EDITORIAL

Welcome to the first regular issue of *SERJ* for 2024! This new year for *SERJ* brings some new faces to the Editorial Board along with a transition from the Board. With this issue, we see the retirement of Rini Oktavia as Associate Editor. Rini, who was an Associate Editor for four years, is a Senior Lecturer at Syiah Kuala University in Indonesia. Please join us in thanking her for her service and in wishing her the best of luck with her future endeavors. We also welcome two new Associate Editors: Karin Binder and Elinor Jones. Karin is a Professor of Mathematics Education at Ludwig Maximilian University of Munich, and Elinor is an Associate Professor of Teaching at University College London. Both bring important experiences and areas of expertise to the Editorial Board, and we look forward to working with them. Please join us in welcoming them. We also would like to thank all our continuing Associate Editors; Anna Fergusson, our Assistant Technical Editor; and Noleine Fitzallen, our Assistant Editor, for their service to *SERJ* and for making this issue possible.

In looking ahead to future issues of *SERJ*, we encourage readers to submit conceptual papers to *SERJ*. *SERJ* accepts three broad types of manuscripts for publication: reports of original empirical research, conceptual papers, and brief reports. Most papers that are submitted to *SERJ* and that we publish are reports of original empirical research. As is true for empirical work, conceptual papers also contribute to the ongoing development of knowledge and learning in our field. They do so not by reporting research results but by synthesizing and extending existing empirical and theoretical literature to develop or refine a concept, theoretical framework, model, approach, or perspective. Multiple types of conceptual papers are possible and are invited for submission. For more information about conceptual papers appropriate for publication in *SERJ*, please go to https://iase-web.org/ojs/SERJ/libraryFiles/downloadPublic/11

There are five articles in this issue of *SERJ*, three of which were managed by Jennifer, and two were managed by Sue. Attending to the need for assessments in statistics education, Sayali Phadke, Matthew Beckman, and Kari Lock Morgan developed an isomorphic instrument to the existing Basic Literacy in Statistics (BLIS) instrument and compared the functioning of the new instrument, the MBLIS, to the original BLIS. The MBLIS retained a subset of six tasks verbatim from the BLIS to serve as anchors. The other 31 BLIS items were replaced by isomorphic items assessing the same concept or learning outcome. The authors retained structural features of the original items such as type of variable, sample, or study, and whether the item required use of raw or summary data. However, they changed all questions on the MBLIS to use real data from real studies, whereas the original BLIS items used naked (no context) data, realistic data, real data without citing a study, or real data from an actual study. The authors provide evidence of validity of isomorphism between the BLIS and the MBLIS through reviews from content experts, whose input contributed to revisions of the MBLIS, as well as through comparisons based on internal consistency and Principal Components Analysis. The results of the comparison of administration of the BLIS and MBLIS indicated differences in student performance for items that originally used naked, realistic, or real data without citing a study when compared to the transformed items using real data citing a study. Some of these differences may be attributed to the longer word count (length of) the revised items. This work contributes to the research endeavor in statistics education by demonstrating a method to create isomorphic assessments. It also serves as a reminder that as statistics education instructors and researchers strive to incorporate more data with real contexts, they should be mindful of the support needed for students to demonstrate statistical knowledge.

In their work with undergraduate students enrolled in an introductory statistics course, Jennifer Hill, George Perrett, Stacey Hancock, Le Win, and Yoav Bergner conducted a randomized vignette experiment to investigate whether the wording of study results affects students' attributions of causal relationships among variables. The authors administered two waves of surveys. For each wave, students were randomly assigned to one of six different types of vignettes of hypothetical study findings for four different topics. The six types of results included language ranging from strongly causal to descriptive, and students were exposed to the same type of language for each topic within each wave. The authors used Bayesian methods to fit mixed effects models to test differences in causal attribution across experimental factors of the type of causal/noncausal wording used in results and across topics. Perhaps not surprisingly, the authors' results suggest that the wording of study findings has some effect on

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students' attributions of causality. The authors also found evidence to suggest that students' causal attributions might be more strongly affected by context and students' prior beliefs about relationships among variables. Although the authors acknowledge several limitations to their work, their work provides insights into the effects that language and context might have on students' determinations of causality and suggests that students might benefit from instruction that presents study results worded in different ways so that students might better interpret results they encounter in daily life.

Anelise Sabbag, Andrew Zieffler, and Casey Ng also 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 assume statistical literacy and reasoning are distinct yet related, with one of these models assuming a hierarchical relationship. A third model assumes the dimension of statistical literacy has a direct effect solely on statistical literacy items and the dimension of statistical reasoning has a direct effect solely on statistical reasoning items. There is also a general construct (referred to as *Statistical Knowledge*) that also has direct effects on all the literacy and reasoning items. The final model assumes that statistical literacy and reasoning as indistinguishable from each other. 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 suggests 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.

Teacher knowledge of and affect toward the subject they teach influence their teaching practices and competence. To increase and improve the quality of research regarding teachers' cognitive and affective aspects in statistics, Sarah Huber, Frank Reinhold, Andreas Obersteiner, and Kristina Reiss studied these characteristics in 88 in-service mathematics teachers from Colombia. In particular, the researchers compared the teachers' motivational and emotional orientations toward teaching statistics to the same aspects of teaching fractions. They also investigated relationships between the teachers' orientations toward statistics and their statistical content knowledge. The instrumentation used was based on the BeSt Teacher framework and adapted from the original German to Spanish. The teachers held positive orientations to statistics but reported being less self-effective, less joyful, and more anxious when teaching statistics compared to teaching fractions. Self-efficacy and anxiety were identified as potential predictors of statistics content knowledge, but to fully understand the effect of anxiety, the authors considered its interaction with gender of the teacher. In fact, there was a small negative effect for the male teachers (higher anxiety for teaching statistics predicted lower knowledge) and a larger positive effect for the female teachers (higher anxiety for teaching statistics predicted higher knowledge). As the teaching of statistics and data science becomes ever more prevalent at the primary and secondary school levels, studies of teacher knowledge and affect such as this one are needed to help the statistics education community better prepare classroom teachers of statistics.

Yannik Fleischer, Susanne Podworny, and Rolf Biehler investigated 11–12-year-old students' constructions of data-based decision trees during students' introduction to machine learning. The authors described the teaching unit they developed to introduce students to decision trees using data cards, which provided the background for seven student pairs to participate in an exploratory interview study to investigate how students approached deriving a one-level decision tree from data. The authors familiarize readers with the process of creating data-based decision trees using data cards and the data set that students used in the study in their descriptions of the teaching unit so that even readers who might not be familiar with creating decision trees can make sense of the results. Perhaps somewhat surprisingly, the results revealed that all student pairs were able to create a reasonable decision tree for recommending foods using a predictor variable of fat, suggesting that the authors' approach to teaching the construction of decision trees offers promise for relatively young students. The authors also found differences in the approaches that pairs took to split the data cards into recommendation categories, with those who initially sorted the cards in ascending order of predictor variable values having greater success. The authors offered several insights their work provides for refining instructional approaches

to decision trees. The work is particularly timely given the proliferation of educational policies that require students at increasingly younger ages to become proficient at working with data and with critically consuming reports based on data.

REFERENCES

delMas, R. C. (2002). Statistical literacy, reasoning and learning: A commentary. *Journal of Statistics Education, 10*(3), Article 1. https://doi.org/10.1080/10691898.2002.11910679

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