Statistics Education Research Journal

Volume 7 Number 2 November 2008

Editors

Peter Petocz
Tom Short

Assistant Editor

Beth Chance

Associate Editors

Andrej Blejec
Carol Joyce Blumberg
Joan B. Garfield
John Harraway
Flavia Jolliffe
M. Gabriella Ottaviani
Lionel Pereira-Mendoza
Peter Petocz
Maxine Pfannkuch
Mokaeane Polaki
Dave Pratt
Chris Reading
Ernesto Sanchez
Richard L. Scheaffer
Gilberte Schuyten
Jane Watson

International Association for Statistical Education
http://www.stat.auckland.ac.nz/~iase

International Statistical Institute
http://isi.cbs.nl/

1.1. STATISTICS EDUCATION RESEARCH JOURNAL

The *Statistics Education Research Journal* (*SERJ*) is a peer-reviewed electronic journal of the International Association for Statistical Education (IASE) and the International Statistical Institute (ISI). *SERJ* is published twice a year and is free.

SERJ aims to advance research-based knowledge that can help to improve the teaching, learning, and understanding of statistics or probability at all educational levels and in both formal (classroom-based) and informal (out-of-classroom) contexts. Such research may examine, for example, cognitive, motivational, attitudinal, curricular, teaching-related, technology-related, organizational, or societal factors and processes that are related to the development and understanding of stochastic knowledge. In addition, research may focus on how people use or apply statistical and probabilistic information and ideas, broadly viewed.

The *Journal* encourages the submission of quality papers related to the above goals, such as reports of original research (both quantitative and qualitative), integrative and critical reviews of research literature, analyses of research-based theoretical and methodological models, and other types of papers described in full in the Guidelines for Authors. All papers are reviewed internally by an Associate Editor or Editor, and are blind-reviewed by at least two external referees. Contributions in English are recommended. Contributions in French and Spanish will also be considered. A submitted paper must not have been published before or be under consideration for publication elsewhere.

Further information and guidelines for authors are available at: http://www.stat.auckland.ac.nz/serj

Submissions

Manuscripts must be submitted by email, as an attached Word document, to co-editor Tom Short <tshort@iup.edu>. Submitted manuscripts should be produced using the Template file and in accordance with details in the Guidelines for Authors on the Journal's Web page: http://www.stat.auckland.ac.nz/serj

© International Association for Statistical Education (IASE/ISI), November 2008

Publication: IASE/ISI, Voorburg, The Netherlands
Technical Production: California Polytechnic State University, San Luis Obispo, California, United States of America
Web hosting and technical support: Department of Statistics, University of Auckland, New Zealand

ISSN: 1570-1824

International Association for Statistical Education

President: Allan Rossman (United States of America)
President-Elect: Helen MacGillivray (Australia)
Past- President: Gilberte Schuyten (Belgium)
Vice-Presidents: Andrej Blejec (Slovenia), John Harraway (New Zealand), James Nicholson (Ireland), Delia North (South Africa), Enriqueta Reston (Phillipines)

SERJ EDITORIAL BOARD

Editors

Peter Petocz, Macquarie University, Sydney, North Ryde, New South Wales 2109, Austraila Email: peter.petocz@mq.edu.au

Tom Short, Department of Mathematics and Computer Science, John Carroll University, 20700 North Park Boulevard, University Heights, Ohio 44118, USA. Email: tshort@jcu.edu

Assistant Editor

Beth Chance, Department of Statistics, California Polytechnic State University, San Luis Obispo, California, 93407, USA. Email: bchance@calpoly.edu

Associate Editors

Andrej Blejec, National Institute of Biology, Vecna pot 111 POB 141, SI-1000 Ljubljana, Slovenia. Email: andrej.blejec@nib.si

Carol Joyce Blumberg, Energy Information Administration, US Department of Energy, 1000 Independence Avenue SW, EI-42, Washington DC 20585, USA. Email: carol.blumberg@eia.doe.gov

Joan B. Garfield, Educational Psychology, University of Minnesota, 315 Burton Hall, 178 Pillsbury Drive, S.E., Minneapolis, MN 55455, USA. Email: jbg@umn.edu

John Harraway, Department of Mathematics and Statistics, University of Otago, P.O.Box 56, Dunedin, New Zealand. Email: jharraway@maths.otago.ac.nz

Flavia Jolliffe, Institute of Mathematics, Statistics and Actuarial Science, University of Kent, Canterbury, Kent, CT2 7NF, United Kingdom. Email: F.Jolliffe@kent.ac.uk

M. Gabriella Ottaviani, Dipartimento di Statistica Probabilitá e Statistiche Applicate, Universitá degli Studi di Roma "La Sapienza", P.le Aldo Moro, 5, 00185, Rome, Italy. Email: Mariagabriella.ottaviani@uniroma1.it

Lionel Pereira-Mendoza, 3366 Drew Henry Drive, Osgoode, Ottawa K0A 2W0 Ontario Canada K0A 2W0. Email: lionel@iammendoza.com

Peter Petocz, Department of Statistics, Macquarie University, North Ryde, Sydney, NSW 2109, Australia. Email: ppetocz@efs.mq.edu.au

Maxine Pfannkuch, Mathematics Education Unit, Department of Mathematics, The University of Auckland, Private Bag 92019, Auckland, New Zealand. Email: m.pfannkuch@auckland.ac.nz

