

EDITORIAL

Welcome to the first regular issue of *SERJ* for 2025! The papers published in this issue were originally scheduled to be included in a regular issue at the end of 2024. Unfortunately, due to unforeseen circumstances, their publication was delayed. The *SERJ* editorial team and *SERJ* Advisory Board (Chair: Iddo Gal, University of Haifa, Israel) apologize to the authors and readers for this unexpected delay. We have taken steps to ensure that *SERJ* processes are streamlined for a smoother publication process. We remain committed to the timely publication of original, high-quality papers from authors worldwide that describe new empirical research, analyze published research, or present conceptual analyses and frameworks that build on scholarly literature and contribute to scholarly knowledge and educational practice in statistics (broadly viewed).

Before we discuss the papers in this issue, we wish to acknowledge the work of a few individuals. First, we welcome Stephanie Budgett (University of Auckland, New Zealand) as Assistant Editor–Manuscripts for a three-year term. She will be in charge of copyediting accepted manuscripts and preparing them for publication. She joins Anna Fergusson (University of Auckland, New Zealand), who has been providing the journal with technical support over the last year and who has officially been appointed to a new position as *SERJ* Assistant Editor–Technology for a three-year term. She is in charge of the final production of *SERJ* issues and managing the *SERJ* Online Journal System [OJS] website. We are grateful to both Stephanie and Anna for their work in putting together this issue of *SERJ*. We are also grateful to Tina Marcroft, who provided copyediting support as the temporary *SERJ* Assistant Editor as we transitioned between Assistant Editors. We thank Noleine Fitzallen (University of Tasmania, Australia), the outgoing *SERJ* Assistant Editor, for her extended contributions to *SERJ* and to the statistics education community.

We also have some changes in our team of Associate Editors with the retirements of two individuals. Alyssa Counsell (Toronto Metropolitan University, Canada) served as an Associate Editor for approximately 18 months, and Susanne Schnell (Goethe-Universität Frankfurt, Germany) served the journal as an Associate Editor since 2019. Both provided supportive and insightful reports for the manuscripts they handled. Please join us in thanking them for their service and wishing them the best of luck with their future endeavors. We also would like to thank all of our continuing Associate Editors for their service to *SERJ* and for making this issue possible. Please also join me in congratulating Daniel Frischemeier and the Guest Editors, Bruno de Sousa (Universidade de Coimbra, Portugal), Teresita Terán (Universidad Nacional de Rosario, Argentina), Lucía Zapata-Cardona (Universidad de Antioquia, Columbia), and Susan Peters (University of Louisville, United States), for the publication of the *SERJ* Special Issue focused on Inclusive Statistics Education With Digital Resources published between December 2024 and February 2025. Last but not least, we welcome Aisling Leavy (Mary Immaculate College, Ireland) to the *SERJ* Advisory Board. Aisling joined the Board in 2024 to replace Jane Watson (University of Tasmania, Australia), who completed her six-year term on the Board. We thank Jane for her insightful contributions to the Board, the Journal, and statistics education in general and wish her well in her future endeavors.

There are six articles in this issue of *SERJ* and acknowledgments of referees who submitted reports during 2023 or 2024. Two of the six articles were managed by Jennifer, and the remaining four were managed by Sue. One article is theoretical; five articles are empirical. Collectively, the articles consider the affective and cognitive characteristics of a wide range of learners.

In their theoretical piece, Anne Patel and Maxine Pfannkuch introduce an inferentialism-based framework in part to address calls about the need for stronger theory to explain knowledge construction (e.g., Nilsson et al., 2018). Their framework is grounded in inferentialism (Brandom, 2000), the pedagogical routine of noticing and wondering (Shaughnessy, 1997), and Heusdens and colleagues' (2019) notions of conceptualising and concretising language use to connect concepts with actions during learning. The authors illustrated an application of their framework using data from students working on two statistical modelling tasks from a study to introduce 11-year-old students to statistical modelling and to extend their probabilistic thinking. Five learning episodes were used to introduce key aspects of the framework and to illustrate how these aspects can be used to consider students' reasoning and conceptual development over time. The framework offers potential for providing explanatory insights into students' statistical learning and concept formation.

Inferentialism also provides the theoretical frame for considering second grade students' informal inferential reasoning in the article written by Stavroula Saplamidou and Charalampos Sakonidis. In particular, the authors examined cognitive and sociocultural aspects of students' informal inferential reasoning (IIR) and relationships among the aspects using an adaptation of the framework of Ben-Zvi and colleagues (2007) and the inferentialist concepts of commitment and entitlement (Hußmann et al., 2018) and deontic scorekeeping (Noorloos et al., 2017) during students' group work and participation in the discursive practice of exchanging and committing to claims known as the Game of Giving and Asking for Reasons (GoGAR). The researchers identified cognitive aspects, such as detecting patterns and trends in data, as well as sociocultural aspects, such as linguistic features, of students' IIR. They found both corroborative and dismissive relationships among cognitive and sociocultural aspects as students formed commitments during the GoGAR to offer insights into the normative factors that may come into play as young students engage in inferential activities.

