Erik Erhardt

Teaching Dossier

Associate Professor of Statistics
Department of Mathematics and Statistics
University of New Mexico

The **goal of this living portfolio** is to be reflective about teaching, for the recording of teaching accomplishments, as the foundation for further reflection, and for recording teaching experience.

Note: *This is the abbreviated form of the complete 100+ page document, containing only my teaching statement and highlights of recent teaching activities. Additional details are available in my CV.*

As an educator, my primary objective is to develop statistically literate students by helping them learn both basic and advanced elements of statistical thinking. Thus, it is essential to practice *evidence-based strategies for instruction*. To that end, I have performed an extensive literature review (see the end of dossier, 85+ mostly-statistics resources), I regularly attend the largest Statistics teaching conference (USCOTS), I am an associate editor at the Journal of Statistics and Data Science Education, I have redesigned my courses (Stat 427/527 and 428/528 Advanced Data Analysis 1 and 2, Stat 590 Statistical Computing), and I have translated that research by successfully implementing an active-learning based Introduction to Statistics at UNM which showed improved performance for all students .

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Recognition

2022 Nominated for Regents' Lecturer, UNM.

2019 – 2020 UNM Academic Affair General Education (AAGE) Faculty Fellow for Undergraduate Research, 2019–20, Introduction to Statistics.

2018 – 2019 UNM Academic Affairs Core Curriculum Faculty Fellow, 2018–19, Innovation and Undergraduate research in Introduction to Statistics.

2017 Outstanding Professor, 2016–17, Department of Mathematics and Statistics, UNM.

2017 Nominated for Presidential Teaching Fellow Award, 2016–17, CTE, UNM.

2017 Nominated for Outstanding Teacher of the Year Award, 2016–17, CTE, UNM.

2016 – 2017 UNM Teaching Fellow, Active-learning redesign of Introduction to Statistics.

2016 Nominated for Outstanding New Faculty Teacher of the Year Award, 2015–16, CTE, UNM.

2015 Innovation grant for Stat 427/527 and 428/528 redesign, innovationAcademy, UNM.

2015 Nominated for Outstanding New Faculty Teacher of the Year Award, 2014–15, CTE, UNM.

2014 Nominated for Outstanding New Faculty Teacher of the Year Award, 2013–14, CASTL, UNM.

2013 Nominated for Outstanding New Faculty Teacher of the Year Award, 2012–13, CASTL, UNM.

2012 Nominated for Outstanding New Faculty Teacher of the Year Award, 2011–12, CASTL, UNM.

2012 Outstanding Undergraduate Instructor (tied as Outstanding Graduate instructor), 2011–12, Department of Mathematics and Statistics, UNM.

2006 Excellence in Teaching Award, 2006, Department of Mathematics and Statistics, UNM.

2006 Outstanding Teaching Assistant of the Year Award 2005–6, CASTL, University of New Mexico.

2022 Reflective Statement for active-learning courses

I believe, as a statistician and an educator, it is my responsibility to challenge and support my students in pursuit of four general learning goals:

1. to understand the appropriate application and limitations of a range of statistical methods and to gain experience using software tools,
2. to learn and apply the statistical analysis workflow cycle to evaluate data and models to make evidence-based decisions or inferences,
3. to evaluate the statistical work of others and provide criticism positively and constructively, and
4. to clearly communicate statistical results and ideas to a variety of audiences, including collaborators and non-statisticians.

The degree of emphasis of these objectives in each of my courses depend on the level of the course.

Introduction

I have been reflecting on my teaching since 2003, and my teaching statements have evolved drastically over those 20 years. In this year's statement, I am focusing on *putting evidence-based practices into action at UNM* by designing active learning materials, mentoring young educators, and providing a comprehensive educational experience for my students. While I have redesigned ("flipped") two large courses, I will use **Stat 427/527 Advanced Data Analysis 1 (ADA1) as the example in the narrative**. Additionally, I have demonstrated at UNM that the teaching improvements I have made in ADA1/2 can be transferred to Math 1350 Introduction to Statistics to have an even more significant impact on statistics education at UNM (2200+ students/year) .

Recommendation from statistics education research

Following the recommendations of George Cobb , the American Statistical Association developed the Guidelines for Assessment and Instruction in Statistics Education (GAISE) , which made six main recommendations.

