Interview With Soma Roy

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Beginnings

AR: Thanks very much for agreeing to this interview, Soma, and congratulations on your new role as editor of the Journal of Statistics Education. Let’s start when you were 18 years old, which is less long ago for you than for most of my other interview subjects. Where were you, and what were you studying at that point?

SR: Thanks, Allan! I am very honored and excited to have been chosen for the position of editor for JSE! And, also for having been chosen to do this interview! (You can tell how excited by the frequent use of exclamation marks!)

The year I turned 18 was the year I started college. As you know, I was born and raised in India. In the Indian education system, students take what are called “board exams” at the end of the 12th year of school (called “12th standard”). After having taken said exams, and while waiting for my scores, I spent some time researching undergraduate programs and colleges. In India you are required to apply to a specific major, so I had to decide on one specific area of interest that I wanted to pursue. However, being only eighteen and having seen very little of the world, it was a difficult decision to arrive at, at the time. I knew I liked working with numbers, but I also liked writing—could I work with numbers and then write the story that the numbers told? Was that what statistics would help me do? Well, there was only one way to find out. Luckily for me, my college of choice, Lady Shri Ram College for Women, New Delhi, has an undergraduate program in statistics, and they were happy with my scores and my interview. So I traveled about 700 miles from home to go to college, and began my statistics journey.

AR: Please tell us about your undergraduate coursework in statistics: What topics/methods did you learn? And were you satisfied in your goal of working with numbers and writing about the story they told?

SR: One thing that I remember being quite unusual about my undergraduate experience was that unlike other programs, the statistics program required only mathematics, statistics, and a few computing courses, no general education courses. In the first year, we had a required English literature course, but that was it. The courses were all year-long courses. In the first year, about half of them were math courses (such as, real analysis, linear algebra, abstract algebra) and about half were introductory statistics courses with the content being much like that of STAT 1 and STAT 2 courses here in the United States. In the second year, we took core statistics classes such as probability theory, sampling theory, design of experiments, applied statistics (similar to a regression class), and introduction to computing. Computing was in FORTRAN! And, we also learned some LOTUS 1–2–3! Haven’t seen it since. In the third year, all the advanced courses looked at statistical applications, such as econometrics, biostatistics and epidemiology, statistical quality control, and operations research. It was (as is typical of many undergraduate programs in India) a three-year program. Although at the end of the three years, I felt like I knew a lot more about working with numbers and writing about them than I had on day one, it also felt like we had only scratched the surface and I didn’t know nearly enough. I still had many questions about how and why things worked the way they did. So, while my choice of major seemed justified, I wasn’t satisfied with what I knew.

AR: Before I ask the obvious follow-up question: You mentioned an English literature course. When did you first study English? Were you fluent in English when you got to college? Were any/some/all of your courses taught in English?

SR: English is a pretty common language of instruction in Indian schools, especially in urban areas. I started studying English in pre-school or what we called “nursery” school. And, English was the language of instruction throughout my K–12 experience. So, I think I was quite fluent in English by the time
I got to college. And, all classes were taught in English in college. I think the reason for that English literature course in college was to ensure that the students who were from non-English language backgrounds got some practice with the language, in non-statistical contexts.

**Graduate Study**

AR: And now the obvious follow-up question that I passed on earlier: Let me make a wild guess that when you finished your undergraduate degree unsatisfied with what you knew, you decided to pursue graduate study in Statistics. I know that you came to the Ohio State University in the United States, so my questions are: Did you make that move immediately after finishing your undergraduate study? Why did you decide to come to the United States?

SR: Good guess! Yes, after I finished my undergraduate degree, for a while I considered getting an MBA, but then decided to try for a PhD in Statistics. I had heard good things (mostly from friends of friends, and relatives) about the higher education system in the U.S.—about how much more hands-on the classes are, how much more experience you get grappling with real data and working on research projects. But, because my undergraduate program was a three-year program, I had 15 years of education and not 16—which is what you are required to have to apply to a graduate program in the United States. (It is possible that this requirement has now changed.) I needed to get at least another year of formal education. So, I went off to get a Master’s degree in Statistics at Delhi University (a two-year program), and after having completed that I made my way to The Ohio State University.

AR: Did your experience at Ohio State convince you that the good things you heard were true?

