EDITORIAL

Welcome to the second regular issue of the three *Statistics Education Research Journal (SERJ)* issues for 2023! This issue is indicative of the transition in Editorship from Jennifer Kaplan to Susan Peters in that it includes papers managed by both Editors. The first issue of *SERJ* in 2024 likely will include papers managed by both Editors as well. Before we discuss the papers in this issue, we wish to acknowledge the work of a few individuals. With this issue, we see the retirement of two Associate Editors from the *SERJ* Editorial Board: Aisling Leavy from Mary Immaculate College in Ireland and Douglas Whitaker from Mount Saint Vincent University in Canada. Aisling served as an Associate Editor since 2013, and Doug served in this capacity since 2018. Please join us in thanking them for their invaluable service of handling the reviews of manuscripts submitted to *SERJ* and writing thoughtful reports. They will be missed. With their departure, we see the arrival of Alyssa Counsell from Toronto Metropolitan University in Canada as a new Associate Editor of *SERJ*. Alyssa has been a valued reviewer for *SERJ*, and we look forward to working with her as a member of the Editorial Board. Please join us in welcoming Alyssa. Also join us in congratulating Daniel Frischemeier and Guest Editors Aisling Leavy, Maria Meletiou-Mavrotheris from the European University Cyprus, and Efi Paparistodemou from the Cyprus Pedagogical Institute for their special issue on Research on Early Statistical and Probabilistic Thinking published in July of this year. Last, but certainly not least, we offer thanks to Noleine Fitzallen as our current Assistant Editor for her hard work with copy-editing and publishing the journal articles.

This issue of *SERJ* has eight articles, the first five of which were managed by Jennifer. Three of those articles focus on graduate student work in statistics or statistics education. In the first paper, Adam Elder used a phenomenological qualitative case study design to investigate how the use of guided project-based learning in a graduate-level statistics course informed students' attitudes toward statistics. The implementation of the guided project-based learning approach drew from Savery's (2006) principles of problem-based learning and was grounded in Knowles's (1980, 1984) work on andragogy and Bandura's (1986) social cognitive theory. Analysis of interviews with four students (cases) selected purposefully based on pre- and/or post-semester results on the SATS instrument yielded three themes: student knowledge of the complexity of the statistical process, building of student confidence in statistics, and elements of project-based learning that were important to its success as a pedagogical technique in graduate statistics courses. The author summarized the findings as: "students found completing projects as a learning and assessment tool—with proper balance of freedom and guidance/support from the instructor—to be a meaningful exercise that exposed them to the process and complex realities of quantitative inquiry, as well as one that built their confidence in reading and doing statistical analyses." This study makes important contributions to the field of statistics education as it provides both a pedagogical model for statistics instruction for future researchers in social science as well as a research model for studying the benefits and limitations of the way future researchers learn statistics at the graduate level.

Thomas Metzger, Tonya Pruitt, Jessica Alzen, Ayale Taye Goshu, and Eric Vance describe the approach of the Laboratory for Interdisciplinary Statistical Analysis (LISA) for training statistics graduate students in statistical collaboration and report the results of a survey of 123 LISA trainees. The main components of LISA are technical statistics courses, a communication in statistical collaborations course, weekly staff meetings, a pod system, contributions to collaboration projects, walk-in consulting, short courses, and video coaching and feedback sessions. Survey respondents reported LISA had beneficial impacts for technical, non-technical, and job-related aspects of their future work, with the most pronounced being perceived benefits to their non-technical skills. Benefits appeared to have a positive association with the number of projects done by a subject, and the results were similar across cohorts and time. While the authors recognized other metrics that have been developed since their data were collected, they used these results to argue for the efficacy of the LISA model for training statistics graduate students in collaboration. They also suggested that those using other training models in statistical collaboration should use similar methods incorporating updated metrics and instrumentation for evaluating their approaches to provide efficacious training for future statistical collaborators.

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In a third paper focused on the graduate level, Lori Viali, Magnus Cesar Ody, Clarrissa Coragem Ballejo, and Elisabete Rambo Braga performed a systematic review of the statistics education research dissertations produced in Brazil through 2021. The authors not only summarized the state of statistics education research in Brazil, but they also provided historical context for their work, describing both statistics education efforts within Brazil and those that have occurred at the international level. The findings of the literature review indicated that most statistics education research in Brazil took place either at the undergraduate level or in primary schools, with most studies using undergraduate students, some of whom were pre-service teachers, primary school students or teachers, or university professors as subjects. The research also uncovered a diversity of theoretical frameworks used in the statistics education research in Brazil, many of which came from the mathematics education research field. The authors attributed the use of mathematics education frameworks to the fact that most statistics education dissertations in Brazil were completed in a mathematics education program or with a supervisor from the mathematics education research field. The results of the research indicate a need for statistics education graduate programs in Brazil, and the authors suggested that statistics education research efforts be expanded in primary and secondary education in Brazil.

