NEWSLETTER OF THE INTERNATIONAL STUDY GROUP FOR

RESEARCH ON LEARNING PROBABILITY AND STATISTICS

VOLUME 11, NUMBER 2, APRIL 1998

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1. NOTES AND COMMENTS

There are few opportunities for members of our Study Group to meet together and the forthcoming ICOTS V Conference is one of these rare events. Many group members are organising sessions, presenting their work at the Conference, or participating in the discussions. Joan Garfield and Carmen Batanero invite those of you who plan to go to Singapore to join the Study Group meeting, which will be held on Tuesday at lunch time (12.30-1.30).

This is a brief outline of specific points for this meeting:

1. Introductions

1. Summary of the Group evolution and activities by Joan and Carmen.

1. Discussion of ways to improve the efficiency of the Study Group. In particular, Carmen will suggest the establishment of a web directory of members and the possibility of including a new PME section and co-editors in the Newsletter.

1. Kath and John Truran will present their proposed project of editing a Stochastic Education Handbook by members of the PME Stochastic Working Group and inviting the Study Group members to participate in this project.

If you plan to attend the Study Group meeting at Singapore, please send a message to Carmen (batanero@goliat.ugr.es), so that a list of participants can be made up for the beginning of the meeting. The Research Round Table session that Joan Garfield is organising in Singapore will also be an important event where we will able to reflect on what have been done until now and make plans for future work.

Please, remember that the newsletters are available from our 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

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2. NEW MEMBERS

Lurdes Babo

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Lurdes teaches at the Instituto Superior de Contabilidade e AdministraÁao do Porto. She is interested in integrating the Internet in the classroom at the College level. At the moment, Lurdes is working on her Master Thesis, and researching about how the Internet could be used to enhance the teaching/learning of probability and statistics, at the College level.

Herman Callaert

Biostatistics, Limburgs Universitair Centrum

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Herman Callaert is professor of statistics and Dean of the Faculty of Sciences at the Limburgs University Centre in Belgium. For more than 25 years he has been teaching statistics, mainly as introductory courses for undergraduates in different disciplines from science and medicine. He also teaches in a MSc. in Biostatistics programme, of which he is the director. For a long time his research interests focused on mathematical statistics and biostatistics. Recently he has started reading research papers on statistical education and got interested in the scientific investigation on how to improve statistical education for students as well as for the general public (statistical literacy).

Cileda Coutinho

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Cileda is preparing a thesis concerning the learning of ideas about randomness and probability in a computer environment. Her master dissertation was related to the frequentist approach to probability and she has written a book (in Portuguese) about this subject. Complementary information about Cileda's previous work is included in this issue.

Graham Curson

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Graham teaches full time mathematics at a comprehensive school in England to 11 - 18 year olds. He is interested in both PME and the International Study Group for Research on Learning Probability and Statistics. His main interests is the use of spreadsheets for the teaching of mathematics in the area of probability, although he is at this moment at the very early stages of research.

Claire Dupuis

Institut de Recherche sur l'Enseignement des Mathématiques

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Claire is Maître de Conferences at the University Louis Pasteur in Strasbourg. She teaches probability and statistics to students in biology, chemistry, and social sciences. Her area of interest is mathematics education in general, and the learning of probability and statistics in particular. The changes in the probability curriculum in the French secondary school have emphasised the

research on probability teaching in France these last years. Research at Strasbourg, started by Raymond Duval, has concentrated on studying the influence of changing representation registers on mathematical learning. Claire is studying probability from this perspective, with the help of Suzette Rousset-Bert. Ernesto Sanchez-Sanchez (CINVESTAV, Mexico) is spending his sabbatical year in Strasbourg and working on teaching probability with Claire and Professor Francois Pluvinage.

P. K. Ito

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In 1992 Paul retired as professor of statistics from Nanzan University, Nagoya, Japan, where he has been teaching and doing research in statistics for 40 years. He has published some papers in mathematical and statistical education, all of them in Japanese, with only two exceptions:

1. Statistics in Japanese universities. _Environmental Health Perspective_, vol. 32 (1979), pp. 21-23.

1. Possibilities of departments of statistics, and departments of biostatistics in particular, in Japanese universities. _Proceedings of the International Round Table Congress_, Japan Statistical Society, Tokyo, August, 1981.

Between 1992 and 1996 he worked full-time as executive-director for a Catholic school corporation which runs a university, two colleges, and six high schools with little time for research works. From 1997 he enjoys a retired life doing a little of research work. At present he is preparing a paper, ìFrequentist and Bayesian revisited."

Regina D. Kiczek

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Regina is a graduate student at Rutgers University, doing research for her doctoral dissertation in the area of the development of ideas related to combinatorics, and probability.

Masakatsu MurakamiThe Institute of Statistical Mathematics

and the Graduate University for Advanced Studies

4-6-7 Minami-Azabu, Minato-ku, Japanmurakami@ism.ac.jpStatistical education in high schools and universities is one of Masakatsu's fields of study. He has been working as a member (from 1982) and chairman (1992) of the Statistical Education Committee of Japan Statistical Society. Since 1995, this committee have conducted an investigation to elucidate the actual state of statistical education at the university level in Japan. The result of this investigation have been reported at an annual meeting of the Japan Statistical Society and at the 51st ISI meeting in Istanbul.

Levent Ozbek

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Levent is finishing a doctoral dissertation on discrete time state space models and convergence problems. He has worked as a computer programmer, research assistant and is a lecturer at the Faculty of Science, University of Ankara since 1996. His teaching include computer programming, mathematical modelling, statistical programming, and statistical laboratory. His publications include papers in the First International Symposium of Econometric and Statistics, 1993,Turkish Government Statistical Institute, Proceedings of the Turkish Research Symposium, 1996, and 51st Session of the International Statistical Institute. He is interested in the meaning of randomness and its teaching at schools, though he has no studies in this area. He is recently becoming more and more involved in education.

Ana Pérez Espartero

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Ana has been teaching probability and statistical inference for several years and now she teaches introductory statistics (descriptive statistics) to the first year undergraduate students at the Faculty of Economics. She is doing her PhD thesis on stochastic volatility of financial time series, what is her main research interest at the moment. She is also involved in a research group working on inequality and income distribution. Although she has always been concerned about improving the teaching/learning process at the university level, it was the reading of some papers by J. Garfield, D.S. Moore and D.G. Watts, among others, that makes her think of statistical education as a matter of research and study. Her main interests are how to make statistics interesting to students, how to make students participate actively in class and how to evaluate their understanding of statistics.

Audy Salcedo

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Audy is Bachelor in Mathematics Education and has been teaching mathematics for 12 years to children in marginal areas of Caracas. He is now starting as a statistics lecturer at the College of Education in the Universidad Nacional Abierta, and the Universidad Central in Venezuela, Department of Computer Sciences and Statistics. He is interested in teaching probability and statistics and in research methodology in mathematics education, and has published some books for primary education. At this moment he is involved in the organisation of a Statistics Education Working Group at the III CIBEM, which will be held in Caracas this year.