Anelise Sabbag, Andrew Zieffler, and Casey Ng investigated an assessment instrument for statistics education research, the REasoning and Literacy Instrument (REALI), designed to measure statistical literacy and reasoning concurrently. Despite the careful construction of the REALI, there has been an open question about whether the two individual sub-scores, one for literacy and one for reasoning, should be reported in addition to the total score on the REALI. The authors used Item Response Theory on a sample of 1,489 student responses to the 40-item REALI to examine four potential models for the relationship between statistical literacy and reasoning. Two models assumed statistical literacy and reasoning were distinct yet related, with one of these models assuming a hierarchical relationship. A third model assumed that the dimension of statistical literacy had a direct effect solely on statistical literacy items, and the dimension of statistical reasoning had a direct effect solely on statistical reasoning items. There was also a general construct (referred to as *Statistical Knowledge*) that had direct effects on all the literacy and reasoning items. The final model assumed that statistical literacy and reasoning were indistinguishable. Although all four models showed evidence of good fit to the data, after evaluating the evidence of distinctiveness and the reliabilities of the sub-scores from the multidimensional models, the evidence suggested the sub-scores for literacy and reasoning may not provide meaningful information beyond the total score on the REALI. In general, these findings may indicate overlap between statistical literacy and reasoning or, as has been proposed by delMas (2002), that statistical reasoning is a subset of statistical literacy.

Randall E. Groth and James P. Barry present the results of a collaboration between a statistics education researcher and a physical education researcher to consider physical education majors' reasoning patterns and use of context knowledge to solve a variant of the famous hospital problem set within a sports context. They used an argumentation lens and argument diagrams based on the work of Toulmin (1958, 2003) to qualitatively examine the reasoning patterns that physical education majors used to solve the variant and to consider how these physical education majors used their knowledge of the sports context and the empirical law of large numbers in their reasoning. They found that even though 39 of 58 participants provided the correct answer to the variant, only 1/3 of them did so using the anticipated argument structure that incorporated the empirical law of large numbers as backing. Other argument structures used to support both correct and incorrect responses incorporated primarily mathematical backing using proportional reasoning, primarily contextual backing using knowledge about the sport or its players, no explicit backing, or unintended interpretations of the variant stemming largely from knowledge of the context. The study provides insights into how students can correctly respond to a variant of the hospital problem using appropriate reasoning based on context knowledge and not intuitions or knowledge about the empirical law of large numbers or by using invalid syllogisms in their reasoning.

Moving from cognitive to affective considerations for student achievement, José Hernando Ávila-Toscano, Leonardo José Vargas-Delgado, and Yurley Alejandra Badillo-Rueda used quantitative methods to examine whether the dispositional variables of worry and its negative consequences might mediate the relationship between negative problem orientation—unfavorable perception and evaluation of problems and the ability to solve them—and statistical anxiety. They selected a sample of students from education sciences, human and social sciences, health science, and basic and economic sciences disciplines at two Colombian universities and administered a series of previously-developed surveys to measure the variables of interest. Using a multiple mediation model with negative problem orientation as the independent variable and statistical anxiety as the response variable, they found that the negative

consequences of worry mediated the relationship between a negative problem orientation and statistical anxiety to provide the field with additional information about factors associated with statistical anxiety. Such results can inform the development of interventions that address factors such as negative beliefs about worry in ways that will reduce students' anxiety.

Chelsey Legacy, Andrew Zieffler, V. N. Vimal Rao, and Robert delMas designed and implemented professional learning activities focused on multivariate data with in-service teachers. They investigated the extent to which the teachers could create visualizations of multivariate data to consider relationships among the variables, reason about the data depicted in a visualization displaying multivariate relationships, and produce tidy data—an organizational structure for data that facilitates analysis—from a data visualization depicting multivariate relationships. They found that teachers were better at creating visualizations to display relationships in multivariate data than in reasoning about the multivariate relationships and creating data tables from visualizations. The authors generated a list of potential developmental understandings that might be key for developing important content knowledge for exploring multivariate relationships—content that is becoming increasingly more prominent in school curricula.

The authors and editors hope that *SERJ* readers enjoy this set of papers. Many thanks again to the editorial team, reviewers, and authors, without whom this issue would not exist.

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