



Teaching Bits: Statistics Education Articles from 2013 and 2014

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I located 16 articles and one book that have been published from November 2013 through February 2014 that pertained to statistics education. In this column, I highlight a few of these articles that represent a variety of different journals that include statistics education in their focus. I also provide information about the journals and book and a link to their websites so that abstracts of additional articles may be accessed and viewed.

Book: *Using Tools for Learning Mathematics and Statistics*

Edited by: Thomas Wassong, Daniel Frischemeier, Pascal R. Fischer, Reinhard Hochmuth, and Peter Bender

Published by Springer Spektrum in 2014

<http://link.springer.com/book/10.1007/978-3-658-03104-6>

Abstract: This book was compiled in honor of the 60th birthday of Professor Rolf Biehler from the University of Paderborn in Germany. The book is in German and English, but there are 16 chapters in English that relate to statistics education. These chapters focus on issues of teaching statistics using technology and are written by leading statistics educators throughout the world, such as Bill Finzer, Arthur Bakker, Gail Burrill, Dave Pratt, Dani Ben-Zvi, Cliff Konold, Katie Makar, Robert Gould, Maxine Pfannkuch, Robert delMas, and Jane Watson.

From *The American Statistician*

<http://pubs.amstat.org/>

The American Statistician contains articles related to statistics education that are organized into the following sections: Statistical Practice, Teacher's Corner, Reviews of Books and Teaching Materials. It is published quarterly and is available by paid subscription.

“I Hear, I Forget. I Do, I Understand: A Modified Moore-Method Mathematical Statistics Course”

By Nicholas J. Horton

Volume 67, Number 4 (2013)

<http://amstat.tandfonline.com/doi/full/10.1080/00031305.2013.849207#.Ux3T0IXFnMU>

Abstract: Moore introduced a method for graduate mathematics instruction that consisted primarily of individual student work on challenging proofs. Cohen described an adaptation with less explicit competition suitable for undergraduate students at a liberal arts college. This article details an adaptation of this modified Moore method to teach mathematical statistics, and describes ways that such an approach helps engage students and foster the teaching of statistics. Groups of students worked a set of three difficult problems (some theoretical, some applied) every two weeks. Class time was devoted to coaching sessions with the instructor, group meeting time, and class presentations. R was used to estimate solutions empirically, where analytic results were intractable, as well as to provide an environment to undertake simulation studies with the aim of deepening understanding and complementing analytic solutions. Each group presented comprehensive solutions to complement oral presentations. Development of parallel techniques for empirical and analytic problem solving was an explicit goal of the course, which also attempted to communicate ways that statistics can be used to tackle interesting problems. The group problem-solving component and use of technology allowed students to attempt much more challenging questions than they could otherwise solve. Supplementary materials for this article are available online.

From *Teaching Statistics*

<http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291467-9639>

An International Journal for Teachers that first appeared in 1979 and has been published three times a year ever since. It is available by paid subscription.

“Teaching Quality Control with Chocolate-Chip Cookies”

By Ardith Baker PhD

Volume 36, Number 1 (2014)

<http://onlinelibrary.wiley.com/doi/10.1111/test.12020/full>

Abstract: Chocolate chip cookies are used to illustrate the importance and effectiveness of control charts in Statistical Process Control. By counting the number of chocolate chips, creating the spreadsheet, calculating the control limits and graphing the control charts, the student becomes actively engaged in the learning process. In addition, examining and interpreting the control charts within the context of the cooking making process encourage the student to think critically in order to solve problems.

“Randomizing Roaches: Exploring the ‘Bugs’ of Randomization in Experimental Design”

By Amy Wagler and Ron Wagler

Volume 36, Number 1 (2014)

<http://onlinelibrary.wiley.com/doi/10.1111/test.12029/full>

Abstract: Understanding the roles of random selection and random assignment in experimental design is a central learning objective in most introductory statistics courses. This article describes an activity, appropriate for a high school or introductory statistics course, designed to teach the concepts, values and pitfalls of random selection and assignment using the not-easily-forgotten Madagascar hissing cockroach. Evidence is summarized demonstrating conceptual gains for students performing the Randomizing Roaches activity, and follow-up activities are suggested.

From *Technology Innovations in Statistics Education*

<http://repositories.cdlib.org/uclastat/cts/tise/>

TISE reports on studies of the use of technology to improve statistics learning at all levels, from kindergarten to graduate school and professional development. It is a free, online journal. Volume 7 issue 3 is a special edition: *Introduction to the Future of the Textbook*, and contains comments and responses in addition to three original articles.