Douglas F. Stalker

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Douglas is working in a Philosophy Department and teaching, primarily, a critical thinking course. He is covering points about probability in that course. He thinks that too many students are quantitatively lacking, and can not think through real-world pieces of reasoning that involve probability and statistics points. He is also realising that most philosophy-department-based critical thinking courses do not, but should, emphasise these points. When he discovered this, he started to study statistics, and went so far as to end up teaching a biostatistics course. Douglas has published on medical reasoning, especially errors in medical reasoning and pseudoscience in medicine. His article "Evidence and Alternative Medicine" (Mt. Sinai J of Medicine, March 1995) is an example, where he discusses how to choose the medical hypotheses to test in a clinical trial format by estimating the prior probabilities of hypotheses. He would like to teach a critical thinking course to medical students and/or physicians and to develop a quantitative-literacy version of his critical thinking course. He is currently exploring some theoretical as well as applied issues in multi-stage probability reasoning.

Sun Yu-Chih

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Sun is a doctoral student in the Teaching and Leadership Department, where he is currently writing a dissertation related to the teaching of statistics.

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Natalya teaches statistics and mathematics at the Karelian State Pedagogical University. He has recently written a paper where she discusses the first steps to teach the classical definition of probability. She believes that the key task is to give the students the right understanding of the main principles of the Theory of Probability, and that, since the first steps, the teacher must mostly rely on the students` common sense and intuition. Didactic suggestions based on this principles are described in her paper.

3. CHANGES IN E-MAIL ADDRESSES

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Note: Throughout the newsletter, members names are highlighted in capital letters.

4. BRIEF NEWS

4.1. Updated IASE Web site

The IASE web site has been updated, and can be located at the following address:

http://www.stat.ncsu.edu/info/iase/

The web page includes introductions to the ISI and to the IASE in English or French. Lists are available of the IASE Executive Committee (1997-1999), current IASE National Correspondents, and a membership directory. Membership information for IASE is provided along with a list of members' benefits and a membership application in English or French. Links are provided to previous IASE reviews and to reports from IASE meetings.

4.2. Research Papers on Stochastic Education from 1997

The collection of papers made by Joan GARFIELD and John TRURAN in order to make these papers more widely accessible has now been prepared. It provides a useful overview of much of the work being done in this field at this time, and would be a useful starting point for new researchers as well as for more experienced researchers who like to keep up with what is going on but cannot attend all the conferences or purchase all the proceedings. The collection contains most of the stochastic research papers from the 1997 meetings of American Educational Research Association (AERA) - 2 papers-,

Psychology of Mathematics Education (PME) - 7 papers-, Mathematics Educational Research group of Australasia (MERGA) - 12 papers-, and Psychology of Mathematics Education - North America (PME-NA) - 2 papers.

The booklet has more than 250 pages, is spiral bound and hard plastic covered. So it is suitable for being ordered for libraries. One paper is in Spanish, the remainder are in English. It is being sold at cost. The price is USD12 within the USA and Canada and USD20 elsewhere, including printing and air mail postage. It are obtainable by sending a cheque/money order (not credit card number) to:

Dr Joan GARFIELD, Department of Educational Psychology, University of Minnesota

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4.3. News from Romania

We are glad to congratulate Vasile BERINDE, who was elected as a Dean of Faculty of Sciences in October at the University of Baia Mare, Romania, and has been nominated by the American Biographical Institute for the 7th edition of the "5 hundred leaders of influence".

5. SUMMARIES OF PUBLICATION BY MEMBERS

BATANERO, C., GREEN, D. R., & SERRANO, L. (1998). Randomness, its meanings and educational implications. _International Journal of Mathematics Education in Science and Technology_, 29(1), 113-123.

In this article we present an analysis of the different meanings associated with randomness throughout its historical evolution and a summary of research about the subjective perception of randomness by children and adolescents. Finally, we also include some teaching suggestions to help students to gradually understand the characteristics of random phenomena.

BEN-ZVI, D., & Friedlander A. (1997). Statistical thinking in a technological environment. In J. B. GARFIELD., & G. BURRILL (Eds.), _Proceedings of the 1996 IASE Round Table Conference on Research on the Role of Technology in Teaching and Learning Statistics_ (pp. 45-55). Voorburg, The Netherlands: ISI.

This paper describes a statistics curriculum for junior high school using spreadsheets, based on the Pose, Collect, Analyse, and Interpret (PCAI) cycle. The curriculum contains two parallel strands: open-ended classroom activities and a research project. From the analysis of student behaviour, four thinking modes were identified and analysed: uncritical thinking, meaningful use of a representation, meaningful handling of multiple representations, and creative thinking. The authors also considered several aspects which relate to the interaction between the learning environment described and the students' style of work and modes of thinking.

BEN-ZVI, D. (1997). Software for teaching statistics. In J. B. GARFIELD., & G. BURRILL (Eds.), _Proceedings of the 1996 IASE Round Table Conference on Research on the Role of Technology in Teaching and Learning Statistics_ (pp. 123-136). Voorburg, The Netherlands: ISI.

The objective of this review chapter is to discuss topics relating to the use of computer software in teaching statistics. The first section includes a brief summary of the discussions following the three papers on developing exemplary software presented at the conference. The second section includes a short summary of some of the questions raised in the general discussion on software. An overview of the types of statistics software and its different uses in teaching, forms the third section. Finally, detailed descriptions of the nine specific software that were demonstrated at the conference concludes the chapter.

BEN-ZVI, D. (1997). Learning statistics in a technological environment. _Proceedings of the 51st Session of the International Statistical Institute_, Vol. 1, (pp. 409-418). Ankara, Turkey: State Institute of Statistics.

This paper outlines some of the recent developments in technology, including graphing calculators and statistics software packages, that have the potential to transform the data handling curriculum, and how it is taught. The author reports on several aspects of an innovative learning environment, such as patterns of student statistical thinking, and data handling as part of the mathematics curriculum.

BEN-ZVI, D., & Friedlander, A. (1997). _Statistics: Exploratory data investigations with spreadsheets_ (in Hebrew). Rehovot, Israel: Weizmann Institute of Science.

A collection of hands-on activities covering basic concepts of exploratory data analysis, for introductory statistics classes in junior high school. Students are actively engaged in activities of two kinds:

a. Hands-on classroom activities. These are semi-structured statistical investigations, based on authentic data and on work with a spreadsheet. The students are encouraged to hypothesise about possible outcomes, choose tools and methods of inquiry, design data representations, draw conclusions and interpret results. Most learning is designed to be done in pairs.

a. Research project. The book also guides the students in the process of work on a research project, in which they act as independent and responsible learners. In this process, students identify a problem, choose a research question, suggest hypotheses, design a study, collect and analyse data, interpret results and draw conclusions. Finally, they submit a written report and present their main results to fellow students and parents in a "statistical happening".

BERINDE, V. (1997). _Advanced engineering mathematics with applicable problems and computer aided lessons_ (in Romanian). Baia Mare: CUB Press.

This is a textbook on advanced engineering mathematics. Chapter 6 of the book, ìProbability and statistics", covering 80 pages, is divided into 7 sections. In addition, chapter 7, "Applicable problems and computer aided lessons", contains 3 applicable problems (electric circuits and mechanics) and 3 computer aided lessons related to probability and statistics. From the Preface: "The characteristic feature of the book consists in inserting alongside the classical theoretical background and problems such kind of computer-aided lessons and applicable problems to concrete problems. The main idea in writing this book was that the teacher's effort must focus on finding ways and tools to convince students that engineering mathematics is not a collection of tricks and recipes but a systematic science of practical importance which is necessary to apply to various engineering problems."

