Statistics Education Research: Opportunities for Dissemination: The Role for Special Issues of a Journal

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Abstract

The dissemination of research results is crucial to consolidate the research effort and to find synergies for further research. Research publications also influence the practice of a discipline. This applies even more when we consider the discipline of statistics education. The present work pursues two goals: First, the ideas and intentions are to be presented against the background of the publication of special issues of a research journal. What can be the special function for special issues within the goals of the journal? Secondly, to examine several questions related to improving the quality and impact of a research journal, particularly in the field of statistics education.

In the first part, we illustrate the topics and big ideas in some recent special issues of the *Statistics Education Research Journal*. A special opportunity for special issues of a journal is to work together in an international team on a common topic that is on the current agenda of the discipline in order to find synergies and to use and implement intercultural approaches that will influence further research in the discipline.

In the second part, we refer to measures that are crucial for improving the quality of a journal and its impact on society, here the impact on the actual teaching in schools and university courses. Ranking issues, language policy, international cooperation, innovative ways of publishing, which can also make better use of the potential of technological opportunities, are just some of the topics we focus on.

Key questions that run through the entire paper are: What makes a special issue a special issue? What will enable us to make future special issues something special?

Key Words: Statistics education, special issues, quality of research journals, replication problem, empirical-research paradigm, innovative ways of publishing, electronic publishing, intercultural exchange of ideas and research results

1. Preview – Structure of this paper

This paper consists of two parts.
- A special role for Special Issues of a journal (Section 2).
- Questions on improving the quality of research journals in statistics education (Section 3).

In the first, we illustrate the potential of special issues of a journal by giving an overview of the topics covered in more recent special issues of the *Statistics Education Research Journal* (SERJ). We then delve into the details of two specific issues, their background, and the main findings. A discussion of the purpose of special issues connects to the concrete considerations dealt with before. In the case of special issues, the way in which research results are disseminated could be less restricted than in the case of regular issues without losing rigour of the argument and validity. International coverage is another advantage of special issues as discussed later.

In the second part of the paper, we look more closely at questions of how to improve the quality and scope of a research journal. We present ideas discussed elsewhere to take advantage of technological progress and to increase the impact of the journal not only on researchers but also on the actual teaching of statistics around the world. Measures to increase the ranking of the journal are of crucial importance in a world where publishing has a major influence on the promotion of authors. The language policy of the journal is a decisive factor for its internationality. The efforts to diversify the journal's contribution formats will have an even greater impact in the future. Widening the circle of researchers and other key players involved in the journal are further crucial issues for the opportunities and success of dissemination and of research itself.

Key questions that run through the entire paper are: What makes a special issue a special issue? What will enable us to make future special issues something special?

2. A Special Role for Special Issues of a Journal

2.1 Illustrating the Variety of Topics Covered by Special Issues in SERJ

The variety of the topics and their relevance to the current discussion in statistics education can best be illustrated by the titles of some of the more recent special issues:
- A Global View of Statistics Education Research (North, Reston, Cordani, & Petocz, 2014).
- Learning and Teaching Probability in Statistics (Chernoff, Paparistodemou, Bakogianni, & Petocz, 2016).
- Statistical Literacy (Ridgway, Nicholson, & Borovcnik, 2017).
- Reasoning about Models and Modelling in the Context of Informal Statistical Inference (Biehler, Frischemeier, Podworny, & Groth, 2017).
- Building Future Generations of Statisticians (Bilgin, Howley, & Borovcnik, 2020).

2.2 Special Issue on Statistical Literacy

The idea behind this special issue (Ridgway, Nicholson, & Borovcnik, 2017) was to clarify what has been used "on a daily basis" in statistics education – whether in research or in teaching. In addition, we intended to seek synergies to promote statistical literacy in society and public debate. Statistical literacy includes an appropriate understanding and a sensible application of statistical inference methods.

