built on strong synergy between content, pedagogy and technology. Statisticians who teach beginners should become more familiar with research on teaching and learning and with

changes in educational technology. The spirit of contemporary instructions to statistics should be very different from the traditional emphasis on lectures and on probability and inference.

Discussants:

GARFIELD, J. (pp. 137-141),

HAWKINS, A. (pp. 141-146),

Hoerl, R., Hahn, G., & Doganaksoy (pp. 147-153),

Kettenring, J. (pp. 153). Gosh, J. K. (pp. 154-155),

SCHEAFFER, R. L. (pp. 156-158),

Tanur, J. M. (pp. 159-160).

Response by D. S. MOORE (pp. 162-164).

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9. EPISTEMOLOGICAL ANALYSIS OF RANDOMNESS

Randomness has received various interpretations at different periods in history, and even today, there are still serious difficulties involved in defining randomness. The following list of references dealing with philosophical and epistemological analysis of randomness will complement the bibliography on subjective perception of randomness included in our last issue.

Ayer, A. J. (1965). Chance. _Scientific American_, 213, 44-54.

BATANERO, C., & SERRANO, L. (1995). La aleatoriedad, sus significados e implicaciones didacticas. (Randomness, its meanings and didactical implications) _UNO_, 5, 15-28.

Bennett, D. J. (1993). _The development of the mathematical concept of randomness; educational implications_. Ph. D. New York University. (DAI n. 9317657).

Burks, A. W. (1963). _Chance, cause, reason: An enquiry into the nature of scientific evidence_. Chicago: The University of Chicago Press.

Chaitin, G. J. (1975). Randomness and mathematical proof. _Scientific American_ 232, 47-52.

Fienberg, S. E. (1971) Randomization and social affairs: The 1970 draft lottery. _Science_, 171, 255–261

Fine, T. L. (1973). _Theories of Probability. An examination of foundations_. London: Academic Press.

Gacs, P. (1986). Randomness and probability, complexity of description. In S. Kotz, & N. L. Johnson (Eds.), _Encyclopedia of statistical sciences_ (v. 7, pp. 551-555). New York: Wiley.

Gingerenzer, G., Swijtink, Z., Porter, T., Daston, L., Beatty, J., & Kruger, L. (1989). _The empire of chance_. Cambridge: Cambridge University Press.

Hacking, I. (1990). _The taming of chance_. Cambridge: Cambridge University Press.

McNemar, Q. (1960). At random: Sense and nonsense. _American Psychologist_, *15*, 295-300.

Kolata, G. (1986) What does it mean to be random? _Science_, 231, 1068–1070.

Kyburg, H. E. (1974). _The logical foundations of statistical Inference_. Boston: Reidel.

Poincare, H. (1936). Chance. _Journal of the American Statistical Association_, 31, 10-30.

Rao, R. (1989). _Statistics and truth_. New Delhi: Council of Scientific & Industrial Research.

Von Mises, R. (1946). _Probabilidad, estadistica y verdad_. Madrid: Espasa Calpe (Edicion original inglesa publicada en 1928).

Zabell, S. L. (1992). The quest for randomness and its statistical applications. In F. Gordon, & S. Gordon (Eds.), _Statistics for the XXI Centur_ (pp. 139-166). The Mathematical Association of America.

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10. OTHER PUBLICATIONS OF INTEREST

Ballman, K. (1977). Greater emphasis on variation in an introductory statistics course. _Journal of Statistics Education_ 5(2).

Many introductory courses teach traditional probability concepts. The objectives of these courses may be better met by emphasizing characteristics of random variation rather than formal probability. To illustrate a different approach, some alternative concepts and related activities are described and discussed.

Frank, T. (1997). Watch your mathematical language _Mathematics in School_ 26(1), 14-15.

 The widespread teaching of probability in comparatively recent times has given rise to the overloading of the word "event". The dictionaries give two principal meanings for "event" as either a happening (e.g. throwing a die), or the result of that happening (e.g. getting a six). Unfortunately, many writers seem to use the word in both senses and while, usually, it is reasonably clear which is which, it seems a great pity that the word should be doing souble duty within the same context. If "event" were restricted to its first meaning (a happening), then the second meaning (=a result) would be dealt with by using only the word "outcome".

Goel, K. P., Peruggia, M., & Baoshe, A. (1997). Computer-aided teaching of probabilistic modeling for biological phenomena._The American Statistician_, 51(2), 164-169.