Chaput, B., Dantal, B., GIRARD, J. C., Grange, J. P., Henry, M., Janvier, M., PARZICSZ, B., Pichard, J. F., Raumondaud, H., Thienard, J. C., & Vendrely, M. (1997). _Enseigner les probabilites au Licee. Ouvertures statistiques, enjeux epistemologiques, questions didactiques et idees d'activites._ (Teaching probability at secondary level. Statistics openings, epistemological issues, didactic questions and suggested activities). Reims: Commission Inter-Irem.

This book summarises the reflections and activities developed by the Commission Inter-IREM on Statistics and Probability. A set of papers present a synthesis of studies by Commission members, as well as other works published in different IREM booklets and the journal Reperes-IREM. It includes an epistemological reflection, as well as didactic tools, trying to answer the didactic questions posed by the teachers when they want their students make sense of probabilistic objects (random experiences) and make the transition from observations (statistics, frequencies) to models (probability, outcomes, random variables, independence).

COUNTIHO, C. (1996). _Introducao ao conceito de probabilidade. Uma visao frequentista_. (Introduction to probability concept. A frequentist approach) Sao Paulo: Educ.

This book summarises the author's master thesis which is described in the Recent Dissertations section. The teaching situation in France and Brazil are compared, with the aim to show the advantages of using a frequentist approach to teach probability. A didactical engineering is organised starting from the identification of main epistemological obstacles along history and the conceptions of some students are explored.

DAHL, H. (1994). Teaching independence . _Teaching Staticics_, 16(2), 34-38.

Examples are given which illustrate how independence enters into statistical problems and a demonstration of independence is presented. Coverage in statistical textbooks is examined. The article is based on a contribution to the RSS Conference in 1992 in

Sheffield. There a "live" version of the demonstration was presented in the form of strings of beads demonstrating negative, null and positived serial correlation. It is interesting to note that "common sense" mistakes independence and negative serial correlation. People think that randomness feels pity for the one who has lost several times.

GIRARD, J. C. (Ed.) (1997). Aides pour l'enseignement de la statistique au collége. (Teaching aids to teach statistique). IREM, Universite de METZ.

This booklet contains a synthesis of several papers recently published in French journals, which concern the teaching of statistics and propose ideas for activities and pedagogical innovations. It is

centred on the problem of giving sense to statistical activities in upper secondary school. It tries to show that doing statistics leads to discussion and reflection and that statistical reasoning should be an essential components of citizens' formation. Making statistics does not only imply doing computations or interpreting other people's numerical and graphical results. Producing meaning for these results, and being able to criticise and interpret them is also needed. Within this aims, innovative and motivating classroom activities are suggested.

LEVIN, J. R. (In press). To test or not to test Ho? _Educational and Psychological Measurement_.

The impressive 1997 edited volume ìWhat if there were no significance tests?î is reviewed. The book is applauded for its comprehensive consideration of the pros and cons of statistical hypothesis testing (and alternatives) in psychological and educational research. The highlights of each chapter are summarised, along with each contributor's presumed stance on the focal " to test or not to test?" question. Also included is the reviewer's personal set of recommendations for transforming statistical hypothesis testing, as it is currently practised, into an "intelligent" process that is capable of yielding more informative scientific returns.

MURAKAMI, M. (1995). Problems in education and research environment in the field of statistics at the University level. _Proceedings of the Institute of Statistical Mathematics_, .43(2),367-375.

Teaching and research in the field of statistics at the university level have been insufficient since no University in Japan has a statistics department and only a few teaching staff are available. In spite of the recent regulation of University education by the Ministry of Education, Science and Culture, there has been no improvement in education and research system in the field of statistics. In this short paper, we investigate the circumstances in detail and discuss the necessity of establishment interdisciplinary statistics faculties at the graduate school level.

MURAKAMI, M. (1996). Problems in education in the field of statistics at the high school level. _Proceedings of the Institute of Statistical Mathematics_ 44(2), 227-233.

Education in the field of statistics at high school level is now serious crisis. There are two factors which influence education at the high school level. One is the curriculum guidelines for education at the high school level compiled by Ministry of Education, Science and Culture. The other is the entrance examinations for universities. In this paper, we first investigate changes in the guidelines for high school and the frequency of questions on the statistics in the university-entrance examinations, then discuss how to improve education in the field of statistics at the high school level.

ORTIZ, J. J., BATANERO, C., & SERRANO, L. (1997). Un estudio experimental de la presentaciÛn del concepto de aleatoriedad en los textos de Bachillerato [An experimental study of the presentation of randomness in secondary school textbooks]. _Publicaciones de la Escuela de Magisterio_, 25, 569-582.

In spite of being a central concept in the development of probability, randomness has received scarce attention from the didactic research. In this paper we present a summary of the concept of randomness in 11 secondary school text books covering the period 1975-1991 and identify the elements of the meaning of this concept. As a consequence, we describe criteria for the development of this topic in future curricular developments.

Gnanadesikan, M., SCHEAFFER, R. L., WATKINS, A. E., & Witmer, J. A.(1997). An Activity-Based Statistics Course. _Journal of Statistics Education_ 5(2), which can be found at http://www.stat.ncsu.edu/info/jse/

This is a report of an effort of the authors to produce and field-test 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. This paper presents examples of the types of activities that work well in various classroom settings along with comments from professors and students on their effectiveness.

WATSON, J. M., Collis, K. F., Moritz, J. B. (1997). The development of chance measurement. _Mathematics Education Research Journal_, 9(1), 60.

This paper presents an analysis of three questionnaire items to explore students' understanding of chance measurement in relation to the development of ideas of formal probability. The items were administered to 1014 students in Grades 3, 6, and 9 in Tasmanian schools. The analysis, using the NUDIST text analysis software was based on the multimodal functioning SOLO model. An analysis of the results and a developmental model for understanding chance measurement are presented along with implications for curriculum and teaching practice.

WOOD, M. (1997). Computer packages as a substitute for statistical training? in J. B. Garfield, & G. Burrill (Eds.), _Research on the role of technology in teaching and learning statistics: Proceedings of the 1996 IASE Round Table Conference_, (pp. 267-278). Voorburg, The Netherlands: International Statistical Institute.

This paper focuses on students - or other users - whose interest in statistics is purely utilitarian. It makes five suggestions:

1. A change of emphasis when designing courses and software from teaching the standard concepts and techniques of statistics to enabling student to reason statistically with confidence and without error. The emphasis shifts from methods of teaching "students" to the design of suitable packages for "users" - who will however need education in the background concepts.

1. This principle means that the framework of statistical concepts and techniques behind what students learn and the software they use should be treated as a variable and designed to make cognitive system as user-friendly and powerful as possible.

1. This statistical framework should be as simple as possible. If a simpler framework is (almost) as powerful as a more complex one from the perspective of its likely uses, then the simpler framework should be used instead of the more complex one (and not simply as an introduction to it). This means, for example, that methods based on simulation or resampling, and non-parametric methods, are likely to be preferred.

1. Where the technical level is likely to be daunting to students (i.e. when (3) above is an insufficiently powerful principle), the software should be treated as a black box: no attempt should be made to get students to understand the algorithms but instead they should be taught to develop an understanding of the role of the black box by experimenting with different inputs and outputs. This is likely to be a generalisable and learnable skill. It is also one which software packages can be designed to encourage or enable.

1. The concepts in terms of which the inputs and outputs of a black box are phrased should be designed to be as simple, user-friendly, and as few in number as possible. These concepts must be understood thoroughly.