2.2.1 The main themes of the special issue on Statistical Literacy

There are so many ways to see the main themes in this highly relevant topic of statistical literacy but the guest editors had the following themes in mind when they submitted their proposal for a special issue:

- What is statistical literacy?
- Innovative approaches to boost statistical literacy.
- Combatting the existential crisis ("post-truth politics", Ridgway & Nicholson, 2017, p. 12).
- Strengths and limitations of statistical methods (are methods of statistical inference useful or are they a nuisance?).
- Cooperation to improve statistical literacy.

As the guest editors state in their editorial, "The future of Statistical Literacy is the future of statistics" (Ridgway & Nicholson, p. 8). This is why it is so essential to clarify and promote statistical literacy.

2.2.2 A discussion on significance testing and p values

We use a format with a sequence of "paper – discussion – rejoinder" that is sometimes used in statistics journals; yet surprisingly, for educational purpose it has not been used so far and can therefore be considered as innovative (White & Gorard, 2017; Nicholson & Ridgway, 2017; Gorard & White, 2017).

- Do scientists use the wrong methods to study social phenomena? White and Gorard (2017) raise this question; Nicholson and Ridgway (2017) respond to their criticism of traditional statistical inference and explain why it still makes sense.
- Yet, what about the pitfalls and the replication problem? Gorard and White, (2017, p. 77) answer by "It is no wonder that there is a replicability crisis (although the use of significance tests is not the only reason for this)".

The unusual format gives an authentic insight into the controversy, which is no less relevant in the era of data science, as there is an urgent need for methods to check for bias of big data (see Wild, 2017).

2.2.3 Co-operations to improve statistical literacy

Of the many co-operations discussed in the special issue, we take up here two completely different ones:

- The International Statistical Poster Competition (ISLP) addresses young high-school students who are to participate in a poster competition. In this competition, they work on a statistics project in which they try to come to some conclusion that may even be a solution to a real problem in their environment, which at least gives them and us insight into the issues raised (MacFeely, Campos, & Helenius, 2017).
- Full Fact (Arnold, 2017) is an influential fact-checking organisation in the UK, which controls public debate when it uses statistics and statistical arguments to support their case. There are many similar initiatives in several countries around the world.

These initiatives promote statistical literacy and establish worthwhile curriculum activities.

2.2.4 Invited Essays – An innovative format in SERJ

We invited experts to summarise their views on statistical literacy, its relevance for teaching and society, and the characteristic features of statistics, which also play a key role in the teaching of statistics. Topics we cover with invited essays are:

- Statistical literacy in the data science workplace (Grant, 2017).
- Data literacy is statistical literacy (Gould, 2017).
- Interactive visualisations and statistical literacy (Sutherland & Ridgway, 2017).
- Statistical literacy as the earth moves (Wild, 2017).
- Statistical literacy in data revolution era: Building blocks & instructional dilemmas (Prodromou & Dunne, 2017).
- Statistical literacy for active citizenship: A call for data science education (Engel, 2017).
- Gaise 2016 promotes statistical literacy (Schield, 2017).

We illustrate the invited essays by statements from Chris Wild's essay (2017, p. 31-35)
- "Statistics should be like cooking".
- "Meaning trumps mechanics."
- "Data can tell lies. Big Data can tell bigger lies."
- "The big thing for small data is random error. The big thing for big data is bias."
- "Bad data leads to bad decisions."

The statements also apply to developments in the direction from traditional statistics to big data and data science. Wild concludes with the statement (p. 36)
> "Computer algorithms feed on information (data) and re-present it. They cannot produce information that was never there in the first place."

2.2.5 Conclusion of the special issue on Statistical Literacy

While the contributions illustrate aspects of statistical literacy and its function for the teaching of statistics in many respects, the following points are particularly noteworthy:

- Statistical literacy is a pre-requisite for an informed democracy.
- To increase statistical literacy is a key element to ward off the existential crisis (post-truth in public debate) in which we find ourselves.
- To revise current curricula in school and at university has a high priority to ensure an appropriate emphasis on the use of evidence for decision making in realistic contexts.

It is necessary that disparate groups of the statistics community come together to cultivate statistical literacy throughout society.

