INTERVIEWS WITH STATISTICS EDUCATORS

Interview With Brian Kotz: Data Science at Two-Year Colleges

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Teaching Statistics at a Two-Year College

AR: Thanks very much, Brian, for agreeing to this interview for the Journal of Statistics Education. I’ll ask about your background later, but I’d like to start by jumping into the present rather than the past. You’re the first two-year college professor that I’ve interviewed. Please tell us about the courses that you teach.

BK: Presently I teach introductory statistics and business statistics. Our annual enrollment for introductory statistics is over 2500 students, and I teach roughly 300 of those students each year (and another 50 or so in the business course). I’ve also taught calculus, finite mathematics, and other math courses.

AR: Some nuts-and-bolts questions: How many students are in a typical section, and how many sections do you teach per semester? Do these classes meet for three hours per week, or more than that?

BK: Our sections are usually 20 to 30 students, and I usually teach six sections per semester, and even a few sections over the summer. Given the high demand for the course, I am able to teach all year round. Our statistics classes are three credit hours and meet for three hours per week in a 15-week semester.

AR: What do you see as the primary challenges with helping students at two-year colleges to learn statistics? I suspect that most of the challenges are the same ones that are faced by teachers at four-year colleges and in high schools and everywhere else. Feel free to comment on them, but I also ask that you mention challenges that might be unique, or perhaps heightened, for students at two-year colleges.

BK: You’ve really hit on a major theme here. In terms of content mastery and conceptual understanding, you are correct that the challenges that two-year college students face in introductory statistics classes are the same ones that students face in an AP Statistics class or a four-year college introductory statistics class. Our students have succeeded with the same mathematics and reading level prerequisites, and many policies and procedures are in place to establish that two-year college courses are delivered with the same quality and rigor of the equivalent courses throughout their state systems. That is why many two-year college statistics faculty find the efforts of the statistics education community so valuable. Through those efforts, we not only share good practices, research, helpful tips, and so on, but we also find supportive and empathetic colleagues beyond the two-year college faculty community.

But when it comes to our students, I could write a whole page on how their day-to-day lives often differ from the traditional perceptions that most people have of a college student. The average age of our students is 25. My college has no dormitories or residential program, but there is certainly a sense of community. With our affordability and commitment to access, we have students from many walks of life, backgrounds, native countries, etc. In our statistics classes, we may have veterans, nurses, grandmothers, single parents, and aspiring journalists all in the same section of 25 students (that happened to me once). With our students often pulled in so many directions outside of the classroom due to their responsibilities, I suppose that some of the greatest challenges we face in helping students learn statistics are often similar to the challenges that other two-year college disciplines face.

AR: How do you respond to the challenge of teaching students with such diverse backgrounds and ages and life experiences and day-to-day responsibilities?

BK: I have taught many courses and in different settings in my career—and I think that regardless of the setting, or the subject
matter, or the level of instruction, or anything else, kindness and respect go a long way. If the students are aware up front about the expectations, the course outcomes, the syllabus, and so on, they can make an informed decision about what they are getting themselves into, and they can try to plan their studies and responsibilities accordingly. Mindful of their situations, I try to create a balance of flexibility and rigor, I remind them of my availability, and I encourage their active participation and personal responsibility in their learning. I seek feedback, I encourage office hour visits, I remind them of support resources available (including free tutoring at our college), and I do my best up front to convey how an introductory statistics course may be quite different from any other course they have ever taken. Establishing that common framework can lead to a classroom where the diversity of background and personal experiences is still recognized but the essence of the academic responsibilities and course material is better understood (and maybe even shared) by all.

AR: How do you send the message to students on day one that their introductory statistics course will be unlike any other?