WOOD, M. (1992). Using spreadsheets to make statistics easier for novices. _Computers and

Education_, 19, 3, 229-235.

This paper considers how computers, and spreadsheet packages in particular, can help non-statisticians (novices) with statistics by providing computational facilities. We assume general agreement for the proposition that a computer helps by enabling novices to handle more data, and more realistic data, and so get experience of a wider range of real problems. In addition this paper discusses two further advantages of using computers. First, they enable the subject matter to be simplified by removing the need for the novice to cover certain intermediate steps and concepts. Second, they can facilitate learning by means of "visual interactive modelling". At present, spreadsheets offer a convenient software environment because worksheets can be written with relative ease which take advantage of these points. They have the further advantage that many novices use them for other purposes, so the cost in terms of learning time is likely to be very low and data from other applications is likely to be available for importing into statistical models. The paper includes as an illustration a description of a simple spreadsheet model of the normal distribution.

6. RECENT DISSERTATIONS

CAÑIZARES, M. J. (1997). _Influencia del razonamiento proporcional y combinatorio y de creencias subjetivas en las intuiciones probabilísticas primarias_ (Influence of proportional and combinatorial reasoning and of subjective beliefs on primary probabilistic intuitions). Ph.D. University of Granada. Supervisor: C. BATANERO.

New curricular designs emphasise the need to start the study of random phenomena as early as possible, as well as changing teaching methodology to make it more active and exploratory. The general question that we pose in our research is whether pupils possess enough inherent knowledge so that it will be possible to put forward the teaching of probability before adolescence and what type of probabilistic tasks would be suitable for this early training. We have concentrated on assessing probabilistic reasoning in school children aged between 10 and 14. In the first phase, we carried out a comparative study with two classic assessment tools for probabilistic intuitions, the one used by Green (1982) and that used by Fischbein and Gazit (1984), on the same sample of 321 Spanish pupils in the 5th to 8th years of primary education. Apart from comparing our results with those of the aforementioned authors, we demonstrate the lack of correlation between the total scores in the two tests, which suggests that the Fischbein and Gazit test contains elements that were not assessed in Greenës study. This result is confirmed by means of a multivariate study.

In the second phase of our research we went further into the pupilsë use of subjective elements for assigning and comparing probabilities and their relationship to proportional reasoning. To do so, we built a new assessment tool with which data were obtained from a sample of 130 pupils in the 5th and 6th years of E.G.B. (primary school) and from the 1st and 2nd years of the E.S.O. (secondary school). In particular, we studied the childrenís strategies and levels in the comparison of probabilities basing on the levels described by Noelting (1980a and b) for comparing fractions. At the same time, we analysed the pupilsë subjective beliefs about independence, controlling chance and fair games, together with their combinatory reasoning. The types of reasoning demonstrated by the pupils are described in detail on the basis of a number of interviews carried out with two pupils from each academic course selected.

As a result of our research, we believe that it is necessary to reject the hypothesis of a linear structure in pupilsë probabilistic reasoning, which would now be better described by means of a vectorial and systemic type construct. The components for the latter may include randomness, independence, subjective elements, proportional and combinatory reasoning. Therefore, an

individual study of each one of these components is now required as well as specific didactic treatment of the reasoning and comprehension difficulties associated therewith.

Carnell, L. (1997). _Characteristics of reasoning about conditional probability_. Ph. D. The University of North Carolina at Greensboro. Supervisor: G. W. BRIGHT. DAI n. DA9729989.

The purpose of the study was to determine characteristics of reasoning about conditional probability. It is grounded in Falk's analysis of major difficulties: (1) Difficulty in defining the conditioning event; (2) difficulty with the temporal order of the conditioning event and the target event; and (3) confusing conditionality and causality. Subjects were 13 pre-service middle grades teachers who had mathematics or science as a certification area and correctly identified the conditioning and target events in two screening conditional probability problems. Each subject was interviewed on 6 conditional probability problems. Transcripts were analysed by categorising subjects' responses and comparing response between problem versions for individual subjects and across problem types and describing the presence of the aforementioned difficulties.

Over all not one subject was misconception-free, and no one showed evidence of a misconception on every problem. Pre-service middle grades teachers' reasoning can be generally characterised as follows: (1) Use of inferred events as conditioning events rather than use of the specific event in the problems. (2) Disregard of the conditioning event when it occurs after the target event in real time. (3) Inappropriate use of independence. (4) Inappropriate application of prior knowledge from other content areas (6) Use of procedures for computation of probabilities in inappropriate situations. (7) Oversimplifying the problem by failing to use all the relevant information.

COUTINHO, C. de Quiros (1994). _Introduçao ao conceito de probabilidade por uma visao frequentista. Estudo epistemologico e didactico_ (Introducing the concept of probability from a frequentist approach. Epistemological and didactical study). Master Thesis. Universidade Catolica de Sao Paulo, Brazil. Supervisor: Dr. Tania Maria Mendoza Campos.

This research work on teaching probability follows the conception about didactic research held by G. Brousseau and other French researchers, and therefore includes a theoretical and applied study concerning the relationships between teaching and learning in mathematics.

The aim of this work was to study the preconceptions that two students held about randomness and probability, by analysing experimental sequences to introduce these concepts, starting from the observation of the relative frequency stabilisation in the long run. There are two final aims in this approach: a) To extend the notion of probability to situations where the elementary events are not equiprobable; b) to model complex situations, such as the spread of epidemic diseases, or stochastic control.

Our data were obtained from a questionnaire built to assess the preconceptions held by two students, and from applying and analysing a teaching sequence based on the results of the questionnaire and on previous investigations by other researchers, such as S. Maury and J. Bordier.

Garrison, J. L. (1997). _The evaluation of a probabilistic intuition supplement to the secondary mathematics curriculum_. Ph.D. Georgia State University. DAI n. DA9731173.

This study addresses the problem of poor probabilistic intuition among secondary students. The average secondary mathematics student, although generally able to solve a simple probability problem, has very poor intuition when assessing non-standard or more complex types of probability problems. Three mental heuristics, "representativeness", "availability", and "adjustments and anchoring" are essential in the intuiting process but often lead students to wrong hunches and conclusions. It is the investigator's claim that probabilistic intuitions is improved by

awareness of these three mental heuristics and practice spotting the fallacies caused by them.

74 control group students received traditional probability and statistics teaching and 76 experimental students received traditional teaching plus a probabilistic intuition supplemental unit designed by the researcher. Data from an intuition and a probability and statistics pre-test and a post-test were collected and additionally six students from each group were interviewed about the intuition post-test questions. The experimental group significantly outscored the control group on the intuition, probability and statistics post-test. Additionally the six experimental students interviewed had a more sophisticated understanding of the post-test questions than did the six control students.

Finally these were a significant correlation between the statistics and the intuition post-tests, and between the probability and the intuition post-tests. The authors conclude that the supplemental intuition unit and its associated activities improved the experimental group's probabilistic intuition. This unit also had a mild beneficial effect on the experimental group's statistics and probability test scores.

JACOBS, V. (1996). Children's informal interpretations and evaluation of statistical sampling in surveys. Ph.D. The University of Wisconsin-Madison. Supervisor: R.C. Serlin. DAI N. DA9625805.

Two studies investigate upper elementary children's informal understanding of sampling and statistical inference in the context of interpreting and evaluating survey results. In Study 1, 17 children were interviewed to categorise children's conceptions of sampling and inference. In study 2, 110 children completed paper-and -pencil tasks to confirm the response categories identified in study 1, and to determine its prevalence.