Mokaeane Polaki, School of Education, National University of Lesotho, P.O. Box Roma 180, Lesotho. Email: mv.polaki@nul.ls

Dave Pratt, Institute of Education, University of London, 20 Bedford Way, London WC1H 0AL. d.pratt@ioe.ac.uk

Christine Reading, SiMERR National Centre, Faculty of Education, Health and Professional Studies, University of New England, Armidale, NSW 2351, Australia. Email: creading@une.edu.au

Ernesto Sánchez, Departamento de Matematica Educativa, CINVESTAV-IPN, Av. Instituto Politecnico Nacional 2508, Col. San Pedro Zacatenco, 07360, Mexico D. F., Mexico. Email: esanchez@cinvestav.mx

Richard L. Scheaffer, Department of Statistics, University of Florida, 907 NW 21 Terrace, Gainesville, FL 32603, USA. Email: scheaffe@stat.ufl.edu

Gilberte Schuyten, Faculty of Psychology and Educational Sciences, Ghent University, H. Dunantlaan 1, B-9000 Gent, Belgium. Email: Gilberte.Schuyten@UGent.be

Jane Watson, University of Tasmania, Private Bag 66, Hobart, Tasmania 7001, Australia. Email: Jane.Watson@utas.edu.au

TABLE OF CONTENTS

Editorial 2

Dave Pratt and Janet Ainley (Guest Editors)
Introducting the Special Issue on Informal Inferential Reasoning 3

Allan Rossman (Invited)
Reasoning about Informal Statistical Inference: A Statistician's View 5

Ruth Beyth-Marom, Fiona Fidler, and Geoff Cumming
Statistical Cognition: Towards Evidence-Based Practice in Statistics and Statistics Education 20

Andrew Zieffler, Joan Garfield, Robert delMas, and Chris Reading
A Framework to Support Research on Informal Inferential Reasoning 40

Jane M. Watson
Exploring Beginning Inference With Novice Grade 7 Students 59

Efi Paparistodemou and Maria Meletiou-Mavrotheris
Developing Young Students' Informal Infernce Skills in Data Analysis 84

Dave Pratt, Peter Johnston-Wilder, Janet Ainley, and John Mason
Local and Global Thinking in Statistical Inference

Arthur Bakker, Phillip Kent, Jan Derry, Richard Noss, and Celia Hoyles
Statistical Inference at Work: Statistical Process Control as an Example

Other Past Conferences

Other Forthcoming Conferences

Statistics Education Research Journal Referees

EDITORIAL

This last August I was fortunate enough to be able to attend several meetings, including SRTL-5 (the fifth forum on Statistical Reasoning, Thinking, and Literacy, at the University of Warwick, UK), the IASE Satellite meeting on Assessing Student Learning in Statistics (Guimarães, Portugal), and ISI-56, the biannual meeting of the International Statistical Institute (Lisbon, Portugal). Information about all of them appears in the "Past IASE Conferences" section at the end of this issue.

It was exciting to chat informally and hear presentations regarding a very wide range of studies, projects, and professional activities related to statistics education. Clearly, the international community interested in research on the learning, teaching, and understanding of statistics and probability, is growing and diversifying. From the many topics I came across, I would like to briefly highlight one that deserves special mentioning in the context of a research journal such as *SERJ*, related to the types of research data and types of evidence we encounter, and their implications for research publishing and for teaching/learning.

We often speak of "quantitative research" versus "qualitative research." Although it is recognized that both types are needed in research of an educational nature, sometimes we see researchers leaning towards one or the other. There is a somewhat tenuous relationship between quantitative and qualitative research in an area whose subject matter, statistics, is based on quantitative information, and where some of the researchers and teachers (as well as manuscript referees…) are mainly trained in quantitative methods.

However, I have now come across a number of situations where neither of these two traditional labels is sufficient, and perhaps we should refer to a third (hybrid?) kind, "Dynamic data." The need to rethink the traditional division of research into quantitative and qualitative became obvious to me this summer when listening to reports about classroom activities and studies where learners and teachers used dynamic software such as Fathom, Tinkerplots, or interactive applets such as probability simulators. In such and related cases, the data being collected by researchers (i.e., information about what students did, what they looked at, and how they thought during an activity or interpreted the results) was more complex than ever before, and sometimes quite slippery. The data accumulated over time and involved a dynamically changing mix of elements such as utterances and conversations among students or among students and teacher, different types of graphical displays, multiple "what if" trials with different aggregations or data views that the students looked at in the course of their work, results of trying different kinds of simulations, and more.

Of course, the need to collect, describe and integrate data from multiple sources, both quantitative and qualitative, has existed before the emergence of dynamic software. However, listening to reports from different studies, it became apparent that researchers are challenged by the need to capture and describe the additional fast-changing and multi-faceted data generated when dynamic software is an inherent part of the teaching/learning environment and when students are given enough time to use it in an exploratory manner. The nature of what students look at, work with, refer to, or think about is becoming more complex and harder to document, as it rapidly changes over time. Of course, all these realities place additional burden and present new demands to teachers working in a "dynamic data" environment, and have implications for the forms of needed assessments.

© International Association for Statistical Education (IASE/ISI), November, 2008