Teaching Bits: Statistics Education Articles from 2009

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Journal of Statistics Education Volume 18, Number 1 (2010),
www.amstat.org/publications/jse/v18n1/garfieldtb.pdf

We located 61 articles that have been published from January through November 2009 that pertained to statistics education. In this column, we highlight a few of these articles that represent a variety of different journals that include statistics education in their focus. We also provide information about the journal and a link to their website so that abstracts of additional articles may be accessed and viewed.

From *Teaching Statistics*

http://www.rsscse.org.uk/ts/
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.

"Statistics Online Computational Resource for Education"

By Ivo D. Dinov, Nicolas Christou.
Volume 31, Number 2 (2009)
http://www3.interscience.wiley.com/journal/122324628/abstract
Abstract: The Statistics Online Computational Resource (http://www.SOCR.ucla.edu) provides one of the largest collections of free Internet-based resources for probability and statistics education. SOCR develops, validates and disseminates two core types of materials – instructional resources and computational libraries.

"Why Don't We Live Forever?"

By Ruma Falk
Volume 31, Number 3 (2009)
http://www3.interscience.wiley.com/journal/122544457/abstract
***Abstract*:** The older one gets, the more one's life expectancy exceeds the population's given expectancy (at birth). Yet longevity is finite. This apparent paradox is analysed probabilistically with reference to empirical demographic data.

"What is Strong Correlation?"

By Marcin Kozak
Volume 31, Number 3 (2009)
http://www3.interscience.wiley.com/journal/122544460/abstract
***Abstract*:** Interpretation of correlation is often based on rules of thumb in which some boundary values are given to help decide whether correlation is non-important, weak, strong or very strong. This article shows that such rules of thumb may do more harm than good, and instead of supporting interpretation of correlation – which is their aim – they teach a schematic approach to statistics. Therefore they should be avoided in a statistics course.

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). SERJ is published twice a year and is free.

"English Language Learners in Introductory Statistics: Lessons Learned from an Exploratory Case Study of Two Pre-Service Teachers "

By Lawrence M. Lesser and Matthew S. Winsor.
Volume 8, Number 2(2009)
http://www.stat.auckland.ac.nz/~iase/serj/SERJ8(2)_Lesser_Winsor.pdf
***Abstract*:** Despite the rapidly growing population of English language learners in U.S. colleges and schools, very little research has focused on understanding the challenges of English language learners specifically in statistics education. At a university near the United States-México border, the authors conducted an exploratory qualitative case study of issues of language in learning statistics for pre-service teachers whose first (and stronger) language is Spanish. The two strongest findings that emerged from cross-case analysis of the interviews were the importance of the role of context (the setting in which information is communicated) and the confusion among registers (subsets of language). This paper overviews and synthesizes relevant literature and offers resources and recommendations for teaching and future research.

"The Transitivity Misconception of Pearson's Correlation Coefficient "

By Ana Elisa Castro Sotos, Stijn Vanhoof, Wim Van Den Noortgate & Patrick Onghena.
Volume 8, Number 2(2009)
http://www.stat.auckland.ac.nz/~iase/serj/SERJ8(2)_Sotos.htm
***Abstract*:** Despite the relevance of correlational studies for most research domains, many students, teachers, and researchers alike hold misconceptions concerning the Pearson product-moment correlation coefficient. One of these, the transitivity misconception, has not yet been documented in a systematic way. This paper summarizes the first empirical study, using 279 university students, and examines the relationship between student-based and task-based factors and the appearance of this misconception. In particular, two task-based factors seemed to have a significant effect on its appearance. In addition, the respondents' level of confidence in their answer to the transitivity item was significantly lower than for most other times.

"Question Format and Representations: Do Heuristics and Biases Apply to Statistics Students?"

By Jennifer J. Kaplan and Juan Du.
Volume 8, Number 2(2009)
http://www.stat.auckland.ac.nz/~iase/serj/SERJ8(2)_Kaplan_Du.htm
***Abstract*:** Researchers in the field of psychology studying subjects' reasoning abilities and decision-making processes have identified certain common errors that are made, particularly on probability questions standard in introductory statistics courses. In addition, they have identified modifications to problems and training that promote normative reasoning in laboratory subjects. This study attempts to replicate, in the context of a statistics classroom, the results of one particular type of probability question, a two-stage conditional probability problem. The psychology literature suggests two possible implications for teaching probability. Although no effect for format modification was found, the representations training effects were replicated. The implications of these results for teaching and directions for future research are discussed.

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.

"Delving Deeper: Sizing Up Class Size: A Deeper Classroom Investigation of Central Tendency"

By Lawrence M. Lesser
Volume 103, Number 5 (2009)
http://www.nctm.org/eresources/article_summary.asp?URI=MT2009-12-376a&from=B
***Abstract*:** A simple question about average class size yields a surprisingly rich classroom-tested exploration of conceptual and procedural knowledge about measures of central tendency.

"**Investigating the Randomness of Numbers"**

by Kenn L. Pendleton
Volume 103, Number 5 (2009)
http://www.nctm.org/eresources/article_summary.asp?URI=MT2009-12-364a&from=B
***Abstract*:** If one claims that a sample has been randomly selected from a population, can the merits of the claim be assessed using statistical tests? Are tests alone sufficient?

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.