BK: Our introductory statistics class has a MATH course designator (MATH117 – Elements of Statistics), and pretty much regardless of where the students come from, many of them are accustomed to a math experience that has a great deal of repetition, drill, and practice—and often very little writing. So first I state that our class will be an introduction to the field of statistics in much the way that a college’s Physics 101, Psychology 101, Biology 101, and so on are introductory courses in their respective fields. I assure the students that a great deal of the prerequisite mathematics they learned will drive many of the processes and theories that we’ll use in the course, but I also tell them up front that there will be sections of material that have no formulas in them. I also try to convey that we care about the collection of data and the presentation of summary analyses, not just the computations. Some students are thrilled to hear that there is a writing component and to later find out that hypothesis testing is not unlike the development of a brief literary argument or mini-essay. Other students however are not as comfortable with all of this as they have found success in “repetition, drill, and no writing” environments previously. In a last attempt to bring home the point, I try to present a brief comprehensive example that highlights many course topics with the hope of additionally stirring some interest in the students and demonstrating both the usefulness and potential of what we cover.

AR: I have two follow-up questions, one that I suspect will be easy and the other less so. The easy one is: Please describe this comprehensive example. The harder one (I predict) is: Do you think there’s something about learning mathematics that makes “repetition, drill, and no writing” an appropriate pedagogical strategy? Or do you think many of your students would benefit from learning mathematics in a way that also emphasizes writing and making arguments?

BK: One of the best aspects of teaching introductory statistics is that one doesn’t have to use the same example each semester; there will always be something going on in the news or the college or the community that is of interest and warrants further examination regarding the claims that were made, how the conclusions were arrived at, how the information was presented, and so on.

I suppose two common examples I can count on even on a slow news day are as follows:

1. FDA drug approvals—highlights of what I would present (without necessarily answering these questions) would be: How did they find these people to participate? What methods did they use to see if the people’s condition changed? How big of a change were they looking for? How did they measure this change and how did they summarize their findings? How sure were they that it was the medicine that made the difference? Why do they keep mentioning “randomized, double-blind, placebo-controlled” and that the people were “18–65 years old”—and who is this “they” I keep talking about? Was it the company developing the medicine or was it someone else?

2. Surveys and polling: How did the pollsters contact the 763 people in the survey? Could the manner in which the people were contacted have affected the analysis? How did the pollsters select the people anyhow? Do you think the 763 people are representative of the population? What population? Do you think this graph is misleading in any way? What is this “margin of error” they mention; was that out of their control?

Now with your last questions, I think “yes” might be the answer to both. I think the kernel of your questions deals with educational expectations and the fact that we all have to start somewhere.

I’m sure people will challenge this analogy, but I had to learn basic grammar, spelling, vocabulary, and even diagramming sentences before I was asked to write a long essay. And with that first long essay assignment, there was an expectation by my instructor that I had mastered those basic elements with fluency and that due to this mastery, we could now really move forward and at a brisk pace into essay writing and then the realms of developing arguments, prose, or even creative writing. My foundation was developed through a great deal of repetition, rule adherence, drill, etc., but it enabled me to firmly and more confidently venture out of my comfort zone at the right time. I’m sure that others could find similar stories in athletics, music, and mathematics.

But would students benefit from learning mathematics in a way that also emphasizes writing and making arguments? I think so, and I think it would improve their performance in the areas that I care most about as an educator: critical thinking, effective citizenship, effective communication, and others. If those emphases are integrated in a way that improves (or at least, does not diminish) student mastery of the foundational elements of mathematics that are typically expected and needed for introductory college level STEM experiences, then I think both the students and the STEM fields they pursue would benefit.

Beginnings

AR: Now let’s go back in time, as I want to ask some questions about your path to becoming a statistics teacher. Where were
you when you were 18 years old, and what were your career aspirations at that point?

BK: Honestly, at that point in my life, I wanted to be an anonymous benefactor. This did not happen (that anyone knows of, at least), but I recall having to be called into the office of the Director of Studies at my high school for writing "anonymous benefactor" under "other" on the career portion of a standardized test I had to take (the PSAT maybe?). Let’s just say that I was interested in nontraditional pathways, but I knew that I would eventually teach at some point.

AR: Good story! Where did you go to college, and how did you find your way to mathematics and statistics?

BK: I attended Harvard, and when I arrived, I really had no idea as to what I wanted to concentrate in. From an advising point of view, that was not considered a problem, and I was encouraged to sign up for those courses I thought I would find most interesting and then figure out a path from there. Looking back, I would say that this is a philosophy I adopted after college as well.