2.3 Special Issue Building Future Generations of Statisticians

The prime focus of this special issue (Bilgin, Howley, & Borovcnik, 2020) is on the surrounding 'outreach' initiatives and supporting mechanisms for a stronger commitment to statistics. We wanted to gather details of activities that would raise interest from the wider community and schools and increase the number of individuals engaging with statistics. Activities that enable the next generation to recognise the value of statistics and to want to be part of a statistics movement. The special issue should inform and inspire successful strategies for arousing student and teacher interest in statistics.

2.3.1 Central theme of the 'initiatives for the development of future statisticians'
Without further structuring the central themes, the intentions behind this special issue were

- To arouse interest of the broader public and of schools.
- To increase the number of individuals engaging with statistics.
- To recognise its value and want to belong to the next generation of international players in this field.
- To enable careers explicitly in statistics or in connection with other fields of investigation.

The focus was not on schools but on surrounding 'outreach' initiatives and supporting mechanisms for engagement and interest in (attraction to) the field of statistics. It did not include contributions on the development of programme content in tertiary education.

2.3.2 The focus on 'outreach' activity and engagement
We had in mind to trace the co-operation with industry, or, with and between statistics associations and institutions. We knew of several national and international initiatives, such as the African Data Initiative, the Japanese Poster competition, the ISLP, Statistical Houses in Iran, the Australian National Schools Competition, or the US Undergraduate Statistics Competition. The focus was on innovative approaches to develop a love of statistics among individual students and the public, or to try to overcome statistical anxiety. We thought of success or failure stories that could illustrate what it takes to make initiatives successful. We wanted to have papers that would inform about strategies or inspire successful strategies to arouse the interest of students and teachers in statistics.

2.3.3 Invited essays for building the next generation of statisticians
Topics that we wanted to address with invited essays are:

- We need to make clear that statistics – as it is involved everywhere – opens a future for the next generation with interesting and challenging work (Bilgin, Bulger, & Fung, 2020).
- We should not forget that we need to teach an interesting and memorable statistics, which means that we also need to focus on meta-strategies of teaching in order to clarify the details of what we are learning at the moment (Sowey, 2020).
- We need to think beyond the traditional school environment by integrating the practice of statistics into the classroom, which requires a change in the way we look at schools beyond teaching, exams, and certificates (Howley & Roberts, 2020).

Building the next generation requires more than just teaching, even if that would be the best.

2.3.4 Structure of the special issue developed by crowd intelligence
In retrospect, we can identify the problems for statistics education to build the next generation of statisticians clearly (Borovcnik, 2020):

- Starting early and developing the ideas and concepts in a spiral.
- Learning to teach statistics.
- Involving the wider society in activities related to basic statistical literacy.
- Helping students and young researchers understand and use statistics.
- Big Data and innovative approaches to deal with data.

We did not structure the call for papers for the special issue; yet, we have seen the intelligence of the crowd in action. It is interesting to note that two of the themes of this special issue are already on the agenda for future special issues of SERJ: An early start is a prerequisite if we want to let the next generation learn and modify what they learn from statistics in a spiral way. Big data and data science will definitely be the challenge of tomorrow, as we increasingly face data, which are by-products of other processes that do not meet the usual assumptions of traditional statistical methods.

2.4 Special Issue: Statistics Education Research from a Latin Perspective
The idea behind this special issue (de Oliveira Souza, Porciúncula, Zapata-Cardona, Audy Salcedo, & Borovcnik, 2019) is to identify something like a cultural characterisation of statistics education research within the Latin-American community. The special issue is due to appear in 2021. The papers are currently under revision – They should reflect the plurality of epistemological and methodological approaches in Latin-American communities. Ideally, these papers contrast and compare the reflections with the current local situation and trends in international research. The idea is to make the specifics of the Latin approach visible to the international community.

2.4.1 The Latin-American Perspective
The papers can analyse current or innovative practices in teaching or try to develop theories for research in Statistics Education. The educational studies can be directed to all school levels, including teacher education at the university. A main objective of the special issue is to highlight the specific paradigm of the Latin approach in comparison to international research.