1. Emphasize statistical literacy and develop statistical thinking.
2. Use real data.
3. Stress conceptual understanding, rather than mere knowledge of procedures.
4. Foster active learning in the classroom.
5. Use technology for developing conceptual understanding and analyzing data.
6. Use assessments to improve and evaluate student learning.

Furthermore, GAISE helps instructors get started by including practical examples of activities and projects, assessment items, use of technology, and real data. Since then, the AIMS Project (Adapting and Implementing Innovative Material in Statistics) has developed materials aligned with GAISE to help realize these recommendations including assessment resource tools by the name of ARTIST (assessment resource tools for improving statistical thinking), which I use for **quizzes**.

The state of statistics-specific education research is so clear about how students learn and which pedagogical techniques work most effectively that if education were a clinical trial, it would be unethical to continue to lecture at students (at least in undergraduate courses); treatment

randomization would be broken, and all lecture courses would switch to the active treatment. In the statistics teaching bibliography (last section of this document), I list a set of sources I have reviewed, adapting several strategies for my courses.

Integrating practice with recommendations

These beliefs summarize my teaching philosophy, each followed by a description of how I put them into practice.

Goals and structure

The goals I have for my students are given at the top of the syllabus before class begins.
Goal (ADA1): *Learn to produce beautiful (markdown) and reproducible (knitr) reports with informative plots (ggplot2) and tables (kable) by writing code (R, tidyverse, Rstudio) to answer questions using fundamental statistical methods (all one- and two-variable methods), which you'll be proud to present (poster).*

Each week has this structure. The **Preparation** assures students are prepared for class by learning the material through pre-class video lectures and quizzes. The **In-class** worksheets are designed for students to apply what they've learned, engage in productive struggle, and get help to keep going. Assignments not completed in class will require some additional work and are supported by instructor and TA office hours. Finally, all of the skills will be applied to their own research questions in their semester-long project culminating in a poster presentation.

- Preparation (Tuesday): Reading, Video, Quiz due Tue 11:50 PM.
- Worksheet 1 (Tuesday): Assignment due by Fri 11:50 PM.
- Worksheet 2 (Thursday): Assignment due by Mon 11:50 PM.

Learning is a developmental process

Students must develop a capacity for self-direction, self-monitoring, and self-generation of ideas. In addition, students must learn how to formulate questions, conduct research, and write professionally.

In practice

In ADA1, we start the semester with the end in mind: a poster presentation to report on a self-generated research question they answer using one of several large public datasets that I provide to the class. The datasets include The National Longitudinal Study of Adolescent to Adult Health (AddHealth, Waves 1 and 4), The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), and The Outlook On Life Survey (OOLS). After looking over the dataset questions and codebooks, students write research questions that can be answered using the variables in a dataset and conduct a literature review and write about what is known about their research question with a short bibliography. The students then assemble a dataset subset by constructing a personal codebook, subset the larger dataset for their research question, code and label variables, deal with missing values, etc.

The semester concludes with a critique of statistical communication in the media, a demonstration of a poster presentation, and a two-session poster presentation in the last week of class where they each present their analyses to address their research question.

Conceptual learning by revisiting information

Students need opportunities for reflection upon key ideas throughout the course to construct a conceptual framework so that they may integrate and organize knowledge into a coherent structure.

In practice

Early in the semester, I introduce statistical summaries and visualization, then we revisit those methods in the context of statistical inference and hypothesis testing. Students must be able to see past the computational drudgery to the underlying principles. Thus, I provide code for every operation I expect them to perform, provide descriptions of what the code is doing, and ultimately emphasize the statistical details in the methods and results.

Learning requires engagement

When students are stimulated with curiosity and interest, they will be motivated to engage and learn new ideas actively.

Using backward design (identifying desired results, determining acceptable evidence, and planning the learning experiences and instruction), I develop teaching modules that incorporate student learning objectives, assessment methods, background reading with screen-capture lectures, and in-class applications using active and collaborative exercises. I have designed roughly 15 quizzes, 30 in-class worksheets, 15 homework assignments, a poster project, recorded lecture videos, and recorded assignment introduction videos to encourage active engagement in ADA1. Each is an opportunity to engage with new ideas and review previous ideas. This accompanies the 400+ pages of lectures notes, 10+ datasets, and all of the R code that I developed in the previous years.

In practice

Student engagement in ADA1 occurs before, during, and after class by engaging with the material and with their peers and mentors. Each assignment is aligned with the course learning objectives. Each class session has clear objectives, definitive concepts to focus on, and is organized using a consistent agenda.