Regarding finding my way to statistics, I can think of a few things. First, I took the STAT 100 course in my freshman year, and I was fascinated by the applications, the practicality, the ability to forecast and predict, and how inferences could be made regarding a population of millions based on the proper sampling of a few hundred. I was also impressed as to how accessible the material was to students of various mathematics backgrounds and interest levels.

The second thing that comes to mind is where I was in terms of my own math studies back then. I was still considering maybe earning a math degree, yet I had also reached the point where I had met the prerequisites for the undergraduate statistics degree courses. I attended the first class of what would have been the required next step for a math degree, and it was a really interesting class, but I don’t believe that a single number or story of context was used in the entire 50 minutes. On meeting with the instructor after class and asking about the utility of the math that had been presented, he said something to the effect of how that was a good question, how he couldn’t think of anything right away, and that the material presented that day was both representative of and key to what we would be doing in that class all semester long. I guess I found that disconcerting. So given my very favorable and inspiring experience in the STAT 100 class, I decided to jump headfirst into the undergraduate statistics program. In the end, it was the program’s courses, rigor, requirements, opportunities, and people that made the experience so exceptional, and I felt that I had in fact chosen the best path for me.

AR: Beyond STAT 100, did you have a favorite statistics course that you took? And did you have a minor or particular application of statistics that you studied?

BK: I think my favorite department course was the first one that I took after STAT 100. It was Regression Analysis (STAT 139), and in addition to being introduced to advanced methods and nuances of modeling, I got firsthand experience with working with larger datasets, using analysis software, and communicating results. The instructor, Hal Stern, was terrific. The class also introduced me to the department, and as one of only three students concentrating in the major out of a sophomore class of 1600, I certainly received very individualized attention. I really couldn’t hide, even on days where I wanted to. The classes were quite small, and the upper level courses were often a mix of both undergraduate and graduate students in the same room. I got to know some people well, and it was not at all like the experiences of my friends who were taking courses in larger programs and lamenting how their instructors did not know them, how they would be one of 300 to 400 people in a room, and so on.

I don’t recall if the program offered a minor back then, but to fulfill the degree requirements for related coursework beyond math, I was able to take some introductory coursework in computer science as well as statistics courses in the undergraduate and graduate programs of sociology, psychology, archaeology, engineering sciences, and economics. I suppose I was living one of John Tukey’s quotes about the profession as I was getting to play in everyone’s backyard, and it was great.

AR: You make it sound so great that I imagine you being charmed when graduation came! Did you know that you wanted to pursue a teaching career at that point, or did your interest in teaching come later?

BK: I come from a family with many teachers: grandparents, mother, aunt, and cousins—so I guess that I knew that I would eventually teach; I just didn’t know when. This was reinforced as I enjoyed informal tutoring of friends and others in high school and college in both math and statistics. When I finished the undergraduate program, my main interests were in paying off debt and using my degree in government or business, so I was encouraged by others to pursue that first and then jump to teaching when I felt ready. I believe that there is a calling aspect to teaching, and I am glad I waited a few years after college to start in the profession.

AR: What did you do in the meantime, while your calling waited (or maybe it was you who were waiting for your calling to come …, well …, calling)?

BK: Consulting mostly—and while I thought about making that my long-term career, I was also thinking more each day about teaching. I had a brief idea about pursuing a degree in operations research, but I eventually reached the conclusion that I was ready to commit to a life in education.

**Teaching Career**

AR: Where did you get your first teaching job, and what courses were you teaching then? How would you describe your teaching style at that point when you were just starting out?

BK: My first job was at a boarding school in New Jersey. I taught Geometry, Probability and Statistics, and an Advanced Algebra course that first year. My teaching style at that time was probably best described as “traditional” and very much like
that of the high school instructors who had inspired me years ago.

The tools we used that year were sort of at extremes. I had my own classroom with chalk and a chalkboard; an overhead transparency projector was available if needed. However, all students had early-version graphing calculators. We also had a very innovative computer department, so we had labs available for students to use geometry software and data analysis tools on occasion, and I incorporated those in my teaching.

Within just a few years, things changed a great deal in terms of the classrooms themselves: whiteboards, overhead projectors, Internet access, and interactive whiteboards that could capture notes. Students soon had their own laptops and newer calculators. While there was quite a learning curve for me with all of this, these updates afforded me an opportunity to modernize my instruction, particularly in statistics.