SR: Yes, absolutely! My experience at Ohio State was very different from my undergraduate or previous graduate experience. It seemed like for the first time I was beginning to connect the dots between all the different concepts and methods I had been learning. This might be partly due to the fact that I was older and wiser (hopefully) than I was in my undergraduate years, and that I was revisiting some of the material. There were also a lot more opportunities to work on projects as a research assistant, as well opportunities to teach my own classes. These opportunities were invaluable.

**Interest in Teaching**

AR: Ah, there’s the first mention of teaching in this interview. Did you do any teaching in India before getting to Ohio State? Where, when, and how did your interest in teaching emerge?

SR: You know the question, “What do you want to be when you grow up?”—as far as I remember most of the time my answer was “teacher”; I think the second most common answer was doctor. When I was in elementary school, my favorite afterschool game involved pretending that our living room was a classroom, the different pieces of furniture were students, and the doors and walls (yikes!) were chalkboards. Perhaps because I liked my school and my teachers, I had good role models to emulate when playing this game and why this game was so much fun for me. Of course, unlike my teachers I never had any discipline issues with my “students.” However, it was not until my high school years that I had my first opportunity to teach real students. During those years and while I was in college, teaching comprised tutoring middle school and high school students, mostly in the science subjects—mathematics, physics, chemistry, and biology. I don’t quite remember exactly how I started with the tutoring but I am pretty sure it had something to do with the fact that my mom taught art to kids, and that inspired me to try teaching something I was interested in.

My first classroom teaching experience happened years later, at Ohio State.

AR: Did you start off as a teaching assistant at Ohio State? What kind of course was it, and what preparation did you receive for the job?

SR: Yes, I did start off as a teaching assistant, for an algebra-based introductory statistics course (STAT 145). Ohio State used to be on quarters then, and students had lectures three days a week, and recitation two days a week. Dr Jackie Miller was the instructor (for the lecture sessions), and I, like many other graduate students, was a recitation “instructor.”

Now about the preparation for the job—all graduate students had the opportunity to take a Teaching Statistics class in their first year, which involved reading papers about teaching statistics, observing senior TAs’ classes, and doing presentations/teaching demos. Also, during the quarters we were TAing, all TAs for a course met weekly as a group with the course coordinator to go over plans for the week. At these meetings, we would discuss what topics would be covered in lecture that week, and also received examples of activities and exercises we could go over in recitation. As TAs, we did have a lot of freedom as to exactly what activities we did in recitation, as long as we were covering the intended material.

AR: How did your teaching style evolve as a TA? Did you come to teach your own courses at Ohio State?

SR: Yes, after a few quarters of being a recitation instructor, I was offered the opportunity to teach my own section. During the regular school year, this was usually the evening section, and I got to coordinate lecture materials with the other instructors. During summers, I was the sole instructor, and was responsible for writing my own syllabus, lecture materials, assignments, quizzes, and exams, and coordinating TAs and recitations. I also had the opportunity to TA for and instruct not only the algebra-based introductory statistics course, but also an introductory statistics course for engineers, and a mathematical statistics sequence of two courses.

As I mentioned earlier, I started out as a recitation instructor, and boy, that first quarter was rough! I had never taught in a classroom before, let alone in a different country! But, I learned so much about teaching statistics, and teaching, in general! I think the classroom teaching experience that quarter was the very best kind of training I could have asked for to prepare me for the years to come! That first quarter as I tried to figure things out, I didn’t spend much time creating my own materials – I just used what was suggested to TAs at the weekly meetings. But, after that first quarter, when I was on better footing, I started experimenting with the flow of the materials, the
content of activities, the questions posed, etc., to figure out what my style was.

Over the course of almost five years of teaching, I got to try out different strategies to teach concepts and methods. As a recitation instructor, most of the time I did examples and activities to reinforce what students were learning in class. When I started teaching my own classes, I stuck to the example-based approach, where concepts were motivated via examples and context. Most of the time classes were large (with 70 or more students) which made it challenging to do student-data-based activities, but I chose examples that I thought were relevant to the students’ interests and majors, and also conducive to get input and discussion from the students. Within the constraints of class size, I tried to make class as interactive as possible.

**Start of Academic Career**

AR: When you were finishing your dissertation and entering the job market, had you decided on a teaching-oriented position, or were you also considering academic positions with a research focus or industry positions as well?

