

## Promoting research and research reporting in statistics education: The SERJ experience

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### ABSTRACT

The Statistics Education Research Journal was established in 2001 by the International Association for Statistical Education (IASE). It is the first journal devoted to research reporting in the area of statistics education. This paper, written by the current co-editors of SERJ, first briefly describes editorial processes and the types of papers suitable for publication, and outlines areas where more research is needed. The paper then describes experience gained by the journal editors when considering submissions, lists typical problems with papers, and provides some advice for prospective authors.

**Keywords:** Statistics Education Research, Online Journal, Refereeing Process.

### 1. Introduction

Recent decades have seen a growing recognition of the importance of statistical knowledge for citizens, students, workers, managers, and policy-makers. The last few years have seen a growing awareness of the complexities involved in developing and applying knowledge pertaining to statistics, probability, and research methods. We frequently encounter reports by educators who teach statistics, probability or research methods, whether at the elementary, secondary, post-secondary levels, or other contexts, of difficulties, misconceptions, misunderstandings, or fragile knowledge of learners. There have been, too, many suggestions for ways to teach these subjects in order to reduce or avoid the problems experienced by learners, and there is a growing body of research into all these issues. Statistics education is thus a challenging interdisciplinary field which is gaining the attention of a broad range of practitioners and researchers operating in many contexts.

Researchers interested in statistics education might examine, for example, cognitive, motivational, attitudinal, curricular, teaching-related, technology-based, organizational, or societal factors and processes that are related to the development and understanding of stochastic knowledge. They might also focus on how people use or apply statistical and probabilistic information and ideas.

The Statistics Education Research Journal (SERJ) provides an outlet for publication of this research. It is a peer-reviewed electronic journal published by the International Association for Statistical Association (IASE) jointly with its parent organization, the International Statistical Institute (ISI). SERJ started publication in May 2002, building from an earlier research newsletter. SERJ mainly publishes papers in English, although submissions in French and Spanish are also considered. Free access to all published issues and author guidelines is possible via the SERJ website at [www.stat.auckland.ac.nz/serj](http://www.stat.auckland.ac.nz/serj) (hosted by the University of Auckland, New Zealand).

The establishment of SERJ reflected the IASE's recognition of the importance of advancing *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 and informal contexts.

### 2. Editors and refereeing issues

SERJ has an international editorial board, comprised of two co-editors, an assistant editor who is responsible for the production stage, and twelve associate editors. Co-editors serve a 4-year term and a search is currently being made for a new co-editor to replace Flavia Jolliffe, who with Carmen Batanero was a founding editor. The other current co-editor, Iddo Gal, is half-way through his term.

Papers are submitted to a co-editor who gives them an initial screening, possibly in consultation with the other co-editor. If the paper is suitable to be refereed it is then sent to an associate editor and in a blinded (masked) form to at least two external referees (reviewers). The co-editor collates the associate editor's and the referees' reports and recommendations and formulates a final decision which is e-mailed to the author with further comments and explanations and with blinded versions of all the referees' reports attached.

The standard editorial decisions are "Accept" (at most simple or editorial changes are needed), "Accept with minor revisions" (the revised paper is seen by members of the editorial team only), "Rewrite and resubmit" (major revision is required and there is a further stage of refereeing), and "Reject". Authors are sent full reports on their papers explaining (where the paper has enough potential) what changes would be needed to bring the paper up to publication standard.

### 3. Paper topics and future research needs

Two main types of papers are acceptable for publication in SERJ, reports of original research and conceptual papers of relevance to statistics education. Original research might be quantitative or qualitative; a suitable length for a full paper is usually 6000-8000 words (up to 10,000 maximum) although shorter papers are strongly encouraged and preferred. Examples of conceptual papers are integrative and critical reviews of research literature, research-oriented theoretical models or epistemological analyses, and methodological issues in research and assessment. Brief papers of 2500 words or less are also accepted, e.g. when describing ongoing research or topics of a more methodological nature.

Journal issues mainly include refereed papers with an occasional invited paper, as well as some information about conferences. In November 2004 SERJ published a special issue focused on research on reasoning about variation and variability, with Joan Garfield and Dani Ben-Zvi as guest editors. Another special issue on research on learning and reasoning about distributions is planned for November 2006. All but the invited papers in special issues go through the same refereeing process as regular submissions.