**AR: How did you become involved with AP Statistics?**

**BK:** Toward the middle of that first year of teaching, I was informed by our school’s administration that the College Board was going to offer a new AP course, and the hope was that we would offer a section for the 1996–1997 academic year. I was asked to write a curriculum proposal, it was approved, and I suddenly became the excited and nervous coordinator of this new course. Despite my background and a great deal of guidance from the College Board, I really was quite concerned about how I would pull this off and what kind of an experience the students would have. I felt some apprehension as I didn’t want to disappoint any of the students, the colleagues who approved the proposal, my mentors and colleagues from college, and so on. As with any new course, that first year was memorable and a ton of work. And while I was not thinking of jumping ship from teaching beforehand or anything like that, I can say that that class really did confirm for me that I had made the right choice to join the teaching profession when I did, and I could not have been happier.

Apart from teaching the class, since I had reached out to the College Board seeking guidance on multiple occasions, they informed me that high school teachers could apply to serve as readers for the Free Response portion of the new exams. Although I had no idea what that entailed (or what that would even look like for this uncharted territory of a new program), I applied. A few months later, I was selected to serve as a reader. My emotions and memories of that reading were very similar to those I experienced teaching the course, namely (and borrowing from above) "I really was quite concerned about how I would pull this off … I felt some apprehension … I didn’t want to disappoint … that first year was memorable and a ton of work …. really did confirm for me that I had made the right choice to join the profession when I did, and I could not have been happier."

**AR: How did you come to leave high school teaching for your current position at a two-year college?**

**BK:** After moving from New Jersey, I lived near a two-year college and would drive past it essentially every day. One day they were advertising an open house event, and I dropped by to get some information. The faculty I met were very enthused about their work and their students’ success, so I asked if they had any evening or weekend volunteer opportunities for math and statistics tutors in their Learning Centers (which provide free tutoring and review). They did not have volunteer positions, but particularly when I mentioned that I had taught statistics, I was encouraged to apply for a part-time position. I was soon teaching introductory statistics and a course called “Survey of College Mathematics” during some of my available nights and weekends. That experience was very positive, and after a few years, I became a full time faculty member, teaching primarily three courses: statistics, the survey course mentioned above, and a nontrigonometry based calculus course.

**AR: Was there a culture shock in moving from a private high school to a two-year college? What (if anything) did you need to change about your teaching? What aspects of your teaching were you determined to retain?**

**BK:** In some ways, yes, there was some adjusting. For one thing, I suddenly was called “Professor”— and during the first week at the college, I recall unintentionally ignoring a student in the hallway who kept saying "Professor… Professor…” and trying to get my attention. I finally stopped walking, but even then, I was wondering "who is she asking for?" There was also the fact that I went from working with 14- to 18-year-olds in high school to working with college students who were primarily in their early to mid-20s—and even some older students who had their own 14- to 18-year-olds in high school. As I mentioned before, the two-year college students sure had a different set of responsibilities from my previous students, different experiences, differing levels of familial support, and so on.

At the same time, much of the new experience was familiar. The material for the college classes was practically the same as the senior level and AP high school classes I was teaching, and many students did their best at all times and were highly motivated just like in high school. At the college level, I also found that the general approach of treating the students with kindness and respect, establishing expectations and rigor, and engendering a culture that communicates that the faculty and administration want the students to succeed (and that I’m here to help) was appreciated and similarly successful.

**AR: In recent years you’ve become more involved with ASA and AMATYC (American Mathematical Association for Two-Year Colleges). How did your work with those organizations come about?**

**BK:** After my first AP Statistics reading, I was encouraged to become involved in the Statistical Education section of the ASA, and I signed up as a K-12 Teacher member. As an association member, I sure did learn a great deal, and I benefited from ASA resources each year (as did my students). I also found that the general ethos of the Stat Ed section was a very positive and supportive one, and the continued encouragement and friendship of section members over the past 20 years has often provided me with both the motivation and the help I needed to improve my instruction and to venture out of my comfort zone when it came to trying new technology, new resources, new pedagogy, etc.
As for AMATYC, after five years of full time two-year college teaching, I was nominated by the ASA to serve on what we now call the ASA/AMATYC Joint Committee, and I served there for six years. It was a great opportunity, and I joined a group of enthusiastic and thoughtful participants from both organizations. The Joint Committee is very active in offering instructor education opportunities, in promoting existing resources in both organizations, and in maintaining and developing the already strong working relationship between the ASA and AMATYC. Just like the ASA Stat Ed section, the AMATYC Statistics Committee and administration have been very supportive, and I have learned much from them.