 The article describes a software system developed by the authors in XLISP-STAT that provides computer simulations that allow students to explore probabilistic modeling while minimizing the need for a thorough understanding of advanced mathematical concepts and probability theory. The computer simulations were developed for use in an introductory course on probabilistic modeling for undergraduates in the biological and environmental sciences. The simulation environment allows students to interactively change parameters in real time and provides visual feedback on how the changes affect the sample paths and relevant summary statistics. Two simulation modules are described, one for the linear birth-death-immigration process and a second for the competition process.

Loosen, F. (1997). A concrete strategy for teaching hypothesis testing. _The American Statistician_, 51(2), 158-163.

The article describes a physical device the author has constructed to help students visualize concepts related to hypothesis testing. The device presents the state of nature, the state when the null hypothesis is true, and the state when the null hypothesis is false on three separate axes. The author argues that the device helps students because the three points of view needed to understand the conditional reasoning behind hypothesis testing are separated instead of overlapped on a single axis. The device allows the instructor to visually illustrate ideas such as the effect of varying the difference between the hypothesized and true means, and the effect of changing the sample size. Several examples are presented to illustrate how the device can be used to teach other concepts in hypothesis testing.

Mac, R. J., & Dawson, G. (1997). Turning the tables: A t-table for today. _Journal of Statistics Education_, 5(2).

Despite advances in computer technology, quantiles of Student's t (among other distributions) are still calculated using printed tables in most classroom situations. Unfortunately, the structure of the tables found in textbooks (and even in books of tables) is usually better suited to fixed-level hypothesis testing than to the p-value approach that many modern statisticians favor. This article presents a novel arrangement of the table that allows p-values to be determined quite precisely from a table of manageable size.

Murphy, J. R. (1997). How to read the statistical methods literature: A guide for students._The American Statistician_, 51(2), 155-157.

The author offers practical suggestions to help students in courses where articles on statistical methods are a required part of the reading.

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11. COMPLEMENTARY SHORT REFERENCES

Callender, J. (1997). Probability by spreadsheet. _Spreadsheet User_, 4 (1)

Embse, C. V. (1997). Visualizing least-square lines and best fit. _Mathematics Teacher_, 90(5), 404-408.

Frantz, M., & Lazarnick, S. (1997). Data analysis and the hardrock 100. _Mathematics Teacher_, 90(4), 274-275.

Holgate, P., & Bingham, N. H. (1997). Studies in the history of probability and statistics XLV. Probability and analysis in Poland between the wars' _Biometrica_, 84 (1), 159-173.

HUNT, N. (1996). Boxplots in excel. _Spreadsheet User_, 3(2).

HUNT, N. & Mashhoudy, H. (1997). Demonstrating sampling distributions. _Spreadsheet User_, 4(1).

Pfanzagl, J., & Sheyni, O.N. (1986). Studies in the history of probability and statistics XLIV. A forerunner of the t-distribution ._Biometrica,_ 83 (4), 891 - 898.

RANGECROFT, M. (1996), Choosing the right sandwich filling, _Means Newsletter_, 1.

Smeeton, N. (1997). Statistical Education in Medicine and Dentistry. _Journal of the Royal Statistical Society: Series D (The Statistician)_, 46.

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12. INTERNET RESOURCES OF INTEREST

12.1. ASA NEWSLETTER

The Summer 1997 issue of ASA Education Newsletter is now available on the WWW. The URL is:

http://renoir.vill.edu/cgi-bin/short/StatEd.cgi

It can also be accessed indirectly through the American Statistical Association web page at: htttp://www.amstat.org

Please, pay attention to the paper "Statistics education resources on the world wide

WEB by Steven Rein, Virginia Commonwealth University .

12.2. Statistics Teacher Network Newsletter

The Statistics Teacher Network newsletter, which is published three times a year by the

ASA/NCTM Joint Committee on the Curriculum in Statistics and Probability, is now available on the web. Check it out at http://www.amstat.org/education/STN. For more information contact: Jerry Moreno, Dept of Mathematics John Carroll University, moreno@jcvaxa.jcu.edu.

12.3. MATCOM information

I have received by e-mail the following information that may be of interest to some readers:

MATCOM: Matlab to C++ Compiler. Translates Matlab .M code into readable and efficient C++ source, which can be further compiled into mex files or standalone applications.

Matrix<LIB> :C++ Matrix Class Library. For implementing high-level, scientific algorithms in a Matlab-like high performance C++ code.

MathTools Accelerator: Provides significant performance gains for MATCOM and Matrix<LIB> programs using Linear algebra and matrix multiplication on Pentium/Pro with VC++/BC++ /Watcom.

Fully functional, time limited evaluation versions are available for immediate download from the web site, http://www.mathtools.com. More information from Michelle Handron

Email: info@mathtools.com

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13. INFORMATION ON PREVIOUS CONFERENCES

13.1. PME: _21st Conference of the International Group for the Psychology of Mathematics Education_, Lahti, Finland, July 14-19, 1997.