Children evaluated sampling methods by: (a) Focusing on the potential for bias, (b) fairness, (c) practical issues, or (d) results. All children used multiple types of evaluation rationales, and the focus of their evaluation varied by context and type of sampling method. Children used affective rationales more often in school concepts. Children had more difficulty detecting bias with self-selected sampling methods than restricted sampling methods because self -selection was initially the most fair (i.e, everyone had a chance to participate).

Children preferred stratified random sampling to simple random sampling because they wanted to ensure that all types of individuals were included. When drawing conclusions from multiple surveys children: (a) Considered survey quality, (b) aggregated all surveys regardless of quality, (c) used their own opinions and ignored all survey data, or (d) refused to draw conclusions. Even when the children were able to identify potential bias, they often ignored survey quality when drawing conclusions from multiple surveys. Children' s understanding of inference proved difficult to assess, yet some children demonstrated understanding. The findings of these studies provide teachers with information about children's informal conceptions and misconceptions of sampling and inference.

KOIRALA, H. (1997) _Conceptions of probability held by preservice teachers of secondary school mathematics_. Ph.D. The University of British Columbia. Supervisor. D.F. Robitaille. DAI n. DANN05990.

The purpose of this study was to explore the qualitatively different conceptions of probability held by two groups of preservice teachers of secondary school mathematics at the University of British Columbia, Canada. The study also explored the consistency of participants' conceptions of probability and their views on the utility of formal probability in solving everyday problems.

A set of written tasks, pair-problem solving tasks, and interview tasks related to probability were given to the participants. A total of 40 preservice teachers participated in the written component, 16 of who also participated in the pair-problem solving and the individual interview components.

It was found that the preservice teachers held qualitatively different conceptions of probability. Their conceptions of probability were grouped into formal and non-formal. Formal conceptions include the use of probability concepts such as independence and randomness, and the use of probability formulas, rules and applications in solving problems. Non-formal concepts included participants' use of everyday experiences and heuristics, use of science knowledge in solving problems. The participants' conceptions of probability varied widely among tasks depending on whether the tasks appeared to be taken from probability textbooks or from an everyday context. Two main conclusions were drawn from the rustles of this study. First, preservice teachers hold qualitatively different conceptions of probability that largely depend on contexts determined by tasks and settings. Second, students' understanding of probability may be influenced by their non-formal conceptions, and these should be used in teaching formal probability concepts.

LESSER, L. M. (1994). The role of counterintuitive examples in statistics education , Ph.D. The University of Texas at Austin. Dr. Ralph W. Cain.

The purpose of this study was to develop a theoretical model for the use of counterintuitive examples in the introductory non calculus-based statistics course at the college level. While intuition and misconceptions continue to be of great interest to mathematics and science educators, there has been little research, much less consensus or even internal consistency, in statistics curriculum development concerning the role of examples with counterintuitive results. Because the study intended to provide educators with useful connections to content, instructional methods (e.g., co-operative learning) and learning theory constructs that have been successfully used in mathematics or science education, the model that emerged was organised around a typical syllabus of topics.

The study critiqued and then reconciled traditional and alternative perspectives. The traditional position attempts to minimise possible confusion and frustration by avoiding such examples, while the alternative position uses them to motivate and engage students in critical thinking, active learning, metacognition, communication of their ideas, real-world problem solving and exploration, reflection on the nature and process of statistics, and other types of activities encouraged by current reform movements.

The study delineated specific criteria and conditions for selecting and using counterintuitive examples to achieve numerous cognitive and affective objectives. Examples explored include the Monty Hall problem, Simpsonís Paradox, the birthday problem, de Mere's Paradox, the Classification Paradox, the Inspection Paradox, and required sample size. The study connected many of these examples (especially Simpsonís Paradox) with other counterintuitive examples, with known probability or statistics misconceptions many students have, with representations from other branches of mathematics, and with the constructivist paradigm. Problematic issues addressed include difficulty in constructing assessment instruments and a multiplicity of terminology and typologies. Additional directions for research were suggested, including several empirical investigations of various facets of the model. The connections, examples, and representations presented should be extremely useful for teachers of statistics, but should also enrich the pedagogy of teachers of other courses.

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7. CHILDREN'S STRATEGIES IN COMPARING PROBABILITIES

Acredolo, C., O'Connor, J., Banks, L., & Horobin, K. (1980). Children's ability to make probability estimates: Skills revealed through applications of Anderson's fundamental methodology. _Child Development_, 60, 933-945.

CAÑIZARES, M. J., & BATANERO, C. (1996). Niveles y estrategias en la comparación de probabilidades en alumnos de 10 a 14 aÒos. (Levels and strategies in 10-14 year-old childrenís comparison of probabilities). In P. Flores et al. (Eds.), _Investigacion en el aula de matematicas: el curriculo_ (pp. 337-344). University of Granada.

CAÑIZARES, M. J., BATANERO, C., SERRANO, L., & ORTIZ, J. J. (1997). Subjective elements in childrenís comparison of probabilities. _Proceedings of the XXI International Conference on the Psychology of Mathematics Education_ (v.2, pp. 49-56). University of Lahti.

Davies, H. (1965). Development of the probability concept in children. _Child Development_, 99, 29-39.

Falk, R., Falk, R., & Levin, I. (1980). A potential for learning probability in young children. _Educational Studies in Mathematics_, 11, 181-204.

FISCHBEIN, E. (1975). _The intuitive sources of probability thinking in children_. Dordrecht: Reidel.

FISCHBEIN, E., & Gazit, A. (1984). Does the teaching of probability improve probabilistic intuitions? _Educational Studies in Mathematics_, 15, 1-24.

FISCHBEIN, E., Pamput, E., & Minzat, I.(1967). The child's intuition of probability. _Enfance_, 2, 193-280.

FISCHBEIN, E., Pamput, E., & Minzat, I. (1970). Comparison of fractions and the chance concepts in children. _Child Development_, 41, 365-376.

Giménez, J. (1992). Some wrong strategies to determine probabilities in 8th graders. Report of a preliminary study. In W. Geeslin, & K. Graham (Eds.), _Proceedings of the XVI PME Conference_ (v.3, p. 163). University of New Hampshire.

Goldberg, E. (1966). Probability judgement by pre-school children. _Child Development_, 37, 157-167.

GREEN, D. R. (1982). Probability concepts in school pupils aged 11-16 years. PhD. Dissertation. University of Loughborough.

GREEN, D. R. (1983). School pupils' probability concepts. _Teaching Statistics_, 5 (2), 34-42.

GREEN, D. R. (1983). A Survey of probabilistic concepts in 3000 pupils aged 11-16 years. In D. R. Grey et al. (Eds.), _Proceedings of the First International Conference on Teaching Statistics_ (v.2, pp. 766 - 783). University of Sheffield.

Hoemann, H. W., & Ross, B. M. (1975). Children's understanding of probability concepts. _Child Development_, 42, 221-236.

Hoemann, H. W., & Ross, B. M. (1982). Children's concepts of chance and probability. In Brainerd (Ed.), _Children's logical and mathematical cognition_ (pp. 93-121). Berlin: Springer Verlag.

Maury, S. (1984). La quantification des probabilites: Analyse des arguments utilises par les eleves de classe de seconde. _Recherches en Didactique des Mathematiques_, 5(2), 187-214.

