Talks in Order

Title: GAISE 2016 in Action

Author and Affiliation: Beverly Wood, Embry-Riddle Aeronautical University

Email: [Beverly.Wood@erau.edu](mailto:Beverly.Wood@erau.edu)

Abstract: A brief overview of the updated GAISE College Report followed by the results from a mixed method study of instructor experiences with implementation in various classroom environments.  Survey and interview data about the awareness of and implementation efforts made by instructors since the American Statistical Association's endorsement of the revised College Report in July 2016.  New and experienced instructors from two-year, four-year, and graduate level institutions were included in the study. Particular attention was paid to the new emphasis on multivariable thinking.

Title: How Technology Facilitates Modernizing Intro Stats

Author and Affiliation: Patti Frazer Lock, St. Lawrence University

Email: [plock@stlawu.edu](mailto:plock@stlawu.edu)

Abstract: Technology can dramatically change how and what we teach in Introductory Statistics.  Some traditional topics may be no longer necessary or relevant, while other topics that used to be inaccessible in an introductory course are now easily accessible and increasingly important.  We discuss what might be in, what might be out, and how making this switch to a technology-rich course can dramatically increase student engagement and student success.

Title: Statistical inference via data science: A "tidy" approach

Author and Affiliation: Albert Y. Kim, Smith College

Email: [akim04@smith.edu](mailto:akim04@smith.edu)

Abstract: We present a pathway for students to learn statistical inference using data science tools widely used in industry, academia, and government. We first introduce the tidyverse suite of R packages, including the ggplot2 package for data visualization, and the dplyr package for data wrangling. After equipping students with just enough of these data science tools to perform effective exploratory data analysis, we cover traditional introductory statistics topics like 1) multiple regression modeling and 2) confidence intervals and hypothesis testing using simulation-based inference. This approach centers on the use of data visualization and real-world multivariate datasets all throughout.

Title: Stats for Data Science

Author and Affiliation: Daniel Kaplan, Macalester College

Email: [kaplan@macalester.edu](mailto:kaplan@macalester.edu)

Abstract (2 paragraphs if possible, otherwise can combine): The canonical topics of college-level statistics are not the result of thoughtful examination of conceptual roots of the field. They are historically contingent, reflecting the needs, resources, and understanding of the era in which they were developed. Almost all of the topics of introductory statistics stem from the period from 1830 to 1925.  They reflect the establishment of sociology, early genetics, and experiments on the bench-top or in agricultural field stations. Methods were tailored to very small amounts of data and calculation by hand.

Needless to say, needs and opportunities are different today. Data are abundant and multivariate; hypotheses are investigated by the dozens (nutrition research) or hundreds of thousands (genomics); an underlying methodology is machine learning; data are used to inform decisions, necessitating responsible inference about causation by adjusting for covariates. This new situation has resulted in a merging of components of computer science and statistics into "data science." In my presentation, I'll examine the appropriate statistical underpinnings for a meaningful engagement with data science, pointing out how they differ and sometimes contradict the topics of the century-old canon.

Title: The p-value: Replacing 0.05 with Understanding

Author and Affiliation: Kari Lock Morgan, Pennsylvania State University

Email: [klm47@psu.edu](mailto:klm47@psu.edu)

Abstract: The American Statistical Association’s 2016 P-Value Statement and The American Statistician’s 2019 Special Issue “Statistical Inference in the 21st Century: A World Beyond p < 0.05” both provide a call for action and dramatic change regarding how p-values are taught and used.   In particular, they discourage the focus on whether a p-value is less than a specific threshold (e.g. 0.05), and encourage a better understanding of what the p-value actually represents.  This talk will discuss ways to replace “p < 0.05” with conceptual understanding of a p-value in introductory statistics courses.

Title: Conceptual approaches to teaching multivariable statistical thinking: Using simulation methods and visualization

Author and Affiliation: Beth Chance (Cal Poly – San Luis Obispo) and Nathan Tintle (Dordt College)

Email: [bchance@calpoly.edu](mailto:bchance@calpoly.edu), [nathan.tintle@dordt.edu](mailto:nathan.tintle@dordt.edu)

Abstract: Use of simulations to motivate and improve student understanding of formal inference procedures has shown promising results.  In particular, students can more quickly focus on the entire statistical investigation process by leveraging tactile experiences, a conceptual focus that stays close to real data, and visualizing the simulation process.  However, additional topics and concepts are also important. In particular, multivariable thinking continues to grow in importance as a fundamental part of a student’s statistical training. In this presentation, we will share ideas for using simulation methods and visualization techniques in order to explore multivariable reasoning (e.g., randomized block designs, interactions, conditional associations) with students in first and second algebra-based statistics courses.