SR: This is an easy one! I knew that I definitely wanted an academic position. And, particularly, I wanted a position in a school where teaching was valued, so I didn’t apply for any industry jobs, only to academic positions that described teaching as one of the key components of the position.

AR: How did your teaching style/approach/philosophy (choose your favorite noun there) evolve during your first few years at Cal Poly?

SR: I think my teaching philosophy has stayed more or less the same in that my goal is still to help students learn how to learn, but over the years there are several aspects of my teaching approach that have changed. Now I do much more in terms of guided discovery-based learning. For example, in my intro statistics courses (algebra-based as well as calculus-based), about 50% of class periods are allocated for “labs” during which students work their way through guided activities which have several goals—reinforcement of previously learned material, introduction to new concepts and methods, and working with statistical applets and software. Perhaps much of this change can be attributed to the fact that the smaller class sizes (of about 35) make them more conducive to such activities, and also to the fact that in comparison to when I was a grad student, teaching and research are now what I work on full time. Now I have a lot more time to reflect on my teaching, as well as share ideas with my wonderful colleagues. I do, however, still use examples to motivate concepts and methods like I used to before.

Another aspect of my teaching that has evolved is that now I am more fearless about having higher expectations of my students. I think if I make it clear to them on day one that I do expect them to put in quality time in class and outside, on learning course materials, and that I have high expectations of them because I believe they are capable of meeting them, students are more willing to rise to the occasion and meet those expectations.

AR: Have you encountered much pushback from students to your newfound fearlessness? How do you respond to student complaints about workload or expectations, or do you not receive such complaints? Have your student evaluations declined at all in light of higher expectations?

SR: Initially, yes, I did get some complaints along the lines of about how much more I was asking of them than they expected from a general education class. But, over time, I have learned that students react well when they understand the reasoning behind the expectations. So, starting on day one, I explain what the objectives of the various assignments are, and how I think that will help them in the long run. Of course, the expectations do need to be realistic as well. For example, I have to keep in mind that my course is not the only one that the typical student is taking that quarter. So, I make sure that the estimated time required to complete any assignment is within reason. Also, I have to be mindful that the assignments are structured well—that students have ample amount of guidance on how to go about an assignment. With regard to assessments, I often include one question on each exam that requires them to think outside the box, but I make these medium to low stakes.

Not that I have run any formal data analysis, but from a glance at student evaluations, I do not think that I have seen any dips (significant or not) that I would attribute to me having higher expectations of students than I used to.

**Simulation-Based Inference**

AR: You’ve also become involved with the group led by Nathan Tintle that has received multiple grants for developing a curriculum and conducting research into teaching introductory statistics with simulation-based inference. What’s been the impact of this work on your teaching?

SR: Working on these projects has led to major changes in how I teach introductory statistics now. Before I started working on developing curricular materials with a focus on simulation-based inference, I used a very “traditional” sequence of topics: I started with descriptive statistics, followed by data collection methods, probability, normal distribution and sampling distribution, and wrapping up with statistical inference in one variable and two variables contexts. And, I found myself constantly struggling with trying to squeeze all the required material into the 10 weeks of classes that a quarter gives you, and with how the topics/sections seemed compartmentalized and disconnected. Also, I found it unfair to students to introduce the hardest part—statistical inference—at the tail end of the course, and then expect them to actually learn the material in such a short time and demonstrate a strong understanding on the final exam. Much of my struggle with timing and sequencing had to do with the fact that in the “traditional” approach, inference builds on probability theory and the concept of the normal distribution. In contrast, simulation-based inference doesn’t require any formal discussion of probability, and I can now start with inference on day one, and introduce topics like descriptive statistics and data collection methods as needed as we go. This takes care of my previous frustration with the apparent disconnect between topics, as well as with putting inference at the end of course. And, to some extent this also helps me be more efficient time-wise, because once students get a grasp of the fundamental concepts of inference, going
through inference procedures in various data contexts goes pretty quickly as the quarter progresses.

AR: For readers who might be less familiar with simulation-based inference, please describe how you manage to start teaching statistical inference on day one of a typical introductory course.

SR: As I have mentioned before, I motivate concepts and methods via examples and studies. So, let me present here an example I do in class on day one, to motivate statistical inference.