Before class, the students are asked to engage with new material by reading and watching video lectures. A quiz due each Tuesday before class assesses reading and video comprehension and ensures they are prepared to actively participate in class activities with minimal (typically no) lecture.

In-class worksheets are designed to engage the students in positive struggle in class with the support of teammates, peer mentors, TAs, and the instructor and to find success with the concepts and skills. Worksheets are due at the end of class, uploaded to UNM Learn to be quickly graded by a TA, though I often allow a little extension for those who want or need more time after class.

Homework assignments are designed to engage the students to apply the concepts and skills of the week to their class poster project. A sample of assignments includes a literature review, plotting univariate and bivariate relationships, data cleaning, inference and hypothesis testing in many situations, nonparametric methods, statistical communication, and poster preparation. I do the homework along with them, an analysis of my own set of research questions using one of the

datasets, and provide this as a model on the website; I prepare this each week before they start their own analyses.

The poster developed through the semester (most homework assignments contribute to the poster content) gives the students experience communicating their research questions, defending their statistical analysis decisions, and presenting their results in a fun and memorable experienc that they can be proud of.

Course surveys at the beginning and end of the course allow our class to participate in national project-based learning research and improve the course (Passion-Driven Statistics).

Active inquiry helps students learn best

Students need opportunities to work with real data to answer authentic questions, just as professionals do, avoiding "toy" problems.

Students learn statistical theory best when they see how this material can be applied in real-life situations. Students need to see instructors who are passionate about their field.

In practice

Throughout the semester, the large datasets the students use to develop their research questions and perform analyses provide a real-world engagement with data that is not replicated with textbook datasets.

At the beginning of many classes, I begin with a discussion of a visualization critique, believing that visual communication may be the most effective form of communication of statistical information. I present a provocative plot and ask the students to consider what story is being told; this leads to a short discussion of what was effective, not effective, and misleading about the visualization.

Students need to engage primary sources critically

Students need opportunities to work on authentic problems using authentic kinds of evidence.

In practice

The poster project using a large public dataset supports this aim.

Experiential learning

Project-based learning allows students to do original work on a self-directed question.

In practice

All of the assignments in my courses involve an actual experiment or use of real data to answer authentic questions.

Teamwork

When students collaborate, they develop a deeper understanding more quickly than working independently because they often discover what they do not know when trying to explain a concept or defend a decision to their team.

In practice

Before the semester, we randomized students into groups of three at round tables that seat nine students. We encouraged students to work together on in-class assignments to get started in the course. As the course evolved, we allowed students to shift around a little to form teams that better met their needs, though many continued in their original teams.

Learning is social

Learning is a social activity that benefits from students contributing to one another's intellectual growth through positive intellectual critique and discussion. We need to develop strategies to overcome students' unhappy experiences with small-group learning.

In practice

I build rapport with my students because I am engaged in their development. I believe that students who feel connected are more willing to devote time and energy to their learning.

Writing to learn

Communication is integral to student success. Writing requires reflection, thinking, and analysis before it becomes effective communication with others.

In practice

The practice of statistics requires effective communication. Writing is not simply a method of imparting information or demonstrating understanding, but the most nuanced and sophisticated way to order, analyze, apply, and synthesize information. Through writing assignments, I believe that I enhance my students' ability to evaluate data and methods, formulate hypotheses, predict, and generalize.

My assignments always include written questions where students must explain their strategy for analysis, evidence-based decisions, and results. Graduate students are strongly encouraged to make oral presentations about their work. Poster presentations allow undergraduate students also to make oral presentations.

While I have no formal training in composition, I try to strengthen student writing and reinforce the course content using these strategies. I try to have students write regularly and frequently to help make them more comfortable in expressing their ideas in written words. I focus their writing on the thinking and writing skills for statistics more than the general mechanics of English. I try to vary the assignment's purpose and audience by asking students to explain their results for their peers, or for a general audience. I try to provide prompts in my assignments that provide a focused direction for both analysis and writing an argument. When possible (ADA1 project), I create sequential assignments that build on one another, so the narrative incorporates layers of complexity and broadens the range of each student's writing experience; for example, the project begins with a literature review with a critique of the literature, specifying a thesis of their own, and then performing a variety of analyses and writing about each hypothesis and conclusion. I focus your criticism on specific communication skills, rather than attempting to address all errors in writing.