Turning to undergraduate statistics education, Nooshin Khobzi Rotondi, David Rudoler, William Hunter, Olayinka Sanusi, Chris Collier, and Michael Anthony Rotondi studied the effectiveness of emailed nudges to undergraduate students on their performance and engagement in an introductory statistics course. This work replicated work that had been done previously in economics and other scientific disciplines on academic nudges and is grounded in the notion that higher student engagement should lead to higher achievement. Over 300 students who took an introductory statistics course in a particular department over two semesters were randomly assigned to either receive or not receive an email, which included information on the students' predicted final grade in the course. Lower-performing students were also provided information on academic resources available at the university. Contrary to previous studies on email interventions for students, the authors did not detect a benefit of the emails in student performance. They did, however, detect an improvement in engagement for students who received the email feedback. In their discussion, the authors advocated for the use of email alerts to students as a relatively low-cost way for instructors to improve student engagement and access to potential instructional supports.

In the final paper of this issue managed by Jennifer, Martha Elena Aguiar Barrera, Humberto Gutierrez Pulido, and Veronica Vargas Alejo investigated the implementation of a model-eliciting activity about the binomial distribution with civil engineering undergraduate students in Mexico. By situating the activity in a context relevant to civil engineering students—the potential for critical defects in the production of clay bricks, the authors hoped the activity would help students develop a deeper understanding of the binomial distribution rather than learning only the procedural aspects of calculating binomial probabilities. The design of the activity was grounded in a models and modelling approach and, in particular, the work of Lesh et al. (2000). Students worked first individually and then in teams to write a proposal justifying decisions made in a contest to find the most successful brick manufacturer. This activity, while rooted in probability (the binomial distribution), makes an explicit connection between probability theory and the statistical application of the theory. The researchers found that while many students began with a linear or proportional approach to the problem, by completing the activity, they were able to move to the use of a probabilistic model. The authors suggest students should be exposed to contexts they know and that variability in those contexts be used to support the need for probabilistic models. They also suggest that future research explore student thinking around random phenomena to help student transition to more fruitful use of probabilistic models.

Karin Landtblom investigated students' opportunities to learn mean, median, and mode using a textbook analysis of tasks from Swedish textbook series written for students between 10 and 13 years of age, inclusive. She considered the contextual nature of tasks and appealed to Lithner's (2008) notions of input objects, transformations, and output objects and their associated mathematical properties to consider the learning opportunities afforded by textbook tasks. Her analysis built from the robust literature base devoted to children's learning about average. The results revealed that textbook tasks present different opportunities for students to learn about mean, median, and mode. For example, perhaps not surprisingly, the results showed that a majority of tasks focused on the mean, involved quantitative data, and required procedural transformations to solve. Some results are somewhat

concerning such as the prevalence of quantitative rather than nominal variables for tasks focused on the mode. Although the results offer a signature of Swedish textbooks, they raise important questions that textbook authors and the teachers who use the textbooks should consider if students are to develop robust understandings of measures of central tendency.

In their work with Costa Rican and Spanish students aged 11–16 years, Carmen Batanero, Luis Hernández-Solís, and María Gea conducted an exploratory study to investigate students' competence with comparing probabilities in contrast with their competence with comparing ratios. At the time of the study, students in both countries learned about probability and ratio and proportion in similar progressions of complexity, although slight variations existed from year to year between the two countries. The researchers used Noelting's (1980a, 1980b) levels of reasoning for children's comparison of ratios—an extension of Piaget and Inhelder's (1951) stages for children's development of reasoning to compare probabilities—to analyze students' responses to ratio comparison and probability comparison questions. The researchers provided the questionnaires they used with students and provided a detailed description of the process they used to obtain reliability and validity evidence for the questionnaire and its use in this study. They found that in general, students had more difficulty with comparing probabilities than comparing ratios, and few students used multiplicative strategies for comparisons, resulting in them struggling to make comparisons requiring higher levels of reasoning. These results offer insights into the types of comparisons that students seemingly can make easily and those that require additional attention in instruction, particularly for students in later grades.

Kelly Findley, Brein Mosely, and Aaron Ludkowski investigated the under-researched area of student thinking about statistical design. In their qualitative study, they used diSessa's (1988) notion of "knowledge in pieces" to consider the resources that introductory statistics students brought to bear when evaluating and comparing imperfect designs. They further used Fauconnier and Turner's notion of conceptual blending to consider how students balanced the competing priorities of causality, generalizability, and power. The researchers included a detailed accounting of their data analysis procedures and offered full transparency by providing a file with student data and their coding of resources to allow readers to determine the credibility of the research for themselves. The results revealed a variety of resources that students drew on to reason about different designs and tensions among competing priorities when comparing designs. Based on their results, the researchers offered much-needed implications for curriculum and instruction in the area of design.

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