Last October (2015), there was a story in *USA Today* about a study conducted by researchers at Edinburgh University to investigate the claim by a woman that she could smell Parkinson’s disease. The researchers recruited six people with Parkinson’s disease and six without, had each of them wear a t-shirt for a day, bagged the shirts, and then had the lady smell them. She could correctly tell for 11 of the 12 shirts whether the wearer had Parkinson’s disease.

At this point, I ask students what they think are two possible explanations for why she got 11 correct answers out of 12, and they are pretty good at suggesting that either (1) she could have been just guessing, and got lucky, or (2) she has some ability that helps her do better than just guess. We discuss strategies for investigating which of the two of the explanations is a better explanation for the data, and very quickly arrive at coin tossing being a good mechanism to simulate what kinds of results we could expect to have happened if she were just guessing. Each student then tosses a coin 12 times, records the number of heads (that is, correct answers), and we combine the class results on the chalkboard to obtain the distribution of what the number of correct answers could have been by chance alone (just guessing). Of course, you and I recognize that this distribution is a simulation-based null distribution of our statistic of interest, the number of correct answers, but I save the technical terms like null, statistic, and so on, for later in the week. We do get into what this distribution tells us about the rarity of 11 correct answers happening by just guessing, and how this investigative process helps us infer something about this lady’s claim of an ability to smell Parkinson’s disease based on the data from the 12 trials.

As you can see, the discussion above relies on neither a formal discussion of probability nor of normal distribution, but allows me introduce statistical inference on day one by just using the idea of coin tossing.

For readers who are interested in reading more the simulation-based inference approach, I recommend visiting the Simulation-Based Inference blog (www.causeweb.org/sbi), which has several posts by many different statistics educators on various aspects of teaching simulation-based inference.

**JSE Editorship**

AR: What sparked your interest in becoming JSE editor?

SR: I was wondering at what point you would ask me this. My first contact with *JSE* was in my first quarter in grad school at Ohio State, when I was in the Teaching Statistics class. One of the assignments was to read a paper about teaching statistics and write a report. Having never before read papers about teaching statistics, I followed the lead provided by the instructors (Roger Woodard and Jackie Miller) and discovered *JSE*! I was amazed at how much people had already researched and written about. Right before I graduated, I got to review my first *JSE* paper, and realized that being a reviewer was very beneficial to me because it helped me learn so much more about what kind of research people were engaged in. After I had been serving as reviewer for a few years, Michelle Everson asked if I’d like to serve as an Associate Editor (AE), which of course, was an offer I couldn’t refuse. Then, in mid-2014, the position of editor for the Datasets and Stories section of *JSE* became available, and I applied for it, and was selected to serve. Being in these positions gave me more of what I experienced as a reviewer. So, when the *JSE* editor position was announced I was immediately interested, but it was Michelle’s encouragement that actually made me submit an application.

AR: Are there any changes that you would like to implement for *JSE*?

SR: I think *JSE* is doing very well. The published articles cover a wide variety of topics from ideas on how to teach certain topics in introductory to secondary to tertiary statistics classes, to results from classroom experiments, to preparing future statistics teachers. My main goal is to uphold the high and rigorous standards established by the past and present editorial board to make sure that *JSE* continues to publish only high-quality articles. So, the things I have in mind for *JSE* are not necessarily changes, but more like additions. I would like to start the tradition of having special topics columns, as well as special issues. I have a few topics in mind, and I have a few suggestions that I have received from various members on the editorial board.

AR: I’m glad you mentioned additions rather than subtractions, so I’ll take that to mean that I won’t be fired soon from conducting this interview series. Are you going to remain mum about specifics for the special topics and columns and issues, or would you like to drop some teasers now?

SR: Alright, alright, I’ll drop some teasers for now, but there is a lot of planning to be done before we can roll out any final topics and dates. The topics for special columns up for discussion are teaching topics in health statistics, causal inference, statistics education in various parts of the world, to name a few. For the special issues, the topics to consider are the new and updated GAISE report guidelines and implications, implications of Common Core on the college level introductory statistics courses, to name a couple.

**Pop Quiz**

AR: Now I’ll ask a series of short questions for which I’ll ask that you keep your responses brief. First, what are some of your hobbies outside of statistics and education?

SR: Hobbies? Are those things that you pursue in your "spare time"? Just kidding! I do know what hobbies are, but it seems that "spare time" has become quite a precious commodity these days. When I do manage to come by it or make it happen, I like to read, watch movies or TV shows, and meet up with friends. Living in beautiful San Luis Obispo also gives my
husband and me many opportunities to go on hikes, picnics, and walks along the beach. We also enjoy putting together jigsaw puzzles, and playing board games with our friends. Some of our favorite board games are: Arkham Horror, Pandemic, Dominion, Carcassone, and Settlers of Catan.