Data Science

AR: Lately the term "data science" has popped up, well, pretty much everywhere. I want to ask about your thoughts on data science and your efforts to bring the study of data science to two-year college students. But first please recount the story that you told at last year's USCOTS about how you came to meet the Chief Data Scientist of the United States.

BK: In early 2015, Dr. DJ Patil was appointed by President Obama as the first Chief Data Scientist of the United States. In May of that year, on his White House blog, DJ posted "I'm the U.S. Chief Data Scientist—and I got my start in community college." He went on to talk about how his two-year college experience changed his life and did more than just start him on his math/data pathway. I had been thinking for a while about the accessibility of introductory data science concepts to a typical freshman/sophomore level curriculum, and his post was a great catalyst for me to stop thinking and start doing. Additionally, I had students coming to my office asking what our college might be doing regarding instruction in data science in the future.

I encouraged my administration to consider what we could develop mindful of our resources, geography, and the already well-known data potential of the Washington, DC area. As a selling point, I mentioned DJ's post, and I said that since we were only about 30 miles from the White House, we should write to him and invite him to our campus. Long shot that it was, he not only accepted, but my provost, a director of special projects, and I were invited to the White House in February of 2016 to meet with Dr. Patil. It was an unforgettable meeting. He was charismatic, enthused, provided us with great suggestions, and said that we had an opportunity to serve as a local and national leader while promoting the accessibility of data science education to two-year college students. We left inspired; I left with a ton of work to do.

Regarding my thoughts on data science particularly in two-year colleges, I do think that more than a few two-year introductory statistics courses have entered the realm of data science by adopting GAISE standards, having students work with real data (and large amounts of it), and so on. My opinion is based on what I see today with some faculty at my own college, what I have learned about other colleges from serving on the ASA/AMATYC Joint Committee, and the history and general progression of introductory statistics education over the years. With this last point, consider that there was a time when textbook examples might have been imagined stories with sample sizes that were perfect squares to accommodate formulas. Then we thought it was cool for a book to have a 5.25-inch floppy disk with a common data set (real or otherwise) and some software on it (I still have some of these). A few years later, the data sets came in multiple file formats to accommodate the various technologies at different institutions—and these were distributed via 3.5-inch disks, CDs, and eventually companion web pages with larger datasets and access to robust software. And maybe most telling of all, textbooks started including links to external, unfiltered data sources, often on the same pages where some related real-world examples with genuine context were presented.

Along with this encouragement to more data centered teaching, the improved accessibility both to raw data and to high quality analysis and presentation tools has facilitated both a greater student interest in working with real data and a greater realization of the transformative opportunities of working with data. But with this accessibility and encouragement comes the need for thoughtful and responsible education, much of which involves new skills, new thinking, and a new appreciation of what data are, how messy they truly can be, and their role in our society. It was with this mindset that we developed our Data Science Certificate program and curriculum for our students and our community.

AR: That's a great story about your meeting with Dr. Patil at the White House. The rest of your response has generated a lot of questions in my mind. I know that a satisfactory definition of "data science" can be elusive, but what do you mean by that term? Do you see "data science" as simply a marketing term for statistics (Nate Silver famously called data science a "sexed up" term for statistics at the 2013 Joint Statistical Meetings) or as a field that goes beyond statistics?

BK: Thanks, Allan, for teeing up such an easy and noncontroversial question for me ("what do you mean by that term"). And as a bonus, through your parenthetical remark, you've also set me up to possibly disagree in print with one of the most famous members of our field. You are a real friend.