Piaget, J., & Inhelder, B. (1951). La genése de l'idée de hasard chez l'enfant. ParÌs: Presses Universitaires de France.

Spinillo, A. G. (1997). Chance estimates by young children: Strategies used in an ordering chance task. In E. Pehkonen (Ed.), _Proceedings of the 21st Conference of the International Group for the Psychology of Mathematics Education_ (v. 4, pp. 182-189). Lahti Research and Training Centre.

TRURAN, J. (1992). _The development of children's understanding of probability and the application of research to classroom practice_, M.Ed. Thesis. University of Adelaide.

TRURAN, J. (1994). Examination of a relationship between children's estimation of probabilities and their understanding of proportion. In J. P. Ponte, & J. F. Matos (Eds.), Proceedings of the XVIII PME Conference (v4, pp. 337-344). University of Lisbon.

Yost, P., Siegel, A., & Andrews, J. (1962). Non-verbal probability judgements by young children. _Child Development_, 33, 769-780.

8. OTHER PUBLICATIONS OF INTEREST

Cox, D. R. (1997). The current position of statistics: A personal view. _International Statistical Review_, 65(3), 261-290.

Some current aspects of statistical work are reviewed under three broad headings: Applied probability modelling, design of investigations, and statistical analysis and interpretation of data. The emphasis is on applications in science and science-based technology, although some incidental comments are made about statistics in public affairs. While no technical details are given, there is some discussion of potential fields for development. The choice of topics reflects the author's personal interests.

This issue also contains the following reactions to the paper and the response to them by D. R. Cox:

Cameron, M. Current Influences of computing on statistics (pp. 277-280).

HAWKINS, A. Forward to basics! A personal view of developments in statistical education (pp. 280-287).

Teugels, J. L. Discussion (pp. 287-288).

Flores, A. (1995). Connections in proportional reasoning: Levers, arithmetic means, mixtures, batting averages and speeds. _School Science and Mathematics_, 95(8), 423-430.

The lever is used to give an alternate physical representation of and as a means to connect situations that involve weighted averages and inverse proportionality. Geometric representations of the situations are also provided as another way to make connections.

Fox, W. P., & Fowler, C. W. (1996). Aiding undergraduate understanding of covariance and correlation. _Primus_, 6(3), 235-244.

We describe the use of graphical exercises to explain the concepts of covariance and corrlation as

they are used in an undergraduate course on probability and statistics. Students seem unable to grasp the concepts and interpretation, although they can perform the necessary calculations to provide examples that help to illustrate the two key concepts of covariance and correlation. These examples show the importance of understanding the meaning of correlation.

9. COMPLEMENTARY SHORT REFERENCES

Abelson, R. P. (1997). The surprising longevity of flogged horses: Why there is a case for the significance test. _Psychological Science_ , 8, 12-15.

Boyd, J. N. (1997). A statistical test for dimension. _Primus_, 7(2), 141-146.

Crawford, D. (1997). Learning probability- Misconceptions and all. _Mathematics Teaching_, 159, 23-29.

Dacunha-Castélle, D. (1996). _Chemins de l'aléatoire. Le hasard et le risque dans la societe modérne_ (Randomness paths. Chance and risque in modern society). Flammarion.

Duperret, J. C. (1995). L'apprenti frequentiste (The frequentist learner). _Reperes-IREM, 21.

Finney, D. J. (1998). Remember a pioneer: Frank Yates. _Teaching Statistics_, 20 (1), 2-5.

Fox, W. P., Grim, P. E., & Hogan, D. L. (1996). Teaching reinforcement of stochastic behaviour using Monte Carlo simulation. _Journal of Computers in Mathematics and Science Teaching_, 15(4), 339-352.

FULLER, M. (1998). Spreadsheets resources for statistics. _Teaching Statistics_, 20 (1), 24-26.

GIRARD, J. C. (1996). Pourquoi il ne faut pas laisser de côté les chapîtres de statistiques au collége (Why we should not get round statistics in high school). _Reperes-IREM, 23.

Graham, A. (1996). Sampling-bottle party games with a graphics calculator. _Teaching Mathematics and its Applications_, 15(1), 33-36.

Harlow, L. L., Mulaik, S. A., Steiger, J. H. (Eds.), (1997). _What if there were no significance tests?_ Mahwah, N.J.: Erlbaum.

A. HAWKINS (1996). Stat-ed il centro per l'insegnamento della statistica della RSS (The RSS centre for statistical education). Induzioni, 13.

Healy, L., & Hoyles, C. (1997). Using a database for student research. _Mathematics Teaching in the Middle School_, 2(3), 154-158.

Hollis, P. J. (1997). Ideas for improving statistics education. _International Journal of Mathematical Education in Science and Technology_, 28(4), 569-573.

Johnson, J. M. (1997). The birthday problem explained. _The Mathematics Teacher_, 90(1), 20-22.

LESSER, L. (1998). Countering indifference using counterintuitive examples. _Teaching Statistics_, 20 (1), 10-12.

E. LOMBARDO(1996). Appunti su di un vecchio paradosso della media aritmetica e sua

attualit‡ didattica (Notes on an old paradox about arithmetic mean and its current didactical interest). Induzioni, 13.

Matthews, R., & Stones, F. (1998). Coincidences: The truth is out there. _Teaching Statistics_, 20 (1), 17-19.

Pagni, D. (1996). Birthday twins. _The Australian Mathematics Teacher_, 52(1), 42-46.

ROUNCENFIELD, M. (1997). Testing a hypothesis...Too testing at key stage 4? _Teaching Mathematics and its Applications_, 16(2), 55-57.

Santner, T. J. (1998). Teaching large-sample binomial confidence intervals. _Teaching Statistics_, 20 (1), 20-23.

Speer, W. R. (1997). Exploring random numbers. _Teaching Children Mathematics_, 3(5), 242-246.

Quin, R. J. (1996). Exploring probability and statistics with preservice and inservice teachers. _School Science and Mathematics_, 96(5), 255-257.

Whitin, D. J. (1997). Collecting data with young children. _Young Children_, 52(2), 28-32.

10. INTERNET RESOURCES

10.1. A statistical analysis package for introductory statistics courses on the web

Jeff BANFIELD (jeff@math.montana.edu; http://www.math.montana.edu/~umsfjban) has been working on a statistical analysis package for introductory statistics courses that can be accessed through the Web. It is called Rweb since it is based on R, a statistical analysis package written by Robert Gentleman and Ross Ihaka at the University of Auckland.

All of the code is freely accessible. Jeff has finally got to the point in the development of Rweb where he would like to get some feedback from the statistical education community. He would appreciate it if you would take the time to look at it and send him your feedback.

The URL for Rweb is: http://www.math.montana.edu/Rweb

10.2. How to study statistics

Paul Hutchinson (Phutchin@bunyip.bhs.mq.edu.au) has put up a webpage on "How to study statistics". It may be of interest to some group members. Its location is http://www.wp.com /STAT/study.html

10.3. Information for introductory statistics courses

Andi Hakim NASOETION (ahnmipa@indo.net.id) is sending us the address of a web-site where you can find some information for introductory statistics courses:

http://etip.unco.edu/lesser/home.htm

10.4. MATHDI database

The data base MATHDI (MATHematical DIdactics) is the most comprehensive and up-to-date information service in the fields of mathematics education and computer science education, elementary mathematics and its applications as well as psychological and pedagogical issues for mathematics and science education. It is now available from the web site http://www.emis.de /MATH/DI.html

More information is available from Gerhard Koenig (GK@fiz-karlsruhe).