The following research reports, short oral communications and posters were presented during the conference and have been included into the Proceedings, edited by Erkki Pehkonen and published by the Lahti Research and Training Center:

Bueno, G. & Cuevas, C. A. A new approach for intelligent tutoring systems: An example for statistical activities (v.2, pp. 193-200).

CANIZARES, M. J., BATANERO, C. SERRANO, L., & ORTIZ, J. J. Subjective elements in children's comparison of probabilities (v.2, pp. 49-56).

FISCHBEIN, E., & Grossmann, A. Tacit mechanism of combinatorial intuitions (v.2, pp. 265-272).

HAWKINS, A., & Hawkins, P. Are lawyers prey to probability misconceptions irrespective of mathematical education? (v.3, pp. 49-56).

Spinillo, A G. Chance estimates by young children: Strategies used in an ordering chance task (v.4, pp. 182-189).

TRURAN K., & Ritson, R. Perceptions of unfamiliar random generators. Links between research and teaching (v.4, pp. 238-245).

FERNANDEZ, F., Monroy, O. L., & Rodríguez, L. Understanding of the notions of p-value and significance level in the solution of hypothesis tests problems (v.1, p. 133).

HARTMAN, A. On the knowledge of high school mathematics teachers for teaching probability (v.1, p. 238).

Tarmizi, R. A. Correlates of students' performance in statistics (v.1, p. 265).

BATANERO, C., GODINO, J. D. & Navas, F. J. Some misconceptions about averages in prospective primary school teachers (v.1, p. 276).

13.2. Report on the Stochastics Working Group Meetings by John TRURAN

Three meetings of the PME Stochastics group were held during the conference. Those who attended the meetings included, Hazimah Abdul Hamid (Malaysia), Carmen BATANERO (Spain), Carlos Cuevas (Mexico) Felipe FERNANDEZ (Colombia), Juan D. GODINO (Spain), Alan GRAHAM (UK), Anne HAWKINS (UK), Michel Henry (France), John TRURAN(Australia) and Kath TRURAN (Australia)

In the first Meeting Carmen Batanero showed us a copy of the new book "The Assessment Challenge in Statistics Education". Kath Truran reviewed the chapter on Data Handling in the new Kluwer "International Handbook of Mathematics Education" and John Truran reviewed the Chapter on Probability. Felipe Fernández told us a little about work at the private University of the Andes. General information was given about the International Statistical Institute, the IASE (International Association for Statistics Education), the latest Newsletter of the International Study Group for Teaching and Learning Statistics and the 1998 ICOTS Conference in Singapore. Finally, Anne Hawkins reflected on her earlier writings on research in statistics education in the light of

today's situations. It was felt by some that at the next PME, we should try to find a way of being involved more with the work of younger/newer researchers and that we should encourage more short presentations within our working group. Carmen Batanero also gave a brief presentation on Advanced Stochastic Thinking to the Advanced Mathematical Thinking Working Group. The AMT group has decided to work towards a book which will focus on the teaching of undergraduate mathematics from a psychological perspective, to be edited by David Reid (Canada). It is hoped that the book will be practical, but will not over-simplify. Drafts are required by July 1998.

The other two meetings were devoted to book planning. There had been substantial discussion of ideas on the e-mail before we met together. These were talked through at length and we reached agreement in the following ways.

- It is important that whatever we do is done in a form which will enable contributors to gain university credit.

-At this point the proposal to produce a book which is based on a critical analysis of key works in the literature is probably not feasible at least in the short term. At the moment a couple of us are thinking about alternative ways of approaching this issue, and we will present our ideas when they are more clearly formed.

-It is worth preparing a more general book, which might be prepared in the more traditional form of calling for offers of chapters, and looking to co-ordinate the chapters into a meaningful form. The book would be directed at teachers of statistics at all levels, and we would attempt to address pedagogic issues from a research background. This book has to be attractive enough that people will want to read it. The co-ordinators were asked to prepare a draft outline of what the book might look like, together with a general set of guidelines for authors, and to circulate this within the group for initial response. The final working session was spent mainly defining key words and concepts which needed to be addressed. These will be incorporated into the suggestions for a basic book structure.

In 1998 there will be an International Conference on the Teaching of Statistics (ICOTS) in late June in Singapore. PME will be held near Cape Town in middle July with a theme of "Diversity and Change in Mathematics Education". It is unlikely that many people will attend both. We have therefore decided that we shall try to arrange working sessions at both meetings to allow people who want to be involved in the book to have an opportunity for personal input on at least one occasion.