Many paths to mastery

Because students learn in various ways, the distribution of learners can be reached by combining approaches: readings, videos, demonstrations, simulations, lectures, discussions, visuals, surveys, problem-solving, and collaborative activities.

Reach students at their own level

Each student is ready for slightly different levels of understanding, and an effective instructor seeks to stretch and broaden a student's understanding by identifying those areas that are within the student's grasp — not too easy, but also not too difficult.

Cultivate a safe and stimulating environment

Encourage participation in a safe and stimulating environment by being sensitive to individual differences, providing clear expectations and goals, and modeling the steps needed to meet those objectives.

Continual improvement

Instructors improve their teaching from regular student feedback (formative evaluations) and other instructors, from a regular review of education research, and from experimentation and reflection.

In practice

I use short "muddy points" feedback assessments throughout the semester and periodic formative evaluations of the course. See sections later in this dossier for discussions of these strategies. My process of improvement really accelarated when I attended the United States Conference On Teaching Statistics 2015 (May 26–30) (USCOTS15) and brought my TA with me to learn about the current state of statistics education research and incorporate best practices in my courses.

Mentoring future educators

By incorporating Peer Mentors in ADA1, in our weekly meetings, I share the implementation of education research, and together we engage with the students in class to keep them engaged in productive struggle and help them succeed.

In practice

In Fall 2015, I created the Statistics Education Practicum (SEP), which attracted 9 Peer Mentors for ADA1, and since there have been 30+ student peer learning facilitators (PLFs). This "course" serves students who are pursuing their undergraduate or graduate degree in various disciplines but who want to expand their skills in statistics and applied data analysis in preparation for a future career. It also serves students currently pursuing independent, quantitative research at the undergraduate or graduate level. This "course" aims to provide students with an opportunity to enhance their statistical skills beyond the introductory level.

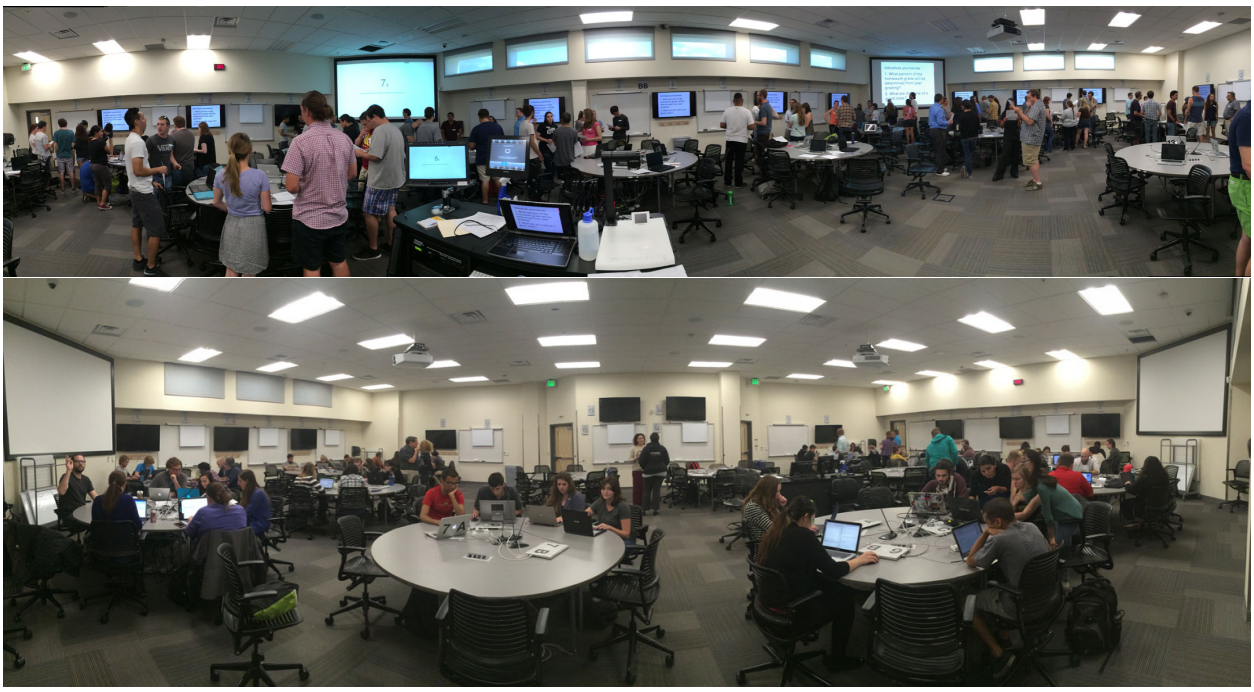
Peer Mentors use a shared post-class journal to reflect on what they observed in class, including their judgments of what worked well and what could be improved.