"Alternative Representations of Statistical Measures in Computer Tools to Promote Communication between Employees in Automotive Manufacturing"

By Arthur Bakker, Phillip Kent, Richard Noss & Celia Hoyles
Volume 3, Number 2 (2009)
http://escholarship.org/uc/item/53b9122r
***Abstract*:** In manufacturing industry, many employees need to interpret and communicate statistical information to monitor and improve production processes. Often the information is reduced to the form of numerical measures, on the logic that numbers are a convenient and understandable type of information to pass among the diverse groups of employees that make up a manufacturing operation. We investigated by means of interviews and observation how several numerical measures, 'process capability indices', were used in an automotive factory and how employees were trained to use them. We found that the typical introduction to the measures deployed statistical and algebraic symbolism as well as laborious manual calculations that did not appear to support employees' understanding of the underlying mathematical relationships. These measures therefore failed to be 'boundary objects' – artifacts that inhabit different social worlds and satisfy the informational requirements of each. The goal of our subsequent design-based research was to design a representation of the process capability indices that would be easier to engage with than the existing formal symbolism used in shop floor calculations and in training. We did this by re-presenting relevant mathematical relationships in computer tools – technology-enhanced boundary objects (TEBOs) – developed in collaboration with company trainers. To evaluate our interaction with three trainers and 37 trainees in three courses in two factories, and the impact of the computer tools on practice, we followed the computer tools' trajectory from the stage of codesign with the original car factory through to the stage at which the computer tools were used by factories beyond this research project. The evaluation points to the importance of aligning statistical and workplace norms and meanings, and gives illustrations of how the tools facilitated communication between employees.

"Reasoning about Probabilistic Phenomena: Lessons Learned and Applied in Software Design"

By Hollylynne S. Lee & Todd J. Lee
Volume 3, Number 2 (2009)
http://escholarship.org/uc/item/1b54h9s9
***Abstract*:** In this paper we provide a glimpse of the iterations of design, research and theorizing of a probability simulation tool, Probability Explorer, that have occurred over the past decade. We provide a brief description of the key features of the technology designed to allow young students opportunities to explore probabilistic situations. This is followed by details about several research observations made in multiple investigations of student explorations with this probability micro- world software package. We then explicate how research results suggest that a focus on a bidirectional interplay between theoretical distribution and empirical data can promote reasoning about probabilistic phenomena, and offer implications for instruction. The paper concludes with a discussion of a next generation innovation in the software for representing a theoretical distribution that we believe may promote better students reasoning about the bidirectional connection between theoretical distributions and empirical data.

"Discrete Bayes with R"

By Jim Albert
Volume 3, Number 2 (2009)
http://escholarship.org/uc/item/9kb6x0bw
***Abstract*:** An attractive way of introducing Bayesian thinking is through a discrete model approach where the parameter is assigned a discrete prior. Two generic R functions are introduced for implementing posterior and predictive calculations for arbitrary choices of prior and sampling densities. Several examples illustrate the usefulness of these functions in summarizing the posterior distributions for one and two parameter problems and for comparing models by the use of Bayes factors.

From *Model Assisted Statistics and Applications*

http://www.iospress.nl/loadtop/load.php?isbn=15741699
Model Assisted Statistics and Applications is an international peer reviewed journal. It is published four times a year and is available by paid subscription.

"Community-oriented projects in calculus-based statistics courses"

By Arkady Shemyakin & Brenda Tiefenbruck
Volume 4, Number 4 (2009)
http://iospress.metapress.com/content/b037h3gvln00lh6w/fulltext.pdf
***Abstract*:** The purpose of the paper is to share the ten years of experience of implementing small group community-oriented projects as a learning tool in three different calculus-based statistics

courses at the University of St. Thomas in Minnesota. The content of the courses, specifics of group organization, authentic data issues, and the products of project work are discussed. Four examples of student projects are considered. Two of these projects were carried out for external community partners and two for community partners found inside the university. These examples serve to illustrate community involvement and community-oriented learning experienced in the statistics classroom.

"Using magic in the teaching of probability and statistics "

by Lawrence M. Lesser & Mark E. Glickman
Volume 4, Number 4 (2009)
http://iospress.metapress.com/content/j730w4777h667125/fulltext.pdf
***Abstract*:** This paper explores the role magic tricks can play in the teaching of probability and statistics, especially for lectures in college courses. Demonstrations are described that illustrate a variety of probabilistic and statistical topics, including basic probability and combinatorics, probability and sampling distributions, hypothesis testing, and advanced topics such as Markov chains and Bayes' Theorem. In addition to magic tricks providing visual demonstrations to supplement traditional blackboard-based lectures and the opportunity to engage students in class-participatory activities, possible benefits include a focus on conceptual understanding, development of critical thinking, and an opportunity to reflect upon the role of assumptions and estimates of probabilities.

"How art helps to understand statistics"

by Stan Lipovetsky & Igor Mandel
Volume 4, Number 4 (2009)
http://iospress.metapress.com/content/06824537m5t3r3q4/fulltext.pdf
***Abstract*:** This article demonstrates that art may inspire statistical thinking in many ways, providing aesthetic pleasure, scientific enlightenment, and humorous excitement. Art can serve as a fine tool for educational purposes in statistics, presenting explicit illustrations of statistical concepts. The role of statisticians here is to find a hidden meaning of a masterpiece and to interpret it for students. This work gives some examples of such an interpretation of painting from a statistical perspective.