As an example of the range of papers published in SERJ, it is useful to examine the latest issue published in May 2005. This issue contained a special section on reasoning about variation with four papers: of two refereed papers one examined how pre-service teachers articulate and make use of knowledge of variation, and

the other one was on college-students' conceptions of the standard deviation in a computer-based environment. Two invited papers presented results of focused literature reviews, of which one presented a broad framework for teaching and assessing reasoning about variability, and one discussed tools which can be used for teaching and understanding variation. Two other refereed papers appeared in the May 2005 issue as well, one on the effect of calculator technology on student achievement in an introductory statistics course, and one on the factor structure of a scale measuring attitudes toward research.

Both the flow and the breadth of new manuscripts are increasing, representing the growing interest in research and in new knowledge that can inform practice in statistics education. That said, many areas of importance for statistics education are underrepresented in current research, such as: learning about associations and correlations, learning advanced topics such as regression or inference, the link between knowledge of probability and learning of statistical inference, students' ability to apply and transfer knowledge to out-of-school situations which requires activation of statistical understanding, or factors that affect and programs that can improve adults' understanding of real-world statistical messages and arguments.

These examples of gaps in topics of research are far from being exhaustive; they merely aim to illustrate the range of research areas that have a potential to contribute to improvement of statistics learning, teaching, and application by people in different educational, cultural and functional contexts. We encourage researchers and educators from diverse disciplines to collaborate, and to consider expanding and extending research plans, in order to address the research and practice needs of the international statistics education community.

### 4. Lessons learned from handling submissions

Below we describe some experiences which illustrate some of the issues editors grapple with when handling incoming papers deemed problematic. These issues can inform prospective authors.

Several of the papers submitted for consideration do not contain any statistics education research, and these are returned to authors with suitable explanations regarding the journal's goals and where possible a suggestion of other journals which might be a suitable outlet. For example, some papers focus on didactical models or suggest methods for teaching a topic but with no description of relevant (classroom or other)

research. Some other papers focus on mathematical statistics or theoretical aspects of statistics with little or no attention to either statistics education or research in this regard, and these likewise do not enter the refereeing process. Clearly many of these submissions would not have been made in the first place if authors had actually read the Author Guidelines available on the SERJ website, which would have saved time and effort for both authors and the editorial team.

As is a common experience in other journals, some submissions appear to address one of the many topics in which the journal is interested and thus have potential for publication in SERJ, yet suffer from glaring weaknesses which are likely to cause an outright rejection or a request for substantial revisions when examined by referees. For example, papers might contain insufficient details of the research conducted, the data appear problematic to start with, the discussion is too weak and not connected to current literature, or the style of the paper is very poor. In such cases authors are sent brief but fairly detailed comments and suggestions and are encouraged to resubmit (if the paper appears to be salvageable).

Some papers appear to be in line with the aims of SERJ but suffer from non-trivial technical problems (e.g., gross deviations from the required format either regarding the main text or the bibliography). In such cases the author is asked to resubmit in the required format and to use the template and guides for authors on the SERJ web page

In a couple cases we have run into "double publication" issues. SERJ policy is that papers which have been published in any form, including on the Internet or in conference proceedings, are not accepted for consideration. (This restriction does not apply to papers which appeared in a brief format in conference proceedings and are then submitted to SERJ in an expanded form which includes significant modifications and additional materials). However, due in part to opportunities afforded by the Internet, there are multiple situations where a duplicate publishing situation might exist to a greater or lesser degree, and authors do not always know how to handle them.

To aid authors, our current author guidelines discuss five common situations where some text has already been published: in a paper in conference proceedings, in a technical report, on a personal website, in a paper in a non-English language journal, and in a brief report in a refereed journal. The guidelines explain to what extent each may involve duplicate publishing (some do not) from SERJ's point of view, and how this can be

addressed. In general, authors are expected to disclose all relevant information to the editor upon submission.

Finally, it is worth commenting that at this stage in the evolution of the field of statistics education we see part of SERJ's role as training less experienced researchers both in doing and in writing up high-quality research. This is at times called for, given the breadth of domains from which authors interested in research on statistics education come from, and given the linguistic and professional heterogeneity among international scholars.