2.4.1 Cultural features
The papers should include a separate section to illustrate how the approach reflects differences or similarities between the Latin and international perspectives.
- How to use the cultural and social background of Latin-American students to improve statistics teaching.
- How does mother language influence learning and teaching of statistics? For example, the words used daily in contrast to a formal use; the meaning of the word in different contexts; classroom dialogues including the use of natural, mathematical, and statistical language, etc.
- The understanding of stochastic concepts is extremely dependent on verbalisation of tasks and explanations.

Spanish and Portuguese have much more structure than the English language. Do these and other cultural factors influence the direction and orientation of research?
- *Curricula*: Are curricular considerations different? The role of games, the placement of inferential statistics, the role of probability in relation to statistics, the ways to teach probability, interventions by teachers confronted with misconceptions, etc.
- *Education of teachers and professional development*: What are the key factors and are there differences to notice in comparison to international approaches?
- *Methods in educational research*: Do researchers see the relationship between empirical research and hermeneutical essays on the nature of concepts differently from researchers embedded in an English environment?

Invariants across cultures and languages are also of interest.

2.4.2 Submission policy
The following guideline should minimise the language barriers for potential authors:
- At the beginning, it is possible to write the manuscript in English, Spanish, or Portuguese.
- Once we accept a contribution for publication, it must be translated into English and submitted in both languages. The cost of translation must be borne by the authors themselves.
- The final articles are in English; authors have the possibility to provide readers with a file in Spanish or Portuguese upon special request.

SERJ will make some efforts to support the authors with polishing the English-language contributions.

2.5 Special Issues of SERJ Planned for 2022-23
There are already concrete plans for the future of the special issues of SERJ. For the period 2022-23, two topics have reached beyond planning stage.

"*Research on Data Science Education*" (Biehler, De Veaux, Engel, Kazak, & Frischemeier, 2020). The call is available; the plan is to publish this special issue in 2022. From the call, we can see the focus of this special issue:
- Articles that report on curriculum approaches to implementing data science at the school or university level.
- Articles that report on research about teaching and learning data science in the context of statistics courses at any level, from primary to tertiary education.
- Articles that investigate the teaching and learning of particular aspects of data science, such as the exploration of messy and ill-structured data, the use of coding, the use of professional digital tools like R, Python, Jupyter Notebooks or the use of machine learning methods, etc.
- Articles with research on teacher education or professional development in data science education.
- Articles that investigate the teaching and learning of data science in collaboration with other disciplines (e.g., computer science) or with partners from industry and administration.
- Articles with a literature-based conceptual analysis of a subdomain of data science as basis of curriculum design.
- Reviews of current research on data science (education) within statistics.

"*Early Statistical Thinking*" (Leavy, Meletiou-Mavrotheris, & Paparistodemou). SERJ will announce the call with more details. Researchers interested in contributing can contact the guest editors. This special issue is scheduled for publication in 2023.

2.6 Purpose of Special Issues
The regular articles in a journal report about a single project and try to embed this within the wider field of existing research in the background in order to identify knew insights and knowledge and to connect them to the existing body – either enlarging it or revising it. Single groups are working together within their project and work for a (smaller) goal. Afterwards, the group reports about the results. Yet, there are other reasons and needs to do research. It could well be that the research community agrees about an urgent topic or problem; a challenge, for which it would pay the effort to write a monograph to establish a major milestone for the discipline or to consolidate and synthesise existing research.

This can be a single author or an established team of authors working together over a longer period, with the explicit aim of meeting the prime challenge and achieving a state of the art that prepares the ground for further research. Nevertheless, it may be interesting to write a specific call outlining the problem and vision in order to involve the whole research community. This is the case with a special issue of a journal. A special issue would normally have the aim

- To involve larger parts of the statistics education community with greater responsibility.
- To identify major problem areas of statistics education research and to contribute to progress through a joint effort.
- To focus on specific topics and work out the topic to some extent to cover the outstanding views and problems.
- To accompany the process of working on the common theme as guest editor and to interact with the authors and the reviewers.