AR: What are some books that you’ve read or movies that you’ve watched recently?

SR: Books I read recently and am currently reading: The Lady Tasting Tea by David Salsburg, and Thinking: Fast and Slow by David Kahneman. I should also add to this list a slightly shorter book: Click Clack Moo by Doreen Cronin. The movie I watched most recently is The Man Who Knew Infinity.

AR: Speaking of books, please tell us about the quote at the bottom of your email signature file.

SR: That is a nice quote, isn’t it! A few years ago I was looking for a children’s book to gift to a friend’s daughter when I came upon The Phantom Tollbooth by Norton Juster. Somehow, I had managed to have never read it before, and after reading a couple of pages, I had to buy a copy for myself. (My friend’s daughter ended up choosing “We are in a book!” by Mo Willems—another really fun book.) Back to The Phantom Tollbooth—it is a wonderful book about a young boy who discovers a love of learning. There are many wonderful lines in the book, but two favorites that I use in all my syllabi are as follows: “…for whenever you learn something new, the whole world becomes that much richer.” And, “…but it’s not just learning that’s important. It’s learning what to do with what you learn and learning why you learn at all that matters.”

Isn’t it a wonderful idea that when we gain knowledge, everyone around us stands to gain, too! But, there’s not much to just learning and not knowing why we learned or what to do with it—we need to be able to apply what we learn!

AR: Yes indeed. Let me ask about travel spots: What has been your favorite conference city and your favorite vacation spot?

SR: So far my favorite conference city has been Seattle. As for favorite vacation spot, if camping counts, then Yosemite!

AR: Next I will ask some questions that I have used to collect data from students. Let’s start with some binary variables: Do you use a PC or Mac? Do you consider yourself an early bird or a night owl? Do you prefer window or aisle?

SR: Actually, I use both a PC and a Mac! I used to be a night owl when I was in college and graduate school, but now definitely am an early bird. And, window seat – makes it so much easier to sleep.

AR: I wonder if your “early bird” answer is a result of your mean department chair (who is also conducting this interview) assigning you so many morning classes! Now a nonbinary categorical variable: On what day of the week were you born? (You can use www.timeanddate.com to produce a calendar for your birth year.)

SR: I was born on a Monday. And, about me being an early bird now, I think my department chair gets credit for helping me rediscover my early birdness. I used to be one before college.

AR: What is your favorite vacation spot, if camping counts, then Yosemite!

SR: 7, that is, all of them!

AR: Now for a continuous quantitative variable: How many miles do you live today from where you were born? (You can use www.distanefromtheshome.net to calculate this distance.)

SR: 8063.83 miles (based on the Rhumb line measure.)

AR: Here’s another question that is completely hypothetical: Suppose that travel was possible, and you could take one trip. You can only observe, not change anything, when you get there. Would you travel to a time in the past or in the future? What time would that be? Explain your choice.

SR: I would like to travel to the past to when my mom was a young girl. All I have ever known her as is my mother. I would like to know what her life was like before she became a wife, and a mother.

AR: Here’s another question that is completely hypothetical: Suppose that you are offered dinner for four anywhere in the world, with the understanding that the conversation will focus on statistics education. Who would you invite, and where would you go?

SR: I am fortunate to work with some great statistics education folk here in my department as well as at other schools, and periodically have opportunities to have dinner with them. So, for this question, I’ll choose people whom I have less access to, but with whom I think it would be great to chat about statistics, education, and statistics education. My first pick for this fantasy panel would be Hans Rosling—he has done some amazing things with Gapminder and his talks about statistics are always entertaining, informative, and accessible to all! My second pick would be Nate Silver—his contribution towards making nonstatisticians realize the value of statistics in recent times is commendable. And, my third pick would be Jake Porway—I first read about his DataKind project on thisisstatistics.org. His project connects data scientists with not-for-profit organizations that need statistical consulting to help work towards social change. I admire his efforts towards using statistics for the greater common good.

