

We Need to Rethink the Way We Teach Statistics at K–12

Response to “Mere Renovation is Too Little Too Late: We Need to Rethink the Undergraduate Curriculum from the Ground Up”

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Kudos to George Cobb for again writing an elegant, visionary, and timely article about teaching our field of Statistics as we move forward in the 21st century—I support George’s core beliefs as to where we need to advance as statistics educators. I would like to offer the following thoughts coming from two perspectives: one as faculty in a large university statistics department and as one involved with promoting the integration of statistics at the K–12 school level.

One statement stood out for me in this article: “In our profession as we practice it, we wait to learn what we need to know until we need to know it, and we focus our learning on what we need to know. Why shouldn’t the ways we teach our subject follow the approach we use in practice?” At UGA, from my perspective as undergraduate coordinator, I have observed the legitimacy of this quote with the success of our two semester Capstone course for statistics undergraduate majors. You can read more about this course in *The American Statistician* article, “A Capstone Course for Undergraduate Statistics Major” (Lazar et al., 2011). During the exit interviews with our graduating students, it is this one course that students most often identify as having the biggest impact on their learning of statistics. They spend a year practicing statistics with a client. They learn such attributes as how to deal with messy data, new computing and database skills, new statistical techniques not in the standard statistics courses, soft skills of writing reports, conversing with clients who don’t necessarily have a statistics background, and presenting their projects as posters to the statistics faculty. After graduating, the students frequently communicate with the department that the Capstone course has helped them most with their careers. This is not to say the students don’t need understanding of core statistical concepts taught in standard classroom courses—our goal as statisticians needs to be identifying those concepts for helping students develop sound statistical reasoning skills. This development should begin at the school level, not post secondary. This leads me to my second perspective.

With the implementation of the Common Core Mathematics State Standards in the U.S. that includes statistics at grades 6–12, we are at a crossroads where we have the opportunity to embrace letting young students explore and take ownership of the wealth of data that surrounds them and that they help generate—with technology young students can explore data visually, learn at an early age database management skills, utilize

programming skills, use simulation for modeling, and appreciate the way data impacts their lives. With the accessibility of data, formal inference is often not applicable although much emphasis is still placed on inference in our current teaching. There is so much to be learned from simply exploring the data and telling a story. I would like to advocate that we work toward implementing many of George’s suggestions at the school level and not waiting until the university level. The field of Computer Science is showing innovation with the new Advanced Placement Course, Computer Science Principles—a course that introduces students to such topics as programming, abstractions, algorithms, and large data sets to address real-world problems. We as statisticians need to follow the lead of Computer Science. I observed first hand the first 6 months of 2015 how New Zealand is attempting to implement a school level curriculum where students explore real world data using technology to carry out the statistical investigative process and letting the data tell an informative story.

The two biggest challenges I see regarding George’s suggestions are building a culture that advocates this as the direction we should travel and the teacher preparation needed (both at the school level and the post secondary level). Even well respected statisticians don’t necessarily want to change the way they teach or what has always been the traditional mathematical based curriculum. Moving the teachers to empower a new culture of teaching statistics has been advocated for at least 50 years, since the championing of exploratory data analysis by John Tukey. We are still struggling to simply teach statistical topics that are more real world and conceptually based versus the more procedural mathematical statistics. Fortunately, the American Statistical Association has one of its priorities teacher preparation at K–16.

References

- Cobb, G. W. (2015), “Mere Renovation is Too Little Too Late: We Need to Rethink Our Undergraduate Curriculum from the Ground Up,” *The American Statistician*, 69(4), doi:10.1080/00031305.2015.1093029.
- Lazar, N. A. Reeves, J., and Franklin, C. (2011), “A Capstone Course for Undergraduate Statistics Majors,” *The American Statistician*, 65, 183–189, DOI: 10.1198/tast.2011.10240.

Online discussion of “Mere Renovation is Too Little Too Late: We Need to Rethink Our Undergraduate Curriculum From the Ground Up,” by George Cobb, *The American Statistician*, 69. Christine Franklin, University of Georgia, Athens GA (Email: codycory@uga.edu).