The guest editors are to synthesise the ideas of the contributions, which are written specifically on a common theme to make clear where the problems lie and where the special issue has come to a contribution. This objective can also be achieved by allowing or tentatively introducing more degrees of freedom and interactivity in the work:

- To enable or encourage innovative ways of research exchange. Think pieces, especially in the form of *invited essays*, or as *seminal paper–discussion–rejoinder* exchange of controversial ideas.
- To allow for the further development of conference papers on a specific topic. Revisit, refine and revise some ideas that have already been completed, may boost the insight and the value of the presentation and understanding of the results of studies even with hindsight.

Guest editors have a more active role than regular editors of a journal. They are not neutral. They accompany the authors and synthesise the ideas presented. If appropriate, they shall seek for additional discussion papers. It is like working on a monograph with a specific research topic.

2.7 Innovative Ways to Disseminate Research Results

Pfannkuch and Kaplan have given a valuable structure for conducting and publishing research in statistics education within the framework of empirical research (Pfannkuch, Borovcnik, & Kaplan, 2018, Jul). Borovcnik (2014) has criticised the narrow paradigm of empirical research, pointing out the restricted frame and tight assumptions for applying traditional statistical methods on empirical investigations, as the results – strictly speaking – lack reproducibility (see again the controversy between White & Gorard, 2017, and Nicholson & Ridgway, 2017). Beyond the usual problems in empirical research in education, there are also the key issues of teacher bias, test-instrument bias, and long-term effects, for which there is no correction at all.

Nevertheless, it is clear that there is much room for qualitative research in education. When a research community faces the task of increasing its impact on society, it becomes important to build a bridge between the stakeholders. For example, a bridge between culturally defined research groups, a bridge between experienced researchers and newcomers, between researchers and those who will implement the results on a larger scale (in education this would mean influencing curricula and textbooks). Consequently, there should be sufficient room for innovative ways of conducting and disseminating research. Some ideas are (feedback and further suggestions are welcome):

- Abstracts in several languages (Spanish, French, etc.).
- Articles in Latin languages with a shorter version in English.
- Material on the background of the studies (complete test items, complete interviews, authentic material used in the experiment, as an appendix).
- Material that takes advantage of the flexibility of the Internet (such as interactive tables, videos or applets).
- Separation of the ideas paper from full account of references including the reasons and background why a particular paper is referenced.
- Links within papers and between papers as well as between papers and additional materials.
- Evaluative conference reports that structure the presented ideas thus complementing the conference calendar.
- Statistics of downloads of articles and other ranking information.

The main idea is that research is communication and that there should be measurements to help stakeholders understand what is being communicated. It is also a matter of making broader use of the potential of electronic publishing. The dissemination of authentic material related to research projects should also facilitate the replication of studies. Regular readers will also be aware that relatively few articles in electronic journals make use of the range of technologies available in this publication medium. Some passages from Borovcnik and Kapadia (2009) may illustrate the challenge and potential of electronic publishing (p. 112, p. 127, pp. 127):

> "Another aim […] was to use the specific potential of an electronic source of publishing. The style of communicating research results will and should change […]. From the beginning, there were ideas to […] develop the papers towards the direction of interactivity. Of course, multi-media can also blur ideas. We had to deliberate carefully […]
> One further advantage of electronic publishing is also space. There is no obvious limit. Yet there are limitations such as the capability, capacity and time of authors to develop their papers further; also, the willingness of reviewers to read, evaluate and suggest improvements of the materials. The ideas also have to be realized by technological skills, which also vary. […]
> Style of referencing is a further issue, which can be dealt with differently in electronic publishing. For scientific papers it is important to give a reason for statements and to show how the presented ideas fit into existing research. In the extreme, this leads to references cluttering the text and possibly hiding the ideas in the background. On the other hand, careful referencing the sources will not include why one refers to such a source, and what role this source plays within a wider context of research; evaluative statements about references used are rare and would nearly always intrude the flux of argument of the text and the presented ideas.
> In one of the articles [Abrahamson, 2009] we have experimented with a new publicizing format by extracting the intellectual background from the main text, and consolidating and expanding it in notes that should prove useful for readers who wish to delve deeper into the issues underlying and motivating the research. In this way, a companion document with research notes emerged; the single notes are linked from the right places within the text."