“The Course as Textbook: A Symbiotic Relationship in the Introductory Statistics Class”

By Andrew Zieffler, Rebekah Isaak, and Joan Garfield
Volume 7, Number 3 (2013)

<http://www.escholarship.org/uc/item/12q2z58x>

Abstract: In the past several decades, the statistics textbook has evolved to include a variety of ancillary materials intended to supplement students’ learning and assist the teacher (e.g., workbooks, study guides, audio program, test banks, PowerPoint slides, links to applets and websites, etc.). Given the capabilities of modern technology and the need for change in content and pedagogy in the introductory statistics course, a new vision of a textbook is offered, one that exploits new technology, provides modern content, and is a more integral part of the course. Rather than serving as a supplement to a course, the modern textbook needs to embody the course. An example of such a text in the context of a unique, new introductory statistics course is provided.

“OpenIntro Statistics: an Open-source Textbook”

By Mine Cetinkaya-Rundel, David Diez, and Christopher D. Barr
Volume 7, Number 3 (2013)

<http://www.escholarship.org/uc/item/6ms0x5nf>

Abstract: The traditional textbook is a familiar and useful tool that has served well for centuries. Here, we discuss *OpenIntro Statistics*, a new textbook that seeks to retain the long-standing points of excellence among traditional textbooks, while overcoming what is potentially the most important traditional limitation: exclusivity. *OpenIntro Statistics* is a completely open-source textbook, which can be downloaded for free and edited by anybody. Its content meets the highest established standards, and is written, edited, and reviewed by faculty from leading universities. In this paper, we provide support for the assertion that *OpenIntro Statistics* retains as many of the advantages of a traditional textbook as possible, while empowering the largest possible audience to own and edit introductory content in statistics. We also discuss how the

open-source textbook model differs from other technologically enabled alternatives to the traditional textbook, and consider trends in the textbook over the coming years.

“Textbooks 2.0”

By Webster West

Volume 7, Number 3 (2013)

<http://www.escholarship.org/uc/item/8mv5b3zt#>

Abstract: Technology allows us to offer great improvements on the traditional paper-bound textbook. I describe reasons for why electronic textbooks will become the norm in the near future.

From *Statistics Education Research Journal*

<http://www.stat.auckland.ac.nz/~iase/publications.php?show=serj#archives/>

SERJ is a peer-reviewed electronic journal of the International Association for Statistics Education (IASE) and the International Statistical Institute (ISI). It is published twice a year. SERJ is a free online journal.

“Survey of Native English Speakers and Spanish-speaking English Language Learners in Tertiary Introductory Statistics”

By Lawrence M. Lesser, Amy E. Wagler, Alberto Esquinca, and M. Guadalupe Valenzuela

Volume 12, number 2 (2013)

http://iase-web.org/documents/SERJ/SERJ12%282%29_Lesser.pdf

Abstract: The framework of linguistic register and case study research on Spanish-speaking English language learners (ELLs) learning statistics informed the construction of a quantitative instrument, the Communication, Language, And Statistics Survey (CLASS). CLASS aims to assess whether ELLs and non-ELLs approach the learning of statistics differently with respect to the distinctive linguistic features of the field of statistics and with respect to language resources they bring to the class. The CLASS was administered to all ($n = 137$) students in an introductory statistics literacy course at a university with a majority Mexican-American student body. Findings suggest ELLs often have distinctive patterns in how they experience aspects of statistics instruction (e.g., wait time) as well as movement between mathematics/statistics and everyday registers.

“Exploring the Role of Context in Students’ Understanding of Sampling”

By Jacqueline R. Wroughton, Herle M. McGowan, Leigh V. Weiss, and Tara M. Cope

Volume 12, number 2 (2013)

http://iase-web.org/documents/SERJ/SERJ12%282%29_Wroughton.pdf

Abstract: Context provides meaning for data analysis and the evaluation of evidence but may be distracting to students. This research explores the role of context in students’ reasoning about sampling: specifically, the relationship between the strength of students’ opinions about a topic,

which provides the context for a study, and their ability to judge the quality of the sampling method and the scope of the conclusions in the study. Data were collected at four diverse institutions in both a testing environment and through individual interviews. Student responses were analyzed using a grounded theory approach. Testing environment results showed little evidence of the use of context whereas interview results showed more evidence of reliance on context-based opinions rather than statistical principles.

From *Mathematics Teacher*

<http://www.nctm.org/publications/mt.aspx>

MT is an official journal of the National Council of Teachers of Mathematics. It is published nine times a year and is available by paid subscription.

“Connecting Research to Teaching: Using Data to Motivate the Use of Empirical Sampling Distributions.”

By Hollylynne S. Lee, Tina T. Starling, and Marggie D. Gonzalez

Volume 107, number 6 (2014)

<http://www.nctm.org/publications/article.aspx?id=40436>

Abstract: Research shows that students often struggle with understanding empirical sampling distributions. Using hands-on and technology models and simulations of problems generated by real data help students begin to make connections between repeated sampling, sample size, distribution, variation, and center. A task to assist teachers in implementing research-based strategies is included.

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