The "course" centers on personal interaction supporting introductory/intermediate statistics students in ADA1 (Stat 427/527) and ADA2 (Stat 428/528). Active peer mentoring and supporting experiences will be based on the theory that good teachers (and learners) of statistics need to be developed, as opposed to being trained. In line with this theory, this hands-on course will provide an intensive opportunity to build specific knowledge regarding teaching and learning in data-driven statistical inquiry.

Students enrolled in this "course" (a) provide one-on-one support for introductory/intermediate statistics students during workshop-oriented class sessions (2.5 hours/week – primary responsibility), that is, come to class; (b) attend statistics mentoring development sessions (rare, as needed); (c) monitoring and critique Learn discussions to resolve R coding and applied data assignment questions (one hour/week); and (d) lead small group mentored meetings for six to eight statistics students (near the end of the course, a few times as needed). A Peer Mentor's grade will be primarily based on attendance at all class meetings and efficacy in helping students succeed, and secondarily on their course journaling for what worked or not (for continuous improvement).

Peer Mentors enable the instructors (Prof and TAs) to use active-learning techniques that would otherwise be very challenging in a large class with a single instructor. They also help keep students "on task" and help facilitate learning at the individual level. The use of Peer Mentors in conjunction with active learning in the classroom suggests improved student attendance, student participation, student attitudes, and learning gains.

There are several in-classroom roles that Peer Mentors fulfill. They work with small groups of learners to support the successful completion of in-class assignments or to lead small-group in-class discussions. They clarify and explain assignment expectations or introduce the discussion. The checking answers when requested by students who desire to build confidence before moving on with an exercise. The Socratic approach of answering student questions with new questions that support successful completion of, and learning from, in-class assignments and discussions.



Stat 427/527 ADA1 working in teams on in-class activities.

I came into **Stat 590 Statistical Computing** on 10/6/2015 to find my students huddled around a single table discussing the homework assignment. I asked what they needed, they wanted to continue working on it, so I let them. They were engaged in productive struggle and making connections, an instructor's joy.

Highlights of recent teaching activity

Highlights

2021 New course: Statistical Literacy, Gen Ed and Core curriculum

2020 UNM Introduction to Statistics (Stat 145/Math 1350) Active-learning version, TA training, report, and manuscript describing superior outcomes

2021 Stat 427/527-428/528 Online version for COVID

2022 Stat 427/527-428/528 Software: R Package for Stat 427/527 - 428/529 ADA1&2

2020 PI on NSF Grant on UNM Undergraduate Research (ECURE)

2018 Passion-Driven Statistics implementation partner, national program

Funding

2020 – 2025 (2) 1953349 (Henning/Holloway) Apr 2020 – Apr 15 2025 10% = 1.2 cal.
NSF **$2,194,211**
IUSE: HSI Track 1, Improving Undergraduate STEM Education: Hispanic-Serving Institutions (HSI Program): Building Capacity: Leveraging Course-Based Undergraduate Research Experiences to Strengthen Transitions for STEM.
PIs: Patricia A Henning (PI as of 8/10/20 James P Holloway), Co-PIs: Hua Guo, **Erik B Erhardt** (Statistician), Pamela Cheek, and Tim E Gutierrez
Role: Co-PI, Statistician

2018 – 2023 (1) 1820766 Oct 2018 – Sep 2023 0% = 0 cal.
NSF **$1,128,096**
"A Data-Driven, Multidisciplinary Curriculum Providing Access to the Data Analytics Economy through Project-based Learning"
PIs: Lisa Dierker, PhD; Jennifer Rose, PhD.
Role: Implementation Partner: Key personnel, Training faculty, Wesleyan University

2019 $11,016, UNM Office of Academic Affairs, Proposal for two years of pedagogy training (2019-2021) for TAs for Gen Ed Stats.

2019 $3000, UNM Academic Affairs General Education (AAGE) Faculty Fellow for Undergraduate Research, Introduction to Statistics.