All contributions in the special issue of the *International Electronic Journal of Mathematics Education* on "Research and developments in probability education" (Borovcnik & Kapadia, 2009) have implemented parts of the ideas just discussed on innovative forms of publishing. The reader can find further ideas to increase interactivity also in publication of research results for the benefit of future research in Kapadia and Borovcnik (2010; 2011).

2.8 International Coverage – An opportunity for Special Issues
There are not many papers from the non-English world published in SERJ. The language problem is still essential, since sometimes authors whose native language is not English express their ideas in poor English, so that the reviewers simply reject the papers without further arguments. Of course, it can be difficult to trace the ideas if they are buried under a clumsy formulation. In certain cases, we offer mentoring to increase the chances of acceptance of a resubmission. Another point is culture- and language-specific ideas that cross the language boundaries only through a drastic transformation that can destroy the key ideas or lead the English recipients astray, leaving the papers vulnerable to rejection. Moreover, the values of approaches vary greatly depending on the culture. This argues in favour of the development of a special issue *within* a non-English community.

To increase the international representation in SERJ, the idea is to develop a special issue within a non-English community with the prominent involvement of local reviewers and to support the process of transmitting the ideas into papers in English by a joint effort. Guest editors should accompany this process by seeking to synthesise ideas and to clarify the specifics of this community shaped by language. In such a project, it is essential to convey this cross-cultural goal to the tentative authors, so that they also make an effort to reveal the culture-specific approach. This should include the authors' own problems and their perception of their situation. Authors should be aware of the specifics of their own approach. It should be noted that it would enrich the findings if the authors – with the help of guest editors – were able to clarify the difference to approaches originating from other culturally defined communities.

The aim of such a special issue should be to answer the question: What can it contribute to enrich the English-dominated paradigm of Statistics Education research?

3. Issues to Improve the Quality of Journals in Statistics Education

To improve the impact of a journal, firstly the ranking is a crucial question: what can be done to be included in a ranking and to maintain or increase the impact factor. Secondly, language policy decides on internationality. Options are English only, papers in specific other languages, abstracts in other languages, submission in specific languages. Thirdly, it is not only with increasing technological equipment that there is a need to introduce innovative ways of conducting and publishing research. Fourthly, in order to increase the impact of a journal, a diversification of contribution formats is essential. Fifthly, it seems very difficult, albeit vital, to diversify between the stakeholders: from teachers to statisticians. For the future of a journal, it is above all a question of survival to expand the circle of researchers and other important stakeholders. We try to illustrate the topics in order to make it clear that they present challenges, but also great opportunities for the sustainable dissemination success of a magazine.

3.1 Ranking
Ranking has become highly relevant for journals but also for authors. We cannot attract the best authors if we do not have a good rank, as the authors need publications in highly ranked journals. SERJ currently is in the second quartile Q2 (2019) in Education and in the third quartile Q3 in Statistics and Probability in Scimago (n.d.); the Impact Factor is 0.98, H rank is 11, and Scimago Journal Rank in 2019 is 0.539 (and 0.854 in 2018). We currently do not display ranking information on the website of SERJ. In order to evaluate the statistics from before, it may be helpful to list some other journals in statistics education and in mathematics education for comparison (see Table 1).

Table 1: Rankings of several journals in mathematics and statistics education [1]

Journal	IF	H	SJR	SQ	c/d
Statistics Education Research Journal (SERJ)	0.98	11	0.539 (0.854)	Q2 / Q3	0.81
Journal of Statistics Education (JSE)	1.00	25	0.291 (0.621)	Q3 / Q4	0.60
The American Statistician (AST)	5.66	71	0.759 (0.635)	Q2 / Q2	2.18
Technology Innovations in Teaching Statistics (TISE)	–	–	–	–	–
Teaching Statistics (TST)	0.41	12	0.168 (0.192)	Q4 / Q4	0.41
Significance	–	18	0.345 (0.315)	Q3 / Q3	0.95
Journal for Research in Mathematics Education (JRME)	3.68	74	2.916 (1.776)	Q1 / Q1	2.81
Journal of Mathematics Teacher Education (JMTE)	1.57	35	1.958 (0.631)	Q1 / Q1	2.31
Educational Studies in Mathematics (ESM)	1.73	60	1.569 (1.574)	Q1 / Q1	2.11
ZDM Mathematics Education	1.23	36	1.082 (0.832)	Q1 / Q1	1.59

[1] IF Five-year Impact Factor 2019, H H index 2019, SJR Scimago Journal Rank 2019 (2018), SQ Scimago Quartile Ed / Math, c/d Citations 2019 / document 2 years; – no information found.