Where to go? Somewhere with good seafood, perhaps. I have never been to the New England area—so maybe somewhere in New England. Or, if this dinner is sometime during winter, I wouldn’t mind taking these folks to India because Indian cuisine is still my favorite. Interesting trivia I learned from a TED talk a few months ago—Hans Rosling used to be a student at a medical college in India.

AR: Can you identify something about yourself that is likely to come as a surprise to JSE readers.

SR: I have yet to watch the movie The Godfather. I have read the book, though.

AR: Please tell us about your family.

SR: Interesting that you would make the segue to my family after I mentioned The Godfather! I come from a small family—just my parents, my brother, and I. My parents, however, each come from pretty large families. My father is the second eldest of four children, and my mother is the eldest of seven. My father is a mechanical
engineer by training, and worked for Tata Steel all his life before retiring five years ago. Now he spends most of his time watching the news and watching cricket (the sport, not the insect) on TV; there’s always cricket on TV in India. My mother is a biologist by training (more botany than zoology though), and an artist. She is great at handicrafts, and is always working on some art piece or other. My brother is an artist, too, but only in his spare time, which has he very little of, because he is a medical doctor by profession. Between shifts at the hospital, he likes to play the keyboard, and paint. My parents and brother live in Kolkata, India.

Here in San Luis Obispo, I live with my husband who is a faculty member in the Mathematics Department at Cal Poly. He grew up in Albuquerque and got his PhD in mathematics from Columbia University. His work is in the area of complex geometry, and my understanding of the area is that it has something to with classifying donuts (more formally known as tori). Mmm… donuts… Besides mathematics, his interests are running, playing chess, watching sports and movies, reading, and following politics, to name a few. We love working on crossword puzzles together, and we do the New York Times crossword puzzle daily.

More on Teaching

AR: What is your favorite course to teach?

SR: That would have to be the algebra-based introductory statistics course. I like that the crowd needs lots of convincing that statistics can be interesting, fun, and relevant to their majors. When students who were skeptical at the beginning of the course start telling me how this statistics class was helping them in their research methods major course, and then leave the course expressing how much they enjoyed statistics and how much value they saw in what they had learned, it makes me really happy.

AR: I was planning to ask about the most rewarding aspect of teaching that course, but you have already answered that convincingly. So, let me ask you to find the most challenging aspect of teaching the introductory course.

SR: I think, both, the most challenging as well as most rewarding aspects have to do with the audience needing lots of convincing that statistics is relevant to their fields. If I have to come up with the second most challenging aspect I would say it’s the large number of topics that need to be covered in the very short amount of time. And, there was a time when I would have considered this to be more challenging than I do now, but since I started using a simulation-based-inference curriculum I have reordered the topics in a way that I think helps me be more efficient.

AR: My final question about teaching an introductory course: Please identify an important topic or skill that students struggle with but you think is important for teachers to focus considerable attention on.

SR: Sampling distribution! I think it is very hard for students to wrap their minds around the idea that we are trying to predict what the distribution of a statistic would be under certain conditions, and the fact that most of the time when we illustrate a sampling distribution for a statistic with examples or activities, we assume we know the parameter value, doesn’t make it any easier for them to understand the concept. But, the concept is so fundamental to the logic of statistical inference that it is very important for us, as teachers, to help students understand that we need to be able to predict a statistic’s sampling distribution to figure out what values of a statistic would be considered unusual in a particular situation.

AR: I think it was one of your Ohio State professors, Deb Rumsey, who I first heard ask whether we do more harm than good by using the term “sampling distribution” with introductory students. Why don’t we just say “distribution of the statistic” as you’ve suggested here? Or perhaps just “how a statistic would vary from sample to sample”? Sure, the term “sampling distribution” makes it easier for people in the know to communicate with each other, but does the term obscure the meaning for novices? Would you care to comment on my interpretation of Deb’s question?

SR: I agree with Deb’s concern. It does seem that sometimes that the terminology gets in the way of helping students understand concepts, especially in intro classes, and “sampling distribution” is an example of that challenge. In my intro classes, I avoid using the term “sampling distribution” and use what you’ve already listed above – “how a statistic would vary from sample to sample.” Sure this takes seven more words but I find it much more descriptive when I am trying to get the concept across to an audience for whom this concept is very new.

AR: Now let me ask the same questions about a different student audience: undergraduates majoring in statistics. What do you find most rewarding about teaching those students, and what is most challenging, and what is especially important to emphasize despite being a struggle for students?