Regarding "marketing," I do not see "data science" as simply a marketing term for statistics, and so I guess I am disagreeing with Silver, at least if he still feels that way today. But I think that's part of the issue—was "data science" intended as just a flashier synonym for "statistics" back in 2013? And more importantly, do the words "data science" now mean the same thing in 2018 as they did in 2013? Of the latter question particularly, I hope not. A science—any science, and particularly an emerging one—needs to have some flexibility for growth, new perspectives, and new definition whether it was born out of marketing or in the name of social and scientific advancement.

Regarding "a field that goes beyond," in statistics, one of my favorite quotes was published in 1983: "Although we often hear that data speak for themselves, their voices can be soft and sly." (Beginning Statistics with Data Analysis, Mosteller, Fienberg, Rourke, p. 234). And in Silver's book The Signal and the Noise some 30+ years later, he states "The numbers have no way of speaking for themselves. We speak for them." (p. 9). Even at the 2017 JSM, Dr. Jim Cochran (who received the ASA's Waller
Distinguished Teaching Career Award) described data as trying to

tell us something and that one of our jobs as statisticians is
to explain their message. This metaphor of data as “communi-
cating entities” appears elsewhere I’m sure, and it’s the “soft
and sly” that concerns me.

In the 1980s, when I thought of “data,” I was not thinking
about downloadable video feeds, or facial recognition, or con-
stant streams of fitness and position information from a watch.
Do these bring new ethical concerns, new risks, new benefits?
Technology now facilitates the gathering of these data (raw,
messy, and so on) at speeds that were unheard of just a few
years ago. Data may now be more vocal, but does that make
their message clearer to us? There is a need for education that
addresses the collection, cleaning, ethical use, and security of
these data. In what fields does that education reside? And with
the same computing power that brings us these data, students
can now use software on the Internet (and at no cost) to run
thousands of simulations for a randomization test in just sec-
onds. While impressive, there is still a need for education that
explains what that software is doing, why this method is impor-
tant, how the test works, how it should be used properly, how
its results can be communicated properly, and so on. In what
fields does that education reside?

Statistics plays in the back yards of many sciences: social
science, computer science, agricultural science, etc. But since
data are to a large extent the raw materials of our field, I
feel we need to spend considerable time in data science’s
back yard—and likewise, we want them to spend consider-
able time in our back yard too. We need to encourage data
science education, and we need to bring data science along
with us when we visit other disciplines. But I don’t think
statistics and data science are the same thing right now, nor
is one a pure subset of the other. The bigger question is
will the fields evolve to a point of being indistinguishable. I
think that’s one reason why the data science definition you
are seeking may be elusive—it is a dynamic field trying to
achieve synergy from several sources. Even well-established
fields with professional associations from the 1800s take
pause for introspection and to further define themselves
sometimes. (See “What is Statistics?” The American Statisti-
cian, Brown and Kass, Volume 63, 2009). It is a healthy
exercise, and I believe that the data science community is
working on their field’s definition and will address this even
more in the years to come.

And lest you think I was going to avoid the challenge of your
first question, and mindful that I am not a data scientist, I
describe the field of data science generally as “the study and
practice of the collection, extraction, transformation, dissemi-
nation, protection, analysis, and visualization of data (often at
large scale) using ethical, computationally supported, statisti-
cally valid methods.”

AR: Thanks for such a thoughtful and thorough response. I’m
tempted to follow up with an easy and non-controversial ques-
tion such as “what was Gosset’s pseudonym?” but that would be
mighty boring. So instead I’ll ask you to tell us about your Data
Science Certificate program. What courses do students complete
in that program, what skills do they acquire, and what do they
going to do with the certificate?

BK: Our Data Science Certificate program is a 16 credit pro-
gram, and for the first 3 credit course in the sequence, students
must take one of the following: Elements of Statistics, Statistics
for Business and Economics, or Biostatistics. After that, stu-
dents take our 100 level DATA courses, including DATA
101—Introduction to Data Science. The remaining coursework
concentrates on writing, communication, and additional statisti-
cal methods for data science—and the certificate culminates
in a capstone experience. Elements of coding and computer sci-
ence, ethics, and the use of authentic data are stressed through-
out. Since the program has our own two-year college students,
undergraduates from other colleges, and those who are already
in the workforce and/or have degrees in other fields, the aim is
for students to gain practical data science knowledge and expe-
rience regardless of whether their end goals are to improve their
marketability, to advance their careers, to prepare for a analyti-
cally based career, and so on. Since our program has only been
offered for six months, we have not had any students earn a
certificate yet—but the feedback from our first DATA
101 sections was quite positive.