2018 $3000, UNM Academic Affairs Core Curriculum Faculty Fellow, Innovation and Undergraduate research in Introduction to Statistics.

2017 $1340, UNM Teaching Allocation Grant, Active-learning redesign of Stat 145 Peer Learning Facilitator.

2017 $2000, UNM Teaching Fellow, Active-learning redesign of Introduction to Statistics.

2016 $200, UNM Teaching Fellow, Active-learning redesign of Introduction to Statistics.

2015 $500, Innovation grant for Stat 427/527 and 428/528 redesign, innovationAcademy, UNM.

Editorships

2022 – 2024 Associate Editor, Journal of Statistics and Data Science Education, Jan 2022 – Dec 2024.

2022 Handled 2 manuscripts.

2019 – 2021 Associate Editor, Journal of Statistics and Data Science Education, Jan 2019 – Dec 2021.

2021 Handled 1 manuscripts.

2020 Handled 3 manuscripts.

2019 Handled 3 manuscripts.

Administrative work on Department, College, University committees

2015 – 2016 UNM STEM Gateway Redesign Council. Department representative. Aug 2015 – Jul 2016

Conference Organizing

2022 National Numeracy Network (NNN) Conference at UNM, Oct 21–23, 2022
National conference
Funding: $275 from UNM Department of Mathematics and Statistics

2019 ASA DataFest at UNM, April 19–21, 2019
Local conference

2017 ASA DataFest at UNM, April 21–23, 2017
Local conference
Funding: $200 from Google

Short Courses

2019 (3) Introduction to the R Tidyverse , *Department of Mathematics and Statistics*, University of New Mexico, SMLC 120, Albuquerque, NM, 3/22, 3/29, 4/5/2019.
10 participants.

2018 (2) UNM Stats R Package Development "R-Hack-A-Pack", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, Aug 17, 2018.
11 student participants.

2018 (1) Introduction to the R Tidyverse , *Albuquerque Chapter of the American Statistical Association*, University of New Mexico, Student Union Building, Albuquerque, NM, Feb 16, 2018.
Sold out!, 38 NM participants.

Introduction to Statistics research

px1 **Erhardt**, E. B. and W. Lim (2020). "Effects of a GAISE-based Teaching Method on Students' Learning in Introductory Statistics". *Communications for Statistical Applications and Methods* (27). pdf. DOI: 10.29220/CSAM.2020.27.3.269. URL: http://www.csam.or.kr/journal/view.html?uid=1897&&vmd=Full.

2019 (4) National Numeracy Network (NNN) 2019 Annual Meeting, Austin, TX. Talk . Oct 11–13, 2019.

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2017 (3) UNM Teaching Fellow Presentation, "Effects of an Innovative Teaching Method on Students' Learning in Introductory Statistics: Executive summary and recommendations", *University of New Mexico, Center for Teaching and Learning*, Albuquerque, NM, Sep 20, 2016, video without slides.

2017 (2) "What do Future Senators, Scientists, Social Workers, and Sales Clerks *Need to Learn* from Your Statistics Class?", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, Apr 26, 2017.

2016 (1) "Introductory Statistics Flipping ON the active learning switch", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, Nov 30, 2016.

Teaching, miscellaneous

Teacher Mentorship

2022 ADA1 Peer Mentors, Fall 2022
Arwyn Lewis, ADA course alumna
Alexis P Amodio-Cardwell, ADA course alumna

2022 ADA2 Peer Mentors, Spring 2022
Valerie Fong, ADA course alumna
Ola Anifowoshe, former ADA course TA

2021 ADA1 Peer Mentors, Fall 2021
Valerie Fong, ADA course alumna

2021 ADA2 Peer Mentors, Spring 2021
Pratap Khattri, ADA course alumnus

2020 ADA1 Peer Mentors, Fall 2020
John Romero, ADA course alumnus
Pratap Khattri, ADA course alumnus
Coby Segay, ADA course alumnus
Jacob Matthew Moy1, ADA course alumnus

2020 ADA2 Peer Mentors, Spring 2020
Kelli Kasper, ADA course alumna
Grace Mayer, ADA course alumna

2019 ADA1 Peer Mentors, Fall 2019
Grace Mayer, ADA course alumna

2017 Intro Stat Active-learning TAs, Spring 2017
Billy Brown
Lindsey Pittington
Kellin Rumsey

2017 Intro Stat Undergraduate Peer Learning Facilitators, Spring 2017
Marissa Berlanga
Catlin Herrera
Sarah Scott
Jeanette Varela