In 1999 PME will be held in Israel in mid- July. In 2000, it will be held in Hiroshima from 30 July to 6 August, ending just two days before ICME starts in Tokyo.

13.3. A Report on Stochastics Presentations at MERGA, New Zealand, July 1997 by John TRURAN.

There is a strong statistics group in Australia and New Zealand, and we had a particularly good meeting this year, so a summary is provided here. An expanded version will be published later in "Teaching Statistics".

Mike SHAUGHNESSY came from the USA to give one of the keynote addresses, entitled "Missed Opportunities in Research on the Teaching and Learning of Data and Chance". He argued that we should work more from what children could do, than from what they could not do. He also

argued strongly that there was inadequate research into students understanding of variability.

This theme was taken up by Maxine PFANNKUCH who has been conducting interviews with practising statisticians to assess how they reason in their work. She also emphasised the importance of understanding variability and thought that it had been neglected in classrooms because of the "pure" approach usually found there. She argued that the interplay between model and reality plays a great part in the work of real statisticians, and should be more emphasised in classrooms.

Two reports were concerned with work with schoolchildren. Jenni WAY summarised the results of asking 48 primary school children to compare proportions in two urns. Jenni is seeking, among other things, to codify the many different categories proposed by a number of other research workers over the last 15 years. If she is successful this will have a number of important consequences for teacher knowledge. Jonathan MORITZ and Jane WATSON have been looking at the ability of students from Year 6 to Year 11 to interpret a potentially misleading newspaper advertisement. Many students failed to interpret and use the advertisement accurately. These results will contribute to a larger study designed to assess how people respond to visual data.

In tertiary statistics Sue GORDON found that for some students surface learning approaches did tend to produce good marks. Some deep learners obtained poor scores because they disregarded the learning of details which are required in examinations. Anne Williams found that students have trouble with significance tests because they lack adequate statistical language, have implicit procedural knowledge and are more concerned to make a statistical conclusion than to think deeply about the situation. Pam SHAW found that even non-naïve students showed a significantly greater tendency recognise skewness when distributions are left-skewed rather than right-skewed. John TRURAN showed how a critical textual analysis of responses to examination questions could provide ways of evaluating questions and refining them in the future. In another paper, he used examples from the introduction of probability into Australian schools to support his argument that curriculum forces within education systems may be constructively interpreted as conforming with the same ecological principles which are to be found in modern zoological thinking.

In teacher education, both Ron SMITH and Kath TRURAN reported on difficulties teachers have with teaching stochastics. Kath found that student teachers' lessons tended not to be integrated into an underlying body of knowledge. In particular, they were unable to design a constructive set of questions designed to help children think through the key ideas. Ron argued that teachers needed a different kind of in-service support for stochastics than for other mathematics topics because of their lack of basic knowledge. He also presented hard data that some teachers really do view probability is viewed as a "wet Friday afternoon activity".

The following papers have been published by the Mathematics Education Research Group of Australasia in the Conference Proceedings, edited by F. Biddulph and K. Carr:

SHAUGHNESSY, J. M. Missed opportunities in research on the teaching and learning of data and chance (pp. 6-22).

Dole, S., Cooper, T. J., Baturo, A., R., & Conoplia, Z. Year 8, 9, and 10 students' understanding and access of percent knowledge (pp. 147- 156).

GORDON, S. Students' orientations to learning statistics. Profiles of experience (pp. 192-199).

Johnson, T., JONES, G., Thorton, C., & Langrall, C. Students' thinking and writing in the context of probability (pp. 255-262).

SMITH, R., Grover, P., & Tytler, R. Professional development: A case study of teachers involved in a change program in the topic of probability (pg. 621).

MORITZ, J., & WATSON, J. Graphs: Communications lines to students? (pp. 337-343).

PFANNKUCH, M. Statistical thinking: The statistician's perspective (pp. 406-413).

SHAW, P. In symmetry is the left the same as the rigth or is the left out? (pp. 450-455).

TRURAN, J. Understanding of association and regression by first year economic students from two different countries as revealed in responses to the same examination questions (pp. 530-537).

TRURAN, K. Beliefs about teaching stochastics held by primary pre-service teaching students. (pp. 538-545).

WAY, J. Which jar gives the better change? Children's decision-making strategies. (pp. 568-577).

Williams, A. Students' understanding of hypothesis testing: The case of the significance concept. (pp. 585-591).