What to do in order to increase ranking? Suggestions reach from 'to have more articles cited in other, higher-ranked journals', over to 'increase the variety of articles (research, discussion, review, invited essay, practical contributions for teaching)', up to 're-think the spectrum of publications', which would mean to go back to the roots of our journal and try to enrich the strict paradigm of "empirical research" (Borovcnik, 2014). Another point of improvement is to get more interest and acknowledgement from the general circle of statisticians who once had been deeply interested in the case of statistics education.

3.2 Language Policy
Language plays an extremely critical role in shaping ideas and expressing beliefs about probabilistic and statistical concepts. Mendes Nacarato and Grando (2014, p. 96) are not the only ones to speak about the crucial role of language in building probabilistic thinking.

> "Therefore, we conclude that […] ideas might be supplemented with the historical-cultural perspective of 'word' as a tool to explore the relationships between thought and probabilistic language. We believe that different conceptions are present in the ideas and speech of students in elementary education, particularly those who have not had the opportunity to explore probability theoretically as a measure of chance."

Amir and Williams (1999) go even further and point out the cultural influences on children's probabilistic thinking. If we go back to Vygotsky (1934/2012), we may come to the conclusion that thinking and language develop hand in hand so that we cannot easily separate them. If this complementarity between conceptions on the one side and language – culture on the other side applies, it will also have profound implications on research in statistics and probability education. Consequently, it seems essential to gather

research-based knowledge about teaching and understanding probability across languages and cultures. This includes that research journals in the field of statistics education actively encourage the exchange of ideas across language and culture boundaries.

In the past, SERJ has mainly published in English, although the intention from its inception was to create a forum for international exchange, with Spanish or French as possible alternatives, as Batanero and Jolliffe (2002) express:

> "Contributions in English are recommended. Contributions in French and Spanish will also be accepted."

Consistently, the options are:
- Restrict to English, as this is today's uniting Latin.
- Offer the opportunity for help in polishing the English.
- Offer submissions in Spanish or French, even if the final papers are in English.
- Continue with a minority of papers in Spanish or French.
- Enrich the multilingual connections by abstracts or short versions in other languages.

Concrete thoughts – especially in the interpretation of interview passages, but not only these – do not cross language boundaries without a substantial loss of meaning. For example, if French-speaking teachers have taken part in a study of pupils' attitudes, perceptions and abilities, they may not find themselves in the interviews with the research team translated to English.

There is more to say about the use of language in a journal. The impact of submissions in English only leads to a strong bias in favour of native speakers; it favours members of the English world; it fails to gather creativity from other cultures. Such a language restriction also narrows the circle of potential people who are actively engaged to a small, language-determined group and does not meet international needs and expectations. Moreover, language plays a much more decisive role in educational matters than in mathematics or statistics.

3.3 Introducing Innovative ways of Doing and Publishing Research

SERJ has been more open in the early phases and has tried to offer a broad forum for the exchange of ideas related to statistics education. We can see this from a general statement of intent by Batanero & Jolliffe (2002), in which they state that the aim of the journal is threefold:

> "Statistics Education Research Journal is published by the International Association for Statistical Education to
> - encourage research activity in statistics education;
> - advance knowledge about students' attitudes, conceptions, and difficulties as regards stochastic knowledge;
> - improving the teaching of statistics at all levels.
>
> It encourages the submission of quality papers, including research reports, theoretical or methodological analyses, literature surveys, thematic bibliographies, summaries of research papers and dissertations."