2017 ADA2 Peer Mentors, Spring 2017
Alicia Dominguez, ADA course alumna
Grace Mayer, ADA course alumna

2016 ADA1 Peer Mentors, Fall 2016
Alicia Dominguez, former student
Andrew Nathan Hollis, former student
Ayed Alanzi, stat graduate student

2016 ADA2 Peer Mentors, Spring 2016
Carrie Booth, Education grad student, ADA course alumna
John Pesko, Stat PhD candidate
Igor Litvinovich, Stat graduate student
Adam Barkalow, ADA course alumnus

2015 ADA1 Peer Mentors, Fall 2015
Carrie Booth, Education grad student, ADA course alumna
Armida Carbajal, Stat grad student
Andisheh Dadashi, Stat grad student
Jerry Hatch, ADA course alumnus, Stat MS student
John Pesko, Stat PhD student
Ana Oaxaca, ADA course alumna
Juan Pablo Madrigal Cianci, Applied Math grad student, ADA course alumnus
Angela Gregory, ADA course alumna, MS
Erin Ochoa, ADA course alumna

Training

2016 Mentee to Beth Chance, ASA Section on Statistical Education Mentoring Program

2016 eCOTS Electronic Conference On Teaching Statistics, May 16–20, 2016; panel discussant.

2016 Wesleyan University, Passion Driven Statistics, Jan 13-16, 2016.

2015 UNM CTE GetSet and Reset, Workshop series, Aug 2015.

2015 USCOTS United States Conference On Teaching Statistics, State College, PA, May 26–30, 2015.

2015 UNM CTE Center for Teaching Excellence, Effective Communication and Decision Making in a "Diverse" Environment, Apr 2015.

2015 UNM CTE Center for Teaching Excellence, A Hands-On Introduction to Screencasting, Feb 2015.

2015 UNM CTE Center for Teaching Excellence, Course Design Institute, Jan 2015.

2012 UNM OSET Designing Courses for Effective Student Learning, Faculty and Instructors Institute, May 2012.

2007 UNM Success in the Classroom: Sharing Practices That Work, CASTL, Feb 2007.

2006 UNM Success in the Classroom: Sharing Practices That Work, CASTL, Feb 2006.

2004 UNM Teaching Assistant Resource Center (TARC) certificate of completion for Interest and Concern for Teaching Excellence, Fall 2004. cert

2004 WPI Graduate Student TA Training Seminar Certificate, Spr 2004.

2002 WPI Seminar in College Teaching, Sum 2002.

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Data visualization education talks

cx1 Allen, E. and E. B. **Erhardt** (2017). "Handbook of psychophysiology". In: ed. by J. T. Cacioppo, L. G. Tassinary, and G. Berntson. 4th ed. pdf book. Cambridge: Cambridge University Press. Chap. 31. Visualizing Scientific Data, pp. 679–697. ISBN: 9781107058521. DOI: 10.1017/9781107415782.031.

2021 (12) "Visualizing Scientific Data" , *UNM Bureau of Business and Economic Research, 23rd Annual NM Data Users Conference*, Albuquerque, NM, Nov 29 – Dec 3, 2021.

2020 (11) "Visualizing Scientific Data" , *San Diego State University, Department of Mathematics & Statistics*, Remotely via Zoom, Oct 14, 2020.

2018 (10) "Visualizing Scientific Data" , *University of California, Irvine, Department of Statistics, Seminar (video)*, Irvine, CA, Feb 8, 2018.

2016 (9) "Visualizing Scientific Data" , *San Juan College, organized by David Wesch*, Farmington, NM, Nov 4, 2016.

2016 (8) "Visualizing Scientific Data" , *University of Iceland, Department of Physical Sciences*, Reykjavík, Ísland, Aug 15, 2016.

2022 (7) "Visualizing Scientific Data" , *UNM Art & Science of Data Event (UNM Data Day)*, Albuquerque, NM 87131, Jan 12, 2022.

2020 (6) "Visualizing Scientific Data" , *UNM Clinical and Translational Investigator Program (CTIP)*, Albuquerque, NM 87106, Jul 30, 2020.

2019 (5) "Visualizing Scientific Data" , *UNM Clinical and Translational Investigator Program (CTIP)*, Albuquerque, NM 87106, Sep 17, 2019.