## 5. Problems with research reports

We now turn to discuss other issues which occur fairly often in research reports which pass the initial screening and enter into refereeing. These are described here in the order in which they usually appear in papers.

First, there may be problems with the description of the goals of the research or the questions it is designed to investigate. These sometimes are not described at all, or the description might be either too broad or too narrow and hence does not serve as a foundation for the remainder of the report. A literature review might be too broad, unfocused, too brief, or inadequate; this may raise a concern that the study is not embedded well within extant literature, that the authors have not planned the study to add to cumulative knowledge. Fuzzy research questions and poor literature review causes authors to run into difficulties later when they have to explain in the Discussion section the contribution and implications of the study's findings.

There are a number of ways in which a "Method" section might be inadequate. The research design itself might be poor. The author might have given too few, or too many, or confusing details about one or more of the approaches taken, the context of the research, the respondents, the instruments used and tasks set, the procedure of the research, and the method of analysis. As a consequence, it can be difficult to judge the quality of the study or its data source, or evaluate the interpretation of the findings. Sometimes an author has used a wrong method of analysis. Sometimes data appear to have been collected earlier on as part of a separate process (e.g., ongoing class assessment, institutional survey) without the particular research questions being discussed in the paper in mind, and hence are not well suited to investigate them.

The Discussion section often gives rise to many problems and is one where there is usually room for improvement. Typical problems here are that the link

back to the stated goals or questions and the cited literature might be poor, the conclusions presented are not supported by the data, the contribution of the research is not explained, nothing is said about the limitations of the research, or no implications of the research are presented, e.g., to scholarly knowledge and known models, to teaching and practice, to assessment, to future research needs. Lastly, the bibliography might be outdated or not sufficiently linked to the specific study or questions being described.

Other problems with papers sometimes emerge at a later stage, when authors receive the editorial letter and referees' reports and when they submit a revised manuscript for further consideration or for another cycle of refereeing. Some authors do not handle this stage very well. We sometimes get a revised paper where it is clear the authors have not attempted to correct the obvious and serious deficiencies in their previous draft, as pointed out in the editorial letter or referee reports; or, in their attempt to fix some problems, authors have created new ones, e.g., adding too much new material not called for by the comments received, which causes a bloated and unfocused new paper or forces a re-evaluation of the paper as a whole. Further, authors sometimes do not accompany their resubmissions with a detailed letter, as requested by the editors, explaining how they have addressed the comments made on the previous submission, or their logic for not accepting certain suggestions.

We conjecture that such situations can be caused due to different factors, such as lack of attention to detail, lack of experience, insufficient allocation of time for reflective and deep processing of editorial letters, or over-confidence. Whatever the reason may be, problems at this stage can cause unnecessary delays and grief for both editors and authors, and can easily lead to eventual rejection of papers at the second or later stage of refereeing.

## 6. Summary and further advice

Over the last couple of years we have realized that some authors, especially novice researchers but also others, could benefit from further training or support, in order to prevent some of the problems noted above. In addition to expanding our author guidelines, we have started to offer workshops at international conferences designed for such authors.

Among other things, we recommend that when planning the paper, authors reflect on the story-line, the study's contribution, and the clarity and scope of the research goals and questions. They should check

whether research questions are clearly explicated. They should make sure to present key conclusions and implications in adequate detail, and check that there is a clear link and continuity between the research goals stated earlier, the actual findings presented in the Results section, and the conclusions and recommendations. The contribution of the paper, but also its limitations, should be made clear, and linked to the extant literature so readers can evaluate the overall contribution of the paper and its findings to current knowledge and scholarly thinking. In the case of papers which need revision and re-writing it is important to evaluate the comments that referees made on the previous submission and consider them in earnest, and follow all of the Journal's guidelines and editorial suggestions.

Looking back at the first four years of SERJ, it appears the Journal is filling a gap and provides an outlet for publishing diverse and interesting statistics education research of growing quality. SERJ sees itself as existing along side and co-operating with other statistics education journals, not competing with them. The Journal aims to serve a diverse and expanding community of practitioners and researchers interested in statistics education and learning in diverse fields and contexts. We encourage all readers of SERJ to send us (at: [iddo@research.haifa.ac.il](mailto:iddo@research.haifa.ac.il)) reactions and suggestions regarding the journal and the papers it publishes as well as ideas for future developments.

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