The special issues of SERJ offer a real opportunity to connect with this spirit and to expand the possibilities of publishing research making the best use of new technologies and innovative ways of research. That may include the following points:

- Make use of crowd research, outreach to industries, or re-establish a link with statistics as a discipline.
- Promoting the exchange of research ideas and research paradigms between culturally defined research groups.
- Encouraging the organisation of special issues as a collaborative effort. A joint rather than a summative effort is necessary to synthesise expertise and to promote young researchers.
- Encourage collaboration between young and experienced researchers, which may express itself in the form of mentorship in writing a research paper between a group of young researchers and some mentors.

The aim is to find ways to synthesise the views, approaches, and expertise of the whole community.

3.4 Increasing the Impact of the Journal by Diversifying Formats and Stakeholders
Just to present some ideas, which measurements could increase the impact of our journal:
- Readers should gain ideas for their own teaching from what is presented in educational magazines.
- Conceptual essays leave more freedom and we would be able to connect with the necessary feedback to the profession: Reflections and insights; as one-offs; alive, to the best of the ... to facilitate insights; the big ideas and what makes it big ideas of statistics.
- Diversification of the type of formats for research exchange, as we intended in the initial phase of SERJ in 2002: Invited essays, discussion papers, exchange of ideas in the form of paper – discussion – rejoinder. Twin papers with the ideas presented and discussed in one paper and the full elaboration of the background references including a justification for the reference to certain sources (and not others) in the other paper.

Formats should encourage interaction between researchers, linking different research groups and finding synergies between their approaches. Diversification should also be attained between those involved, from teachers to statisticians:
- Intensification of exchange with all the key players involved in the actual teaching process.
- Liaison with statisticians, applied statisticians, and data scientists.
- We should revive the interest of statisticians: Vic Barnett initiated the ICOTS series and organised the first one in Sheffield in 1982. Frederic Mosteller or John W. Tukey, the giants, participated in ICOTS 1.
- Collecting educational literature from the ranks of statisticians. How would it be to have Trevor Hastie as a writer? This would boost the quality of our discussion about data science and big data enormously.

It could be beneficial to stimulate intercultural exchange on ideas and approaches to statistics education. This includes rethinking language policy and reviving the idea of publishing papers in French and Spanish. At least to add abstracts in other languages or summaries of the contributions in French and Spanish to better reach these communities. This would increase the usefulness of a unifying language such as English as the Latin of today. The encounter with other language-defined cultures such as the Latin world or the African community would enrich the possibilities to find and examine innovative approaches in statistics education.

4. Conclusion

Once readers have identified an urgent topic for the education sector that needs to be explored in greater depth, they can use the background ideas presented here to see how they can implement their own plans. If readers have not yet thought of organising a special issue on an educational topic, the ideas in this paper could enrich their imagination about how to proceed to get involved. If readers are simply involved in topics of statistics education research, they might be interested in what distinguishes a special issue from the regular issues of a journal of statistics education. They could also see what it needs to make research communicable and relevant and how to improve the dissemination of research results.

The report on the topics, the approaches and the way in which special issues of the *Statistics Education Research Journal* are designed, clearly shows that special issues play a special role for the Journal and that they actually contribute a lot to the objectives of the journal, as already expressed by Batanero and Jolliffe (2002).

Special issues should – depending on the topic – attract and collect the knowledge of the whole community to study the urgent problems of statistics education and reach to the most remote parts of the community concerned with statistics education.

Special issues also provide a good opportunity to expand the circle of people actively involved in the journal, which is crucial for its future development. Enhancing the role of guest editors could be a wise decision. The search for guest editors from outside statistics education would open up opportunities to re-establish a link with statistics as a discipline and to establish contacts with industries and institutions working with statistics. It would also provide a link to those who apply statistics to find a new paradigm for teaching statistics.

The involvement of more people with different backgrounds and expertise offers more opportunities for the successful development and dissemination of ideas on statistics education. This is a primary objective of the *Statistics Education Research Journal*. One aim of this paper is to contribute to a development that more researchers actively participate in the work of research journals in statistics education. Either as editors, associate editors, reviewers or authors, or only in such a way that they challenge the researchers responsible for such journals to further develop the ways in which we can contribute to increasing the impact of the dissemination of research results on the actual teaching of statistics.

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