13.4. Annual Conference of the Australian association of Mathematics Teachers.

The Annual Conference of the Australian association of Mathematics Teachers was held in Melbourne in July. The proceedings are on the web at the address: http://www.aamt.edu.au

Below I include summaries of stochastics papers in these proceedings:

MORITZ, J. B., & WATSON, J. Pictographs

Students from Grade 3 to 9 were asked to represent given information on numbers of books children had read, using picture-cards of children and books. The interview protocol included questions requiring interpretation and prediction, which allowed for a wide range of responses, from imaginative story-telling to the use of sophisticated statistical reasoning. This paper discusses some issues for student understanding when representing data, interpreting the representation, and using it to make predictions.

Taplin, M., & Mulligan, J. Using real data to generate mathematical thinking

The use of real data is an easily accessible and powerful resource for developing children's mathematical knowledge. This paper promotes the idea that mathematics learning can be reorganised to be almost completely 'data driven'. In particular, the paper focuses on ways in which technology can be used as a tool to promote the effective development of data handling skills.

WATSON, J. M., & MORITZ, J. B. Teachers' views of sampling

The importance of sampling in the school curriculum is discussed in the context of changes to the mathematics curriculum in the 1990s. Over 100 teachers responded to questions related to what

sampling means, where it fits in the curriculum and approaches to teaching the topic. These responses are discussed in relation to professional development initiatives in statistics education.

WATSON, J. M., & MORITZ, J. B. The C&D PD CD: Professional development in chance and data in the technological age.

This paper discusses the production and evaluation of the Chance and Data Professional Development CD-ROM, which along with a textbook and video, was used as part of a trial professional development package for teachers of Chance and Data. The multimedia CD-ROM includes curriculum documents, classroom activities, and examples of student responses to a variety of questions from research. Evaluation of the package and its effectiveness is based on responses from teachers and other evaluators who trialed the package.

SMITH, R. Chance activities for middle primary school

The teaching of chance concepts is becoming increasingly important in schools. As well as providing practical applications of mathematics, society is also being challenged by a growing gambling industry and a developing 'casino culture'. Classroom activities in chance can be developed through informal language into quite sophisticated mathematical understanding. The activities suggested for Years 2-5 make use of easy-to-make biased dice.

Kissane, B. The graphics calculator and the curriculum: The case of probability.

A graphics calculator may influence the curriculum in three kinds of ways: offering new opportunities for teaching and learning, providing new ways of performing mathematical procedures, and suggesting changes of emphasis and content in the curriculum. Illustrations of these for the senior school probability curriculum are suggested, focussing on simulation, probability distributions and stochastic modelling respectively. The Casio cfx-9850G calculator is used to explore these examples.

13.5. 51st SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

The 51st Session of the International Statistical Institute was hold in Istanbul from 18 to 26 August 1997 under the responsibility of the State Institute of Statistics of Turkey. The following papers with educational component were presented and summaries have been published into the Proceedings.

Invited Papers Sessions:

IP 36: Research on teaching and learning statistics. Organizer: J. M. SHAUGHNESSY.

BEN-ZVI, D. Learning statistics in a technological environment.

BATANERO, C., & SERRANO, L. The meaning of randomness for secondary school students and implications for teaching probability.

IP 38: Teaching and training in statistics with sampling and sample surveys. Organizer: G. Cicchitelli. Discussants: B. K. Sinha, & G. E. Montanari.

SCHEAFFER, R. L. Discovery of sampling concepts through activities.

Dussaix, A. M. L'enseignement des sondages a des etudiants de formations differentes: quelques experiences.

Chant, C., & Lievesley, D. The use of data in teaching statistics.

IP 39: The role of bayesian methods in statistical education. Organizer: J. A. Witmer; Discussant: T. O'Hagan, & J. Berger.

Rossi, C. Bayesian statistics in school: Basic elements through examples.

Bernardo, J. M. Multiple choice examinations and bayesian statistics.

IP40: Data centered versus mathematics centered training in statistics. Organizer: S. M. Shen; Discussant: S. Chattjee, & S. Kiranandana.

Rao, C. R. A cross disciplinary approach to teaching of statistics.

JOLIFFE, F. How much theory should be covered in an MSC conversion course?

IP41: Assessment and measurement in education. Organizer: A. Bazargan. Discussants: R. L. SCHEAFFER, S. M. Shen, & R. Smulders.

Euriat, M. Indicateurs d'evaluation du systeme educatif: l'experience francaise.

Sarmad, Z. Linking statistical education in the School of Education with the improvement of educational quality.

Bazargan, A. Pedagometrics: Statistical measurement and analysis for improving the quality of education.

Contributed Papers

CP 24: Statistical Literacy :

ROMEU, J. L. Assessment of group learning, workshops, & simulation in statistical education.