AR: Please tell us a bit more about the DATA courses. What are
some of the topics covered? What programming languages are
used?

BK: With our prerequisite structure, we expect a certain level of
common statistical background in our students, and so general
topics throughout the curriculum involve how data analysis,
ingerential statistics, and modeling can be integrated with
machine learning and statistical computing. Additionally, the
DATA courses address data mining methodology, data collec-
tion and wrangling, assembling datasets from multiple sources,
the creation and modification of customizable tools and code,
ethics, security, and reproducibility of results. Our 100-level
courses also contain writing/communication topics such as pre-
senting to target audiences, relating compelling stories with
data, and assessing situational communication preferences.
Programming languages include R (RStudio), Python, SQL,
and Tableau.

AR: Who teaches the DATA courses—statisticians, computer sci-
entists, mathematicians, others, all of the above? Did the instruc-
tors receive any professional development specific to data
science?

BK: We were very fortunate that among our part-time faculty
for our MATH 117—Elements of Statistics course, we had two
data scientists, and we had one former consultant who had
recently completed quite a bit of data science coursework.
I think that finding and training data science educators is a con-
cern for the discipline’s future, just as it has been for statistics.
In keeping with earlier comments regarding support, I should
point out that experienced data science instructors in the Stat
Ed community were very helpful to our college’s faculty and
encouraging of our efforts. This is also a good time for me to
mention StatPREP, a program funded by NSF that assists
undergraduate educators in incorporating data wrangling and
visualization methods in their curricula (www.statprep.org).
Many two-year college faculty have participated, and Kate
Kozak, President-Elect of AMATYC, is a member of the StatPREP project leadership.

**Pop Quiz**

AR: Now let’s begin the “pop quiz” portion of the interview, where I’ll ask a series of questions and request that you keep your responses to just a few sentences or less. What are some of your nonprofessional hobbies?

BK: Occasional trivia contests, walking and hiking, and lately, watching the Olympics.

AR: Please name some (nonstatistics) books that you’ve read recently.

BK: I really haven’t jumped into any books lately. Readings from the past six months include journalism pieces, particularly in sports and human interest; “The Will to Believe” by William James (portions); and poems from the *Norton Anthology of Poetry.*

AR: What are some of your favorite travel destinations? Perhaps you could mention one place you’ve been for professional reasons and one strictly for pleasure.

BK: San Diego, Boston, Paris, Tuscany. I’d love to revisit them all.

AR: Next I’ll ask a fanciful question: You can have dinner anywhere in the world with three companions, but the dinner conversation must focus on statistics education. Who would you invite, and where would you dine?

BK: That would depend on who is paying. Assuming that someone other than me is picking up the tab, it would be a five-star place that Rob Gould recommends. (I sometimes think he secretly works for Zagat.) Since the conversation must focus on statistics education, I would choose three empowered people (not sure who they are: benefactors, administrators, etc.) who were on the fence about the worth of statistics and data science education to society, or the cost of starting a program at their school, or the need for supporting instructor education in the fields. I would listen to their concerns and then do my best to make a strong pitch.

AR: Several people have mentioned Rob Gould when I’ve asked this question, so I think we can all agree that Rob will pay not only for the meal but also for travel expenses with getting there. Now let’s get even more fanciful. If you could travel to any point in time, past or future, what would you choose, and why?

BK: When I was younger, I was interested in space travel. I’d like to be on the expedition to Mars when people from Earth first land there.

AR: And now back to reality, what has been your favorite course to teach?

BK: Introductory Statistics, hands down.

AR: Let’s end this pop quiz with four questions that I use to collect different kinds of data from students. Do you consider yourself an early bird or a night owl?

BK: I think I migrate depending on my life circumstances, but lately, it’s “night owl.”

