A GLOBAL VIEW OF STATISTICS EDUCATION RESEARCH

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1. INTRODUCTION

With this issue, *SERJ* completes 13 years as an international academic forum for reporting on statistics education research. While it is not the only publication in which the results of such research appear, it is the only journal with an exclusive focus on this area. A large number of papers, representing diverse research projects with varied approaches, has appeared in the journal. As expected for an international journal, authors have come from a variety of countries and regions of the world. However, in the call for papers for this special issue, we pointed out that through the end of 2011, only 16 countries were represented in the *SERJ* author list. In the five subsequent issues, authors from four more countries – China, Portugal, Turkey, and Sweden – have joined the list. Some countries – such as the USA, Australia, Spain, and Britain – are well represented due to their long traditions of statistics teaching and a strong resource base for pedagogical research in statistics. Other countries – such as Cyprus and Israel – are represented by individual 'champions', researchers who have investigated particular aspects of statistics education, sometimes in collaboration with colleagues from other countries. And despite the option of submitting papers in two other languages, to date very few such papers have been published in *SERJ* (four in Spanish and two in French).

Statistics education is carried out in most countries, and research in statistics education also occurs in many of these countries, as we know from the proceedings of the International Conferences on Teaching Statistics (ICOTS). So what is the 'story' from these other countries? Are they carrying out studies similar to those from the USA, Australia, Spain and Britain, or are they addressing different research questions, utilizing different approaches and methods? This was the particular question that we sought to investigate with the preparation and publication of this special issue: A Global View of Statistics Education Research.

2. PROCESS

The aim of the special issue was to present articles focusing on the international dimension of statistics education research, or views and experiences of statistics education research from countries not yet represented in the journal. An international team of guest editors from Brazil, South Africa, and The Philippines, each with a profile of statistics education research in their own country or region, joined one of *SERJ*'s co-editors to realise this aim. A call for papers appeared in the May 2012 *SERJ* and was widely publicised through alternative networks. A

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total of 35 expressions of interest or abstracts was received, of which 29 were deemed appropriate, and their authors were encouraged to write and submit full papers. The 20 papers received went through *SERJ*'s usual double-blind peer review process; of these, 18 were deemed to be potential contributions after minor or major changes, and 16 papers made it through the review process to publication in this special issue – the largest issue of *SERJ* to date. The issue includes authors from Brazil (8 papers), South Africa (3, one with a co-author from Israel), New Zealand (2, one based on a study carried out in Fiji), Turkey, Venezuela, and one with co-authors from Malaysia and The Philippines.

In order to accommodate the widest range of potential authors, the editorial team used two strategies. First, we sent out and publicised the call for papers with a much longer timeline than usual for *SERJ* special issues. Secondly, we prepared a series of regular editorial bulletins to potential authors, designed to create a sense of community and support authors through the process of publishing their research. The initial bulletins pointed out that articles needed to focus on statistics education research, and discussed approaches to writing an article in English for non-native English authors. Later bulletins made suggestions about planning and drafting a paper, turning the draft into a submission, reviewing a paper and responding to reviewers' comments. These editorial bulletins were aimed primarily at supporting less-experienced researchers/authors; those who were more experienced were polite enough to receive them in a positive spirit (and we thank them for this). Each submission was reviewed by the author of another submitted paper, and also by an expert who was not involved with the special issue. There was no evidence at all that the 'internal' reviews were any less thorough and critical than the 'external' ones.

Having received contributions from many authors without a native English-speaking background, there was a fairly substantial job in smoothing the written English of many papers. This job was undertaken initially by *SERJ* co-editor Petocz (an English speaker since the age of 5). It involved working with each author team, corresponding about the precise meaning of some paragraphs and sentences, helped occasionally by machine translation tools, and obtaining approvals for revisions. The experience of untangling shades of meaning encouraged a decision to include the original language (in this case, Portuguese) of student and teacher quotations in the papers. When co-editor and authors were happy with the result, the papers were passed to our Assistant Editor (Larry Lesser) for copyediting and final preparation – it was a real eye-opener to see how many more changes were needed!

3. THE PAPERS

Here is a brief summary of the contents of the papers comprising the special issue. This can serve to orient readers to the main topics discussed. First, there is a group of papers that focuses on the development of statistics educators and education systems in order to improve the teaching of statistics. Delia North, Iddo Gal, and Temesgen Zewotir discuss an initiative to build mathematics teachers' capacity to teach statistics. The paper is set in the context of South Africa, but will have implications for other developing countries. Marcos Magalhães and Maria Magalhães describe an innovative Brazilian statistics course for future mathematics teachers in which collaborative and practical activities were used to broaden students' attitudes towards their future statistics teaching. Sarah Bansilal investigates South African mathematics teachers' understanding of a topic in probability – the normal distribution – using an APOS (action, process, object, schema) framework. Antonio de Souza, Celi Lopes, and Débora de Oliveira write about stochastic education at the very beginning of formal schooling in Brazil. They describe two innovative teaching sequences developed by members of a class of early-childhood educators and carried out with preschool children. Sally Hobden analyses South African (non-mathematics) teachers' understanding of the median in the context of a statement about survival time after HIV infection, using a hierarchical statistical literacy framework developed by Watson (2006). Leandro Souza, Celi Lopes and Luzinette Mendonça present two case studies of mathematics teachers planning teaching activities for probabilistic simulations. They show the benefits of collaboration and discussion, and the limitations of underlying beliefs in the utilisation of these teaching sequences.