Blejec, A. Computer simulations: An aid for statistical education.

Habibullah, S. N. Conduct of sample surveys by teams of teachers and students: Making theory come alive.

Furst, P., & Beltrao, K. I. Identifying cognitive obstacles in the learning of statistics.

Araya, K., Matusita, K., Siotani, M., & Takeuchi, K. On statistical education in japanese industrial

society.

Milito, A. M. On the use of statistics in the educational field.

De Lima, J. M. Socio-economic profile of statistics majors in Rio de Janeiro (Brazil).

Murakami, M., Murakami, M., & Miura, Y. Statistical education in universities in Japan.

CHADJIPADELIS, T. Statistics in education: A case study.

Jili, W. The chinese statistical education system.

Cacoullos, T. The statisticity and stochasticity of the greeks.

Joly, S., & Le Calve, G. Utilisation de la notion de distance dans un enseignement elementaire de la statistique.

CP 25: Statistical Literacy II:

Antcliffe, M. Can the World Wide Webb revolutionise statistics learning?

ERSOY, Y. Designing an inset for maths teachers: Teaching basic concepts in statistics.

Goordazi, H. M. On the significant role of statistical literacy in the society.

Carter, L. Teaching contingency tables and log-linear models in human sciences.

STARKINGS, S. Teaching questionnaire data analysis procedures.

Chatterjee, S. Teaching statistics effectively.

Miura, Y., & Hirakawa, K. Teaching statistics in the secondary-level education in Japan.

TERAN, T. E. Teaching statistics to teachers.

In addition to these papers, there was a panel on the Research and Teaching of Probability and Statistics in the physical sciences, organized D. Vere-Jones with the following discussants: C. Cutler, E. Cinlar, A. Kijko, & E. Waymire.

13.6. STOCHASTICS RESEARCH PAPERS FROM 1997.

This is a collection of research papers on stochastics education which were presented at different conferences during 1997 (e.g., PME, MERGA, AERA). This collection will be available for approximately $25 (US) in December. Please contact Joan Garfiield (jbg@maroon.tc.umn.edu) for further information.

14. FORTCOMING CONFERENCES

14.1. Western Statistical Teacher's Conference, (WeSTCo), Colorado (U.S.A.). March 27-28, 1998.

The Western Statistcal Teacher's Conference, (WeSTCo), which will be held in Colorado Springs March 27-28, 1998. The CO-WY Chapter of the ASA is sponsoring this conference to promote excellence in teaching statistics. The conference will include invited presentations as well as contributed talks. Abstracts for 15 minute presentations on the teaching of statistics can be sent to: Jim Rutledge

(RutledgeJH.DFMS@USAFA.AF.MIL).

For the latest conference information visit the web site at:

http://www.concentric.net/~jimstat

14.2.The Fifth International Conference on Teaching Statistics, ICOTS-5, Singapore, June 21 - 26, 1998.

Theme: Statistical Education - Expanding the Network

Contacts:

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Background

ICOTS meetings are organised by the International Association for Statistical Education, the IASE, which is a section of the International Statistics Institute, the ISI. These are the most important international conferences on the teaching of statistics and are held in different locations around the world once every four years. They bring together several hundred statistics educators and practitioners, including those from schools, colleges and universities, industries and governments.

Proposed topics and organisers for ICOTS-5

1. Statistical education at the school level. Convener Lionel PEREIRA-MENDOZA, Singapore pereiraml@am.nie.ac.sg

1.1. Statistical education at Elementary education. Organiser Carolyn MAHEr, USA, cmaher@math.rutgers.edu

1.2. Statistical education at secondary level. Organiser Janet Chaseling, Australia, J.Chaseling@ens.gu.edu.au

1.3.Demonstration lessons. Organiser Berinder Kaur, Singapore kaurb@nievax.nie.ac.sg

1.4. Local teachers. Organisers Rosalind Phang, Singapor,e phangr@am.nie.ac.sg

1.6. Network opportunity 1: Linking Government statistics with the teaching of statistics at all levels. Organiser Len Cook, NZ, lcook@stats.govt.nz