2017 (4) "QuantBrains: Visualizing scientific data" , *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, Apr 7, 2017.

2016 (3) "Visualizing Scientific Data" , *UNM Clinical and Translational Investigator Program (CTIP)*, Albuquerque, NM 87106, Sep 20, 2016.

2015 (2) "Visualizing Scientific Data" , *Mind Research Network, COBRE2*, Albuquerque, NM 87106, Jul 10, 2015.

2016 Mountain West Clinical Translational Research - Infrastructure Network (CTR-IN, 3rd Annual), UNLV, Las Vegas, NV, **invited** plenary speaker , Jun 6–8, 2016.

Replication crisis talks

2016 (7) "The Crisis of Replication in Biomedical and Behavioral Research", *San Juan College, organized by David Wesch*, Farmington, NM, Nov 4, 2016.

2016 (6) "The Crisis of Replication in Biomedical and Behavioral Research", *University of New Mexico, Cristina Murray-Krezan, BIOM 559: Biostatistics for Clinical and Translational Research*, Albuquerque, NM, Sep 21, 2016.

2016 (5) "Psychology's Crisis of Replication", *Mind Research Network, COBRE2*, Albuquerque, NM 87106, May 6, 2016 and May 13, 2016.

2016 (4) "The Crisis of Replication in Biomedical and Behavioral Research", *University of New Mexico, CTIP Didactic Presentation, Clinical and Translational Investigator Program*, Albuquerque, NM, April 19, 2016.

2016 (3) "Psychology's Crisis of Replication", *University of New Mexico, Department of Psychology, Psy 492 Honors Seminar (Prof. Eric Ruthruff)*, Albuquerque, NM, Mar 28, 2016.

2015 (2) "Psychology's Crisis of Replication", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, Sep 18, 2015.

2015 (1) "Psychology's Crisis of Replication", *Mind Research Network, COBRE2*, Albuquerque, NM 87106, Sep 11, 2015 and Oct 16, 2015.

Reproducibility talks

2018 (3) "Reproducibility in Imaging", *Mind Research Network, COBRE2*, Albuquerque, NM 87106, Sep 31, 2018.

2016 (2) "Reproducible research with R and knitr", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, April 8, 2016.

2016 (1) "LaTeX, its capabilities and why you should be using it", *University of New Mexico, Department of Mathematics and Statistics*, Albuquerque, NM, April 1, 2016.

Statistical methods talks

2022 (6) "Generalized linear models and generalized estimating equations", *Mind Research Network, COBRE3*, Albuquerque, NM 87106, Jan 7, 2022.

2020 (5) "The Statistical Bootstrap, an Introduction with Examples", *Mind Research Network, COBRE3*, Albuquerque, NM 87106, Jul 31, 2020.

2014 (4) "The Statistical Bootstrap, an Introduction with Examples", *IEEE Engineering in Medicine & Biology Society Technical Meeting / Educational Speaker Series, Mind Research Network*, Albuquerque, NM 87106, Dec 16, 2014.

2014 (3) "From Repeated Measures ANOVA to Mixed Models", *Andrew Mayer's lab, Mind Research Network*, Albuquerque, NM 87106, Apr 25, 2014.

2014 (2) "From Repeated Measures ANOVA to Mixed Models", *Mind Research Network, COBRE2*, Albuquerque, NM 87106, Mar 28, 2014.

2010 (1) "Discussion of Bacchetti's 'Current Sample Size Conventions: Flaws, Harms, and Alternatives' ", *Mind Research Network, Medical Image Analysis Laboratory (MIALab)*, Albuquerque, NM 87106, Dec 17, 2010.

Productivity talks

2017 (1) "Productivity and Time Management Workshop", GTD, *University of New Mexico, Advance at UNM*, Albuquerque, NM, Sep 8, 2017.

Meetings

2019 National Numeracy Network (NNN) 2019 Annual Meeting, Austin, TX. Talk . Oct 11–13, 2019.

2019 USCOTS United States Conference On Teaching Statistics, State College, PA. Short course instructor. May 15–19, 2019.

2016 eCOTS Electronic Conference On Teaching Statistics, webinar series, panel discussant, May 16–20, 2016

2015 USCOTS United States Conference On Teaching Statistics, State College, PA, May 26–30, 2015.

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This section is for maintaining an active bibliography on Statistics education with the intent to implement the best theory, strategies, and resources at UNM.

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