The next group of papers moves the focus to the learners themselves, and investigates students from primary to tertiary levels working to understand various aspects of statistics. Adair Nacarato and Regina Grando explore the development of probabilistic language by Brazilian primary school students (10–12 years old) in the context of collaborative work in a social context. Sashi Sharma discusses the cultural and social dimensions of Fijian secondary students' (14–16 years old) understanding of probability. Ayşe Yolcu examines Turkish secondary students' (13–15 years old) understanding of statistical literacy on the basis of their gender and grade level. Robson Ferreira, Verônica Kataoka and Monica Karrer investigate senior secondary students' learning of probability using a teaching sequence – Carlinha's random walks – with the support of R software. Aida Vita and Verônica Kataoka use a specially-modified version of the same teaching sequence to show how adult students who are blind are able to investigate the basic concepts of probability using a series of tactile models. Keli Conti and Dione de Carvalho describe an adult education project in which a group of Brazilian students developed their statistical literacy by carrying out investigations on the topic of pregnancy. Mauren da Silva and Suzi Pinto discuss their experiences running a Brazilian undergraduate statistics class using an approach based on 'learning projects'.

The final group of three papers broadens the previous themes. A team of New Zealand statistics educators – Sharleen Forbes, Jeanette Chapman, John Harraway, Doug Stirling, and Chris Wild – presents a survey of data visualisation tools available for assisting students at school and university level to learn statistical concepts. Several of these tools were developed by members of the team and are all publicly available for use. Audy Salcedo investigates university test questions used in introductory statistics courses, categorised according to the SOLO taxonomy. There seems to be a preponderance of questions at the lower levels of taxonomy, and in this Venezuela is no different to other countries where such studies have been carried out (for instance, in Australia; see Smith et al., 1996). Finally, Enriqueta Reston, Saras Krishnan, and Noraini Idris carry out a comparative analysis of statistics education research in two Asian countries, Malaysia and the Philippines, giving information on the state of research in these countries and providing a model for similar studies in other countries that are developing their effort in this area.

A global summary of the main ideas and areas of concern in the collection of papers can be deduced from the word cloud (Figure 1) of the combined text (excluding references) from the 16 papers. It is pleasing to see that the most commonly-used term is 'students', indicating our primary concern. Other common terms include 'statistics'/ 'statistical', 'education' and 'research', reflecting the specific focus of the journal, and also 'teachers'/'teaching', 'learning', 'literacy' and 'probability', reflecting the focus of some individual papers. We can look further into the cloud to identify other terms, such as 'school', 'project', 'curriculum' and 'mathematics', that form important parts of some of the papers. Separate word clouds can be prepared for each of the papers – we have not shown these here, but they clearly distinguish the content and themes of each paper.

Figure 1. A word cloud of the text of the papers in this special issue (www.wordle.net)

A careful reading of the collection of papers shows evidence of the variety of approaches, methodologies and literatures used by researchers from different geographic and linguistic regions of the world. This is most clearly shown in the group of eight papers from Brazil, and– to a lesser extent– in the group of three papers from South Africa. Other countries are represented by individual papers, so it is not possible to see general trends. Several of the papers made use of the philosophical perspectives of Vygotsky, Piaget or Papert, or the onto-semiotic approach of Godino and Batanero. Others utilised frameworks for statistical literacy developed by Gal and Watson, or the SOLO and APOS classifications of Biggs and Dubinsky (respectively). One paper (da Silva and Pinto) made use of an interesting qualitative methodology called *Collective Subject Discourse* (or *Discurso do Sujeito Coletivo* in the original Portuguese, Lefèvre, 2005) in which statements from a variety of respondents are combined into a synthetic report that reflects the main themes. Many papers showed a strong sense of social justice in the role of statistics education, or education in general, in its development. Brazil is the home of 'critical pedagogy' and the spirit and work of its founder, Paulo Freire, are present in many of the Brazilian papers. The South African papers also show a strong sense of using statistics education to rebalance social conditions.

It is interesting to look at the combined reference list from the 16 papers. The authors who appear most often in this list, as first authors, at least five times, are, in alphabetical order: Batanero, Biggs, Cazorla, delMas, Gal, Garfield, Lopes, Pfannkuch, Reston, Shaughnessy, Vygotsky, and Watson. Depending on your background, you may be very familiar with the works of some of these authors and completely unfamiliar with the works of others.

4. THE FUTURE

It was interesting to see that many papers came from countries in which the International Conference on Teaching Statistics has taken place. This special issue has three papers from South Africa (ICOTS 6) and eight papers from Brazil (ICOTS 7). A paper from Slovenia (ICOTS 8) missed the deadline due to health and time issues but may make it into a future issue of *SERJ*. Of course, ICOTS 9 took place in the USA, and there are already many submissions from that country, but maybe we can look forward to submissions from Japan, now that ICOTS 10 has been announced for Kyoto for 2018. Maybe the profile of publications in this special issue supports the benefits of moving ICOTS to a different country, region or continent each time. Each continent, with the exception of Antarctica, has had at least one ICOTS; South America and Australasia have each had only one. Maybe it is time for an ICOTS conference in Australia, or maybe some country that is in the process of developing its profile in terms of statistics education research – maybe Russia or China?

In summary, the Editors hope that this special issue will open statistics educators' eyes to some examples of the range of statistics education research that is being carried out in other countries and in other languages, and encourage researchers in as-yet-unrepresented countries to submit their papers to the *Statistics Education Research Journal*.

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