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11. ICOTS 5 TOPICS 1-3, AND KEYNOTE SPEAKERS

The Fifth International Conference on Teaching Statistics will be held in Singapore, from June 21 to 26, 1998. Below is the list of keynote speakers and program for Topics 1-3. More information is available from the web site:

http://www.nie.ac.sig:8000/~wwwmath/icots.html

Keynote speakers

CHEUNG, P. Developments in official statistics: Implications and challenges for statistical. education.

Cleveland, W. S. Technology and changing paradigms for statistics: Putting models first and methods second.

Luk, R. Applications of statistics in the business world.

Vere-Jones, D. Background influences on the development of statistical education.

SCHEAFFER, R. Statistical education: Bridging the gaps among school, college and the workplace.

Topic 1. Statistical education at the school level. Convener: L. PEREIRA-MENDOZA, pereiraml@am.nie.ac.sg

1.1 Statistical education at elementary level: The emergence of statistical reasoning in young children. Organiser: C. Maher, cmaher@rci.rutgers.edu

Amit, M. Learning through game playing.

Vidakovic, D., Berenson, S., & Brandsma, J. Statistical ideas and children's rules of fair play.

Frant, J. B., & Kaufman E. Children's ideas of fairness.

Speiser, R., & Walter, C. Children roll dice.

Dunkels, A. Basics of EDA as a vehicle to number sense in primary teacher education.

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

Hyde, H., & Nicholson, J. Sharing data via e-mail at the secondary level.

Rogerson, A. Innovative secondary school classroom experiments with statistics education using

the computer.

RANGECROFT, M. Supporting statistics teachers.

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

2.1 Teaching introductory statistics and probability (post-secondary). Organiser A. Rossman, rossman@dickinson.edu

Witmer, J. Using activities in STATS 101.

Rossman, A., & Chance, B. Workshop Statistics: Dissemination and assessment.

Dansie, B. Using collaborative learning packages to teach introductory statistics.

Bilotti-Aliaga, M. Re-thinking STAT 101.

Fitz Simons, G. E. Statistics for vocational, technical, and 2-year college students.

Swanson, D. A., & McKibben, J. N. Teaching statistics to non-specialists: A course aimed at increasing both learning and retention.

Wood, G. R. Transforming first year University statistics teaching.

Sowey, E. R. Statistics teaching and the textbook: An uneasy alliance.

Vaanman. K., & Dunkels, A. Tertiary statistics with co-operative small groups and without teacher exposition.

GUNAWARDENA, K. L. D. Introductory statistics: A co-operative learning approach.

Shoesmith, E. Developing a statistics syllabus for finance and accounting.

Carlson, W. L. Statistical cases to increase learning and motivation.

Maillardet, R., & Brown, T. Introducing multimedia tools for statistics learning across many university departments: Experience with StatPlay.

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

Tanis, E. Using maple for instruction in undergraduate probability and statistics.

Saville, D., & Wood, G. A new angle on the t-test.

Berger, R. Using computer algebra systems to teach graduate mathematical statistics: Potential and pitfalls.

2.3 Teaching design and analysis of experiments. Organiser R. Lock, rlock@vm.stlawu.edu

Lock, R. Using simulation, sports, and the WWW to help students experience experimental design.

COBB, G.. & Miao, W. Bears in space: Activities to introduce basic ideas of design.

Bishop, G. Experimental design training on the World Wide Web.

Ho, S. L. Understanding statistical design and analysis of experiments in the classroom.

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

T. Foucart. Improving the classical uses of regression modelling.

Chan, W. S. Teaching the concept of breakdown point in simple linear regression.

Stephenson, W. R., Meeker, W. Q., Cook, D., & Kaiser, M. Beyond traditional statistical methods.

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

Stangl, D. Classical versus Bayesian paradigm: Can we teach both?

Iversen, G. Student perceptions of Bayesian statistics.

LECOUTRE, B. Teaching Bayesian methods for experimental data analysis.

Schield, M. Using Bayesian strength of belief to teach classical statistics.

2.6 Teaching sample survey design and analysis. Organiser A. Lee WANG, j2wang@cc.um.edu.my

Manly, B. & McDonald, L. L. Teaching sampling theory using ecological examples.

Chambers, R., & Skinner, C. Communicating sampling concepts to social scientists: the CASS experience.

JOLLIFFE, F. A course on sample surveys for statistics students.

Mukhopadhyay, P. Teaching of sample survey design and analysis in the in-service training programme of statistical officers.

2.7. Teaching statistics to medical students. Organiser G. Berry, geoffb@pub.health.su.oz.au

Campbell, M. J. Teaching Logistic Regression.

Yanagawa, T. Teaching the Mantel-Haenszel procedure to medical students.

Svensson, E. Teaching biostatistics to clinical research groups.

Laake, P. Teaching statistics to medical doctors via the World Wide Web.

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

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

Kanji, G. Learning at work: Continuous statistical education for employees.

Chan, L. K., & Tse, S. K. University industry partnership in statistical development.

Po Lo, H., & Lam, J. K. L. Employee's perception on teaching, learning and use of quantitative methods: A survey report.

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

RANGECROFT, M., & Wallace, W. Group consultancy, as easy as falling off a bicycle?

Bentley, J. L., Schneider, T. J., & Bentley, D. T. Statistical consulting in archaeology: Digging for real data.

Olejnik, S. Developing case studies for applied statistical methods classes through consultancies.

Ruberg, S. J. Consulting: The two way street.

Wisenbaker, J. M., & SCOTT, J. S. Examining the consulting-teaching relationship for University based statisticians.

Belli, G. M. The teaching aspects of consultancy.

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

Teekens, R. Training European statisticians: An international training programme for official statisticians.

Davies, N., & Smith, F. A strategy for continuing professional education in statistics.

Kennessy, Z. The Netherlands training official statisticians.

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

Lunn, D. An overview of statistical education at a distance.

Talbot, M. Horgan, G. W., Mann, A. D., Scotland, Bishop, G. R., Alonso-Sanz, R., & Badia, J. Smart -on-the-job training in quantitative methods via the WWW.

Young, S. Integrating technology into teaching - the Scottish high-speed networks.

PHILLIPS, B. Francis, G,. & Hutchenson, M. Statistics for workers in social and health sciences by flexible learning modes.

Dunning, D. B., & Lai, C. D. Supporting the distance learning of the introductory business statistics course by telephone and E-mail.

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

WILD, C., & PFANNKUCH, M. What is statistical thinking.

Mittag, H. J. Experimenting with quality data: New dimensions of statistical education in industrial process control.

Abraham, B., & Beecroft, D. Statistical education and University industry partnerships.

12. FORTHCOMING CONFERENCES

12.1. CIT Conference, Cortland campus, New York, May 26-29, 1998

This conference is designed to empower SUNY faculty and professionals with the knowledge to use the current technological tools of education so that they may be used continually and effectively to improve the educational process. More information is available from Jorge Luis ROMEU (matresearch@SNYCORVA.CORTLAND.EDU) or the web site: http://snycorva.cortland.edu/~matresearch

12.2. International Seminar on Science, Mathematics and Technical Education for National Development, June 29-July 2, 1998

The Department of Science and Mathematics Education of the Sultan Hassanal Bolkiah Institute of Education is pleased to announce an International Seminar on Science, Mathematics and Technical Education for National Development, June 29-July 2, 1998. We aim to bring together theoreticians and practitioners to discuss contributions science, mathematics and technical education could make towards national development in a range of contexts.