2. Statistical education at the post-secondary level. Convener Richard SCHEAFFER, USA, scheaffe@stat.ufl.edu

2.1. Teaching introductory statistics and probability. Organiser Allan Rossman, USA, rossman@dickinson.edu

2.2. Teaching mathematical statistics. Organiser Graham Wood, NZ, g.wood@cqu.edu.au

2.3. Teaching design and analysis of experiments. Organiser George Cob, USA, cobb@mhc.mtholyoke.edu

2.4. Teaching regression and correlation. Organiser Richard Tomassone, France, richard.tomassone@biomserv.univ-lyon1.fr

2.5. Teaching Bayesian methods. Organiser Jeff Witmer, USA, Jeff_Witmer@qmgate.cc.oberlin.edu

2.6. Teaching sample survey design and analysis. Organiser Ann-LEE WANG, Malaysia, j2wang@cc.um.edu.my

2.7. Teaching categorical data analysis.Organiser Geoffrey Berry, Australia, geoffb@pub.health.su.oz.au

2.8. Network opportunity 2: Linking statistical education at the post-secondary level with the teaching of research skills both in an educational and workplace context.Organiser John Taffe, Australia, jtaffe@swin.edu.au

3. Statistical education for people in the workplace. Convener Carol Joyce BLUMBERG, USA, wncarolj@vax2.winona.msus.edu

3.1. Continuous statistical development for employees in technical industries. Organiser Maria Ramalhato, Portugal, d554@alfa.ist.utl.pt

3.2. Statistical consultancy, a basis for teaching. Organiser Carol Joyce BLUMBERG, USA, wncarolj@vax2.winona.msus.edu

3.3. Continuing education of professional statisticians.Organiser Fred Smith, UK, tmfs@maths.soton.ac.uk

3.4. Distance education in statistical education. Organiser Daniel Lunn, UK, lunn@vax.ox.ac.uk

3.5. Total quality in statistical education. Organiser Bovas Abraham, Canada, babraham@math.uwaterloo.ca

3.6. Network opportunity 3: Linking people people involved with continuing statistical education with people in the workplace. Organiser Carol Joyce BLUMBERG, USA, wncarolj@vax2.winona.msus.edu

4. Statistical education and the wider society. Convener Anne HAWKINS, UK, ash@maths.nott.ac.uk

4.1. Statistical Societies. Organiser Helen MacGillivray, Australia, h.macgillivray@fsc.qut.edu.au

4.2. Statistical literacy .Organiser Anne Sevin, USA, asevin@mecn.mass.edu

4.3. Statistical education publications. Organiser David GREEN, UK, d.r.green@lboro.ac.uk

4.4. Statistics education for legal contexts. Organiser Peter Hawkins, UK, Peter_Hawkins@lawcol.ccmail.compuserve.com

4.5. Network opportunity 4: Linking the statistical training of people in schools or post-secondary education with the outside. Organiser Anne HAWKINS, UK, ash@maths.nott.ac.uk

5. An international perspective of statistical education. Convener James Ntozi, Uganda, isae@mukla.gn.apc.org

5.1. Statistical education in the African region. Organiser Vitali Muba, Tanzania, Fax + 255 51 43053

5.2. Statistical education in the Asian region .Organiser Ana Maria Tabunda, The Philippines stat@nicole.upd.edu.ph

5.3. Statistical education in Spanish speaking regions. Organiser Teresita TERAN, Argentina, maverick@citynet.net.ar

5.4 .Statistical education in other developing regions. Organisers Alan Rogerson, Australia arogerso@mgs.vic.edu.au and Manmohan Arora, Bahrain

5.5. Network opportunity 5: Linking people from different cultural and socio-economic backgrounds. Organiser David Vere Jones, NZ, dvj@isor.vuw.ac.nz

6. Research in teaching statistics. Convener Joan GARFIELD, USA, jbg@maroon.tc.umn.edu

6.1. Research in teaching statistics at school levels. Organiser Carmen BATANERO, Spain, batanero@goliat.ugr.es

6.2. Research in teaching statistics at post-secondary levels. Organiser Gilberte SCHUYTEN, Belgium, gilberte.schuyten@rug.ac.

6.3 .Research in teaching probablity. Organiser Kath TRURAN, Australia, Kath.Truran@unisa.edu.au

6.4. Challenges in assessing reasoning skills. Organiser Iddo GAL, Israel, iddo@research.haifa.ac.il

6.5 .Round table discussions on research. Organiser Joan GARFIELD, USA, jbg@maroon.tc.umn.edu

7. The role of technology in the teaching of statistics. Convener Rolf BIEHLER, Germany, rolf.biehler@post.uni-bielefeld.de

7.1 .Software designed for statistics education.Organisers Robin Boyle, Australia, rgboyle@deakin.edu.au and Peter S. Mortensen PSM@hdc.hha.dk

7.2. New conceptions in teaching experiments using. Organiser Mike SHAUGHNESSY, USA, mike@fpa.lh.pdx.ed

7.3. The use of graphics calculators in the teaching and learning of statistics. Organiser, Peter JONES, Australia pjones@swin.edu.au