AR: On what day of the week were you born? (You might consult www.timeanddate.com.)

BK: Wednesday.

AR: How many of the 50 states have you been in?

BK: 32 of 50.

AR: How many miles from where you were born do you live now? (You might consult www.distancefromto.net.)

BK: 62.5 miles.

**Conclusions**

AR: Thanks very much for taking the time to answer all of my questions. I have just three left. First, what’s your vision of the future of statistics and data science at two-year colleges? Do you think more and more statistics will continue to be taught? Do you envision a proliferation in data science programs such as yours at Montgomery College? And what needs to happen to ensure a bright future? (I realize that it looks like I just asked four questions there. But by my strange counting rule, I’m regarding this as one mega-question, and so I still plan to ask two more.)

BK: Wow! Your students must love your “one question” exams.

Regarding my vision of the future, the design and mission of most two-year colleges means that we are very much connected to the needs of our communities, to funding, and to the four-year colleges with whom we work. Therefore, I think that the future of statistics and data science at two-year colleges will be bright and busy, but I also have concerns. There is still great variability in how America’s two-year colleges are perceived both in society and by other institutions of higher learning, so I think that a bright future will require networking, passion, convincing, and initiative by communities, industries, governments, higher education, and other stakeholders.

In terms of “more and more statistics” being taught, I think introductory statistics enrollments will continue to track along with any growth (or decline) in general enrollment in two-year colleges. I could also see statistics enrollment trends surpassing general enrollment trends—so many disciplines and transferring institutions recognize the benefits of students being introduced to statistics, and I think that other degrees and programs are increasing the levels of quantitative reasoning and critical thinking in their curricula. However, if by “more and more” you mean additional statistics courses beyond introductory statistics, then I am not as optimistic about their development in two-year colleges unless they are infused and advertised with data literacy and data science components. That gets to your “proliferation in data science programs” question; and in order
for that to occur, I think there will need to be a commitment to instructor education in the field in addition to the networking, passion, etc. mentioned above. This also gets back to some earlier comments regarding the future of the fields of statistics and data science—what will those fields become, and in that evolution, will two-year colleges be partners, leaders, or left in the dust? I may be off base, but I think it is possible that two-year colleges may serve as the inspiration and starting point to more data scientists than statisticians in the coming years. Regardless, there will still be a need for continued quality statistics education in two-year colleges; preliminary findings from the 2015 CBMS Survey Report stated that there were an estimated 280,000 statistics enrollments in two-year colleges in Fall 2015 (www.ams.org/profession/data/cbms-survey/cbms2015-work – Chapter 1 Tables, accessed 2/21/18).

AR: That’s certainly a lot of students who are learning statistics at two-year colleges. That 2015 CBMS Survey indicates that this number has increased almost four-fold since the year 2000. As of fall 2015, two-year colleges now account for almost 45% of introductory statistics enrollments at the college level.

My penultimate question is: Of which of your professional accomplishments are you most proud? And what’s a specific goal for the remainder of your career?

BK: I am extremely thankful to have worked with so many great people on publications, textbooks, committees, talks, conferences, and so on over the years; and recently, I was very pleased to see the start of the AMATYC Data Science Subcommittee (November 2017). But I think I’m most satisfied with the fact that I have been able to teach statistics to nearly 4000 students in my career thus far. Although I’ve never had a teaching assistant in that time, that was never a hindrance, and in fact I prefer the model where my interactions with the students are direct and in sections of 30 or fewer students. This structure suited me, and it reinforced my primary career goal to be a statistics educator while inspiring my writing and my service to the profession. I really don’t have a specific goal for the remainder of my career other than to keep teaching and to keep serving the profession for as long as circumstances allow.

AR: What advice do you have for JSE readers who are just beginning, or just starting to contemplate, a career in statistics education?

BK: Congratulations! You are joining the profession at a very interesting time, and you have joined an exceptional group of people who are passionate about what they do. Please feel free to ask anyone for assistance; the community is supportive, energetic, and willing to share. Attend and engage in as much professional development as you can, and be sure to examine new areas as well as the familiar. And lastly, regardless of the location or level at which you are teaching, try to show your students each day that your course connects with their lives and their world.