The Seminar will be held at University Brunei Darussalam, located near the shore of the South China Sea about twelve kilometres from Bandar Seri Begawan. Negara Brunei Darussalam is situated on the north-western shore of the island of Borneo and is bordered on three sides by the Malaysian state of Sarawak. The capital city, Bandar Seri Begawan, blends the modern with the traditional, and is one of the most picturesque capitals in the Asian region.

More information available from the Seminar Secretary (Dr Martin Quigley) Department of Science and Mathematics Education, Sultan Hassanal Bolkiah Institute of Education, University Brunei Darussalam, Bandar Seri Begawan 2028, Negara Brunei Darussalam, martyn@ubd.edu.bn

12.3. RELME-12 XII Reunión Latinoamericana de Matemática Educativa. July, 6-10, 1998, Santafé de Bogotá, Colombia

This meeting is organised by the Universidad Pedagogica Nacional, Universidad Nacional de Colombia, Universidad Distrital Francisco Jose de Caldas. CLAME, and Comité Latinoamericano de Matemática Educativa.

More information available from: Departamento de Matemática Educativa CINVESTAT- IPN, http://www.cinvestat.mx/clame

Universidad Pedagógica Nacional, Bogotá, Colombia, Departamento de Matemáticas, (upedago2@coll.telecom.com.co)

Universidad Nacional de Colombia, Bogotá, Colombia, Departamento de Matemáticas, (macevedo@matematicas.unal.edu.co).

12.4. Stochastics work at PME-22, Stellenbosch, South Africa, 12 -17 July, 1998

This conference will be held from 12-17 July 97 at a small university town in the wine growing region of Southern South Africa about 50 km from Cape Town. The theme is "Diversity and Change in Mathematics Education". Details may be found at: http://www.sun.ac.za/pme22

An important part of the Conference will be a Research Forum on the subject "Learning and Teaching Data Handling" co-ordinated by Paul Laridon, University of Witwatersrand, Johannesberg. This will have two presentations:

"Graphing as a Computer-mediated Tool". Janet Ainley, Elena Nardi, Dave Pratt from the University of Warwick, UK.

"Building the Meaning of Statistical Association through Data Analysis Activities". Carmen BATANERO, Juan D. GODINO from the University of Granada, Spain, and Antonio ESTEPA from the University of Jaen, Spain.

There will also be two reactors to these presentations, whose names have not yet been announced, and substantial time for discussion. This should provide a real opportunity for us to think through some of the big ideas with which we are concerned.

The Working Group will meet three or four times during the Conference. This is the plan for the sessions:

a. Report of ICOTS meeting and details of future conferences.

b. Providing opportunities for members to talk about their work in an informal way.

c. Studying the possibility of developing a book on statistical education, which presents the state of arts of research and pedagogical implications. As this is a huge project, an invitation to participate will be made to the members of the International Study Group for Research on Learning Probability and Statistics during the meeting of this group in Singapore. This book is being co-ordinated by Kath TRURAN, John TRURAN and Carmen BATANERO, with Kath(Kath.Truran@unisa.edu.au) as the main responsible. A detailed call for proposals will be done soon after the PME conference, if there is sufficient consensus about the Project.

d. Proposal for developing a specific PME Section in the Newsletter of the International Study Group for Research on Learning Probability and Statistics, which will be the base for an electronic Data Base of annotated bibliographies.

12.5. III CIBEM, 26- 31 July, 1998, Caracas, Venezuela

The Third Iberoamerican Conference on Mathematics Education will be held at Caracas, Venezuela since July 26 to July 31, 1998. Information is available from the Chair of the Scientific Committee, Prof. Walter Beyer, Apartado postal 54087, UCV 1053-A, Caracas-Venezuela or from the Conference Secretary, iiicibem@sagi.ucv.edu.ve,

jmosquer@reacciun.ve

A working group on statistical education is meeting during the conference with the specific aim of bringing together statistical education people from Iberoamerican countries and planning future collaborations. People interested in presenting papers at the working group sessions should send a message to Audy SALCEDO (audysalc@yahoo.co).

12.6. The First Conference of the European Society for Research in Mathematics Education, CERME 1, Osnabrueck, Germany, 27 - 31 August, 1998

In May 1997, representatives from 16 European countries met in Osnabrueck, Germany, to establish a new society ERME, to promote communication, co-operation and collaboration in mathematics educational research in Europe, which is holding its first Conference this year. More information is available from the Conference secretary: Sabine Jones, Universitat Osnabrueck, FB Mathematik /Informatik, CERME 1, D-49069 Osnabrueck. E-mail: erme@mathematik.uni-osnabrueck.de

web site: http://www.erme.uni-osnabrueck.de/erme98.html

12.7. International Colloquium on Mathematics in Gambling, Budapest (Hungary) on August 30 - September 5, 1998

The Janos Bolyai Mathematical Society is organizing a Colloquium on "Gambling in Mathematics" in Budapest (Hungary) on August 30 - September 5, 1998.

The scope of the Colloquium includes the following topics:

- combinatorial problems in gambling (e.g. lottery, keno, etc.)

- statistical testing of gambling devices

- gambling in mathematical education

- bankruptcy estimations

- lottery - market analysis

- probabilities of sequence patterns

- card shuffling

- estimates of odds for totalisator agencies

- gambling and the history of mathematics

- furthermore any mathematical theories related to roulette, blackjack, redfox, bingo, lottery, toto, keno, dice games, card games.

Information available from the Conference Secretary jatek@math-inst.hu or the web site

http://www.math-inst.hu/~jatek) .

12.8. PME-NA XX, Twentieth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, North Carolina State University, Raleigh, North Carolina, USA, October 31 - November 3, 1998

Program Chair: Dr. Sarah B. Berenson (berenson@unity.ncsu.edu)

Conference Coordinator: Dr. Wendy N. Coulombe (wncoulom@unity.ncsu.edu)

http://www.ncsu.edu/pmena98/

12.9. Statistics Education Topics and Organisers at the 52nd Session of the International Statistical Institute Helsinki, Finland, 10-18 August, 1999

1. Statistical education and the significance tests controversy. C. BATANERO, batanero@goliat.ugr.es
1. Teaching and training multivariate data analysis. H. Bacelar-Nicolau, ulfphelb@cc.fc.ul.pt
1. Statistical education using flexible learning approaches. A. Di Ciacio, diciaccio@econ.uniurb.it
1. Statistical education for life. A. HAWKINS, ash@maths.nott.ac.uk
1. Issues involved in the assessment and evaluation of student learning of statistics. J.B.

GARFIELD, jbg@maroon.tc.umn.edu

1. Visualisation as an educational tool. L.Weldon, weldon@cs.sfu.ca
1. Statistical training for people working in and with official statistics (in co-ordination with IAOS). R. Smulders, rsls@cbs.nl, and C.J. BLUMBERG, wncarolj@vax2.winona.msus.edu

Executive Secretariat of the 52nd ISI Session: Ilkka Mellin, Statistics Finland, FIN-00022, Helsinki, Finland, isi99@stat.fi, http://www.stat.fi/isi99