7.4 .Multimedia, WWW and statistical videos in teaching statistics. Organiser Jan de LEEUW, USA, deleeuw@stat.ucla.edu

7.5. Visualization as an educational tool. Statistical Graphics. Organiser Laurence Weldon, Canada, K.L.Weldon@massey.ac.nz or weldon@cs.sfu.ca

7.6. Research in using technology for statistics teaching. Organiser Cliff KONOLD, USA, konold@srri.umass.edu

7.7. Network opportunity 6. Linking people involved with developments in technology with teachers in schools and post-secondary institutions. Organiser Dani BEN-ZVI, Israel, ntdben@wiccmail.weizmann.ac.il

8. Other determinants and developments in statistical education.Convener Guiseppe Cicchitelli, Italy, pino@stat.unipg.it

8.1. Cultural/Historical factors .Organiser John TRURAN, Australia, jtruran@arts.adelaide.edu.au

8.2. Learning factors.Organiser Robert delmas, USA, delma001@maroon.tc.umn.edu

8.3. Gender factors. Organiser Megan CLARK, New Zealand, megan.clark@isor.vuw.ac.nz

8.4. Projects/competitions. Organiser Linda J. Young, biom025@unlvm.unl.edu

9. Contributed papers. Convener Shir Ming Shen, Hong Kong, hrntssm@hkucc.hku.hk

9.1. Topics 1-4. Organiser Michael GLENCROSS, South Africa, glencross@getafix.utr.ac.za

9.2. Topics 5-8. Organiser Susan STARKINGS, UK, starkisa@vax.sbu.ac.uk

10 Poster sessions. Convener Peng Yee Lee, Singapore, leepy@am.nie.ac.sg leepy@am.nie.ac.sg

The 2nd announcement can be obtained from the ICOST-5 Secretariat email ctmapl@singnet.com.sg or fax +65 299 8983. This contains all the conference and registration details. Information can also be found on the Web at http://www.nie.ac.sg:8000/~wwwmath /icots.html

14. 3. PME 22, University of Stellenbosch, in Stellenbosch, South Africa 12 -17 July,1998.

You are invited to participate in the 22nd Annual Conference of the International Group for the Psychology of Mathematics Education (PME22), organised by the University of Stellenbosch, in Stellenbosch, South Africa from Sunday afternoon 12 July to Friday afternoon 17 July, 1998.

The theme of the conference is Diversity and Change in Mathematics Education.

 As we enter the new millennium, increasing diversity and rapid change are key features of educational contexts worldwide. South Africa, as is well known, is currently a contest of explicit political, social and economic transformation, affecting all organs of society.

The issues of equity and quality of access in a complex, diverse and unequal society are of

particular concern in mathematics education.

The conference organisers hope that in and through a theme that captures our specific interests, we will provide an important and open forum for stimulating debate in the PME community.

 In addition to attending the PME Stochastics Working Group, which will have four sessions in the conference, researchers are invited to submit proposals to present a personal presentation at the conference, according to the following deadlines:

 Proposals of research forum presentations must be in the hands of the Conference Chair by 15 November 1997.

 Proposals of research report presentations must be in the hands of the Conference Chair by 15 January 1998.

 Proposals for short oral communications, posters, working groups and discussion group presentations must be in the hands of the Conference Chair by 1 March 1998.

 'Early Bird' Support:

Proposals for research reports which are received by the Conference Chair by 30 November 1997 will be sent to referees who will be able to recommend acceptance or to specify suggestions for improving the report. If suggestions for improvement are made, these will be returned to the author(s) as quickly as possible so that an improved research

report can be submitted for the normal procedure by 15 January 1998.

This is intended to encourage and support only new researchers, who cannot find adequate support on their own.

 For more information about PME22 please contact:

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http://www.sun.ac.za/local/academic/education/pme22/pme22.htm

14.4. The 52nd Session of the International Statistical Institute, August 10-18, 1999, Helsinki, Findland.

The National Organizing Commitee of the 52nd Session of the International Statistical Institute has great pleasure in inviting the members of the ISI and its sections as well as all other statisticians to the 52nd Session in Helsinki, Finland, in 10-18 August, 1999. Information is available from ILkka Mellin (isi99@stat.fi) and from the web site: http://www.stat.fi/isi99

IASE invited paper meetings for ISI 52nd Session:

1. Statistical education and significance tests controversy.

2. Teaching and training multivariate data-analysis.

3. Statistical education using flexible learning approaches.

4. Statistical education for life.

5. Issues involved in the assessments and evaluation of student learning of statistics.

6. Visualisation as an educational tool.

7. Statistical training of people working in and with official statistics(in coordination with IAOS).

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