SR: I am fortunate to be at a school where we offer an undergraduate degree in statistics, and we have wonderful statistics majors! The most rewarding aspect about teaching these statistics majors is that I have the opportunity to show them how applicable their major is, and that it can be applied to pretty much any field they can think of. I think that this is nice for them to know because this assures them that they made a good choice with their major.

My answers to your second and third questions are sort of related to the same issue. The aspect I struggle with the most is gauging how much majors retain as they go from one class to the other, especially made hard with the quarters that go by so fast. And, I think it is important for majors to understand that the concepts and methodologies in their various core statistics, mathematics, and computing classes are connected. Given more time, I would like students to be able to explore more deeply how all these concepts are related and together help to answer statistical questions. I guess that is the purpose of cap-stone experiences, but those too have time constraints and don’t always allow the exploration of as many scenarios as I would like.

Conclusions

AR: I often ask about the theme of the most recent U.S. Conference on Teaching Statistics, which was “Making Connections.” But your previous answer covered that topic very well, so let me ask about the theme of the 2017 USCOTS, which will be “Show Me the Data.” Do
SR: I hope it is okay if I list two of my favorites — they are both historical and pretty predictable choices. My first favorite is the classic Charles Minard graph (1869) for Napoleon’s March to Moscow in 1812 (Figure 1). This graph is famous for displaying data on six variables (size of army, distance traveled, direction of travel, latitude and longitude, temperature, and location relative to specific dates) in two dimensions. I love that the graph tells such a complete story about the army’s journey.

My second favorite is Florence Nightingale’s polar area diagrams (Figure 2). When Nightingale was in Turkey, in 1855, caring for soldiers wounded in the Crimean War, she became worried that much of the high mortality rate had to do with malnutrition and poor sanitation. She worked hard to change

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**Figure 1.** Classic graph (1869) for Napoleon’s March to Moscow in 1812, by Charles Minard (1781–1870)—see upload log. (Public Domain, https://commons.wikimedia.org/w/index.php?curid=297925.)

**Figure 2.** Polar area diagrams by Florence Nightingale (1820–1910). (See https://www.agnescott.edu/friddle/iwomen/nightpiechart.htm; Public Domain, https://commons.wikimedia.org/w/index.php?curid=1474443.)
the wounded soldiers’ living conditions, and she kept meticulous records of the death toll from before and after the changes were made. When she returned to Great Britain after the war, she used these data to create graphs, now called polar area diagrams, for her reports to Members of the Parliament, to push for sanitary reform in hospitals. Various sections of the graphs represented how the proportions of deaths due to different causes changed over time, and with changing conditions at the hospitals. I love this graph for being one of the first documented uses of data and data visualization to further the cause of human welfare.

AR: I also often ask about an accomplishment of which the statistics educator being interviewed is most proud, but you still have most of your career ahead of you. So, let me ask instead: What do you aspire to accomplish for your proudest contribution to statistics education?

SR: This is a tough question to answer. Mainly because I don’t know if I have developed the kind of vision yet that goes into making significant contributions to statistics education, but I hope that someday I will have done a significant amount of work towards preparing and providing support to current and future K-12 statistics teachers. As many states are starting to implement the Common Core standards, in-service and pre-service teachers are being expected to teach statistical concepts and methods in which they might not have a strong background. I would like to be able to work with such teachers to provide them professional development opportunities.

AR: What advice do you have for those just beginning a career in statistics education?

SR: My advice would be to have conversations with colleagues and other statistics educators about teaching statistics, be willing to listen to suggestions and advice from those more experienced, be open to change, and not be afraid to try things.

I have learnt so much from talking to colleagues, listening to them speak about their teaching approach, and watching them teach. In the Statistics Department here at Cal Poly, we have a wonderful culture of sharing materials and resources, and this worked very nicely for me when I started here as a new faculty member. All I had to do was ask for samples of materials and activities, and my colleagues would share their materials. As a new teacher I found this to be a huge help—I didn’t have to reinvent the wheel. I could use existing resources and modify them to match my style. Do not be afraid to ask for help!

I understand that sometimes change can appear overwhelming, and the first time you make a tweak to a course or perhaps a major overhaul, the transition is not always smooth. This only means that next time around you know exactly what to change to make the process so much better. Don’t let the possibility of a bumpy transition stop you from making the change that you so desperately want and need to make!