MEET A MEMBER

Stacey Hancock

We have members involved in many MAA programs, SIGMAAs, and professional development opportunities. This column lets us get to know them a little better.

What is your current job and how long have you been there?

I joined the statistics faculty as an assistant professor at Montana State University, Bozeman, in fall 2016. The primary reason for my move to MSU was to help implement our new statistics education option in the PhD statistics program; returning to my home state was an added bonus. Prior to my appointment at MSU, most recently, I was an assistant teaching professor in the Department of Statistics at University of California, Irvine, where I helped develop and implement a bachelor of science in data science.

How long have you been an MAA member, and why did you initially join?

I have been an MAA member since 2001, the year I graduated with my bachelor of science in mathematics and music from Concordia College in Moorhead, Minnesota. The Concordia Mathematics Department awarded MAA memberships to promising graduating seniors, and I have been a member ever since. I went to graduate school in statistics and learned about the American Statistical Association soon after; I am grateful for Concordia's award, since without it, I might never have joined the MAA.

What has kept you an MAA member since then?

The Special Interest Group in Statistics Education (SIGMAA Stat-Ed) has been my primary draw to the MAA since I joined in 2001. The SIGMAA Stat-Ed, in conjunction with the Consortium for the Advancement of Undergraduate Statistics Education (CAUSE), sponsors free workshops preceding each Joint Mathematics Meetings on innovative methods for teaching statistics. In 2008, during my last year of graduate school, I participated in Allan Rossman, Beth Chance, George Cobb, and John Holcomb's workshop "Introducing Concepts of Statistical Inference" at the JMM. (Little did I know at the time just how big these names were in the statistics education community!) It was at this workshop that I learned about the simulation-based curriculum for the introductory statistics course, a curriculum that we have adopted at Montana State.

One of the SIGMAA Stat-Ed roles is to reach out to "isolated statisticians"—sole statisticians housed in mathematics departments. I started my career as a visiting assistant professor at Reed College, a highly selective small liberal arts college in Portland, Oregon. In my first year at Reed College, I participated in a CAUSE/MAA workshop on "Teaching Introductory Data Analysis Through Modeling" by Daniel Kaplan and Vittorio Addona at the 2009 JMM. This workshop inspired me to adopt Daniel Kaplan's textbook *Statistical Modeling: A Fresh Approach* for the introductory statistics course at Reed. Since then, modeling has only become more prominent in the mathematics and statistics education research literature; in fact, the theme of the most recent International Research Forum on Statistical Reasoning, Thinking and Literacy (New Zealand, July 2017) was "Innovations in Statistical Modelling to Connect Data, Chance and Context."

The welcoming community of statisticians and mathematicians that make up the membership base of the SIGMAA Stat-Ed is what has kept me an MAA member throughout the years. I started attending the SIGMAA Stat-Ed JMM business meetings and soon found myself treasurer of the SIGMAA in 2014. Treasurer led to chair-elect, and this year I am serving as chair of the SIGMAA. I am excited that I am now in a position to help organize the JMM workshops and sessions that inspired me when I was starting out in my career, and to help promote increased understanding and effective teaching and learning of statistics.

Describe the MAA in four words.

Inspiring, innovative, quantitative, community.

What are you working on?

My primary research focus is in statistics education, with branches in data science education and, more generally, STEM education. Much

of my statistics education research has focused on student understanding of sampling distributions in the introductory course. Sampling distributions are probability distributions of sample statistics—they describe what we would expect in the behavior of, say, a sample mean, if we were to collect many samples of data. Sampling distributions are notoriously difficult for students to grasp since they involve synthesizing several basic statistical concepts across different levels. In particular, I have studied how students use language, specifically metaphors and metonymies, when learning sampling distributions, and how these metaphors or metonymies help or hinder their learning. I am designing a future study to compare the language of sampling distributions across introductory statistics students, upper-level statistics undergraduate and graduate students, statistics faculty, and professional statisticians.

My work on developing and implementing the data science major at UC–Irvine drew me into the world of data science curriculum development. As the fields of statistics, mathematics, and computer science work together to embrace the new field of data science, I have become passionate about promoting an interdisciplinary perspective to data science curriculum development. Most recently, I chaired a review group for the American Statistical Association to provide feedback to the National Academies of Sciences, Engineering, and Medicine on its interim report, *Envisioning the Data Science Discipline: The Undergraduate Perspective*.

One of my current projects I am most excited about is an interdisciplinary project to use storytelling—an important part of First Nations tradition—to bring computational thinking to First Nation and rural students in Montana. In 1999, Montana passed the Indian Education for All (IEFA) Act, which states that "every Montanan, whether Indian or non-Indian, be encouraged to learn about the distinct and unique heritage of American Indians in a culturally responsive manner."

The storytelling project, an NSF Innovative Technology Experiences for Students and Teachers (ITEST) grant (PI Brittany Fasy, co-PIs Barbara Komlos, Sweeney Windchief, Mike Wittie, and myself), will develop and implement middle school lesson plans that infuse computer science through culturally responsive storytelling into the middle school curriculum within the framework of IEFA and the Montana K–12 Content Standards.

The lesson plans will use Alice, a graphical computer program that allows students to animate objects in a virtual world by dragging and dropping lines of code into the environment. The primary goal of the project is to make computational thinking and programming more accessible to students at an earlier age in a way that is relevant to their lived experiences and to attract more First Nations and rural students to computer science and STEM disciplines.

What would you like to see from MAA in its second century?

Although education and public appreciation are already core interests of the MAA, improving quantitative literacy and promoting an appreciation for how mathematics and statistics can help us understand and improve our society has never been more crucial. In a casual stroll across news sites and social media, it is not hard to find data visualizations or statistics that are misinterpreted by the public—correlations implying causation, biased samples being generalized to a larger group, or risks misinterpreted by neglecting the base rate.

Along with a general misunderstanding of data and statistics, our society often suffers from what some call "big data hubris," the belief that big data is better data, and that with enough data, we do not need traditional data collection and analysis methods. Additionally, we tend to believe that mathematical and statistical models are objective and unbiased; a dangerous belief when these models are developed by humans, may be based on biased data, and can have wide-reaching societal consequences. The Google Flu Trends' overprediction of influenza rates, or the controversy around predictive policing—using data to predict crime before it occurs—are two cautionary examples.

The MAA is in a unique position to provide outreach and education to help improve our ability to understand and interpret quantitative information. Outreach may include online tutorials on topics such as "interpreting statistics in the news," "ethical dilemmas with data," "best practices for data visualization," or "what exactly *is* a *p*-value?"

The MAA could facilitate training for practicing mathematicians and statisticians on how to communicate with the media and advance quantitative literacy. In an era where technology enables us to access a myriad of information instantaneously, this kind of education and outreach would prove invaluable. ■