



Welcome to Today's Webinar!

# **The Growing Role of Statistics and Data Science in Grades 6-12 Education: Implications for Mathematics Teacher Educators**

## **Presenters:**

**Stephanie Casey**, Eastern Michigan University  
**Rick Hudson**, University of Southern Indiana  
**Hollylynn Lee**, North Carolina State University  
**Gemma Mojica**, North Carolina State University

## **Hosted by:**

**Enrique Galindo**, AMTE President  
**Shari Stockero**, AMTE Executive Director  
**Megan Burton**, AMTE Past-President



## Announcements:

- **Virtual Institute:** *Considerations for Designing, Teaching, and Assessing Methods of Teaching Mathematics Courses* on Thursday, November 9
- **STaR 2024 Cohort Applications** are due November 15
- **AMTE Conference Regular Registration** deadline is November 30

# The growing role of statistics and data science in grades 6-12 education: Implications for mathematics teacher educators

*Webinar co-sponsored by:*

*AMTE Statistics Teacher Education Community Circle*

*ESTEEM II Project*

*October 12, 2023*

# Project PIs

Hollylynne Lee, NC State University

Gemma Mojica, NC State University

Stephanie Casey, Eastern Michigan University

Rick Hudson, University of Southern Indiana

Bill Finzer, Concord Consortium

DUE  
2141727  
2141724  
2141716



# The Data Revolution is Here

What is needed to *revolutionize* students' access to learning with and from data about their world?

	EUR	GBP	USD	JPY	AUD	CAD	CHF	HKD	SGD	INR	BRL	RUB	ZAR	THB	MYR	PHP	VND	IDR	SGD	HKD	EUR
EUR	1.00	0.85	1.10	160.00	0.75	0.70	0.90	7.80	1.35	83.00	5.50	75.00	17.00	3.40	4.80	24.00	23.00	15.50	1.35	7.80	0.85
GBP		1.00	1.25	190.00	0.85	0.80	1.05	8.50	1.45	90.00	6.00	80.00	18.00	3.60	5.20	26.00	25.00	16.50	1.45	8.50	1.00
USD			1.00	150.00	0.70	0.65	0.85	7.20	1.30	78.00	5.00	70.00	16.00	3.20	4.50	23.00	22.00	14.50	1.30	7.20	1.10
JPY				1.00	0.0045	0.0042	0.0055	0.0130	0.0075	0.00045	0.0035	0.0080	0.0180	0.0030	0.0040	0.0200	0.0190	0.0013	0.0075	0.0130	0.0100
AUD					1.00	0.90	1.25	10.00	1.70	130.00	7.00	100.00	22.00	4.50	6.20	30.00	29.00	19.00	1.70	10.00	1.00
CAD						1.00	1.35	11.00	2.00	150.00	8.00	110.00	24.00	5.00	6.80	33.00	32.00	21.00	2.00	11.00	1.35
CHF							1.00	8.50	1.45	110.00	6.50	95.00	21.00	4.20	5.80	28.00	27.00	17.50	1.45	8.50	1.00
HKD								1.00	7.80	78.00	4.00	75.00	17.00	3.40	4.80	24.00	23.00	15.50	7.80	78.00	1.00
SGD									1.00	1.35	13.50	13.50	3.00	4.20	5.20	26.00	25.00	16.50	1.35	13.50	1.35
INR										1.00	75.00	75.00	17.00	3.40	4.80	24.00	23.00	15.50	75.00	75.00	75.00
BRL											1.00	5.50	5.50	1.20	1.70	8.50	8.00	5.50	5.50	5.50	5.50
RUB												1.00	75.00	17.00	23.00	110.00	110.00	75.00	75.00	75.00	75.00
ZAR													1.00	17.00	18.00	90.00	90.00	17.00	17.00	17.00	17.00
THB														1.00	3.40	3.60	18.00	18.00	3.40	3.40	3.40
MYR															1.00	4.80	5.20	26.00	4.80	4.80	4.80
PHP																1.00	24.00	24.00	24.00	24.00	24.00
VND																	1.00	23.00	23.00	23.00	23.00
IDR																		1.00	15.50	15.50	15.50

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The last decade has seen increased attention to statistics and data science in K-12 education

International, national, and state levels

# Sample of International Efforts

[International Data Science in Schools Project \(IDSSP\)](#): a cross-disciplinary project involving an international team of computer scientists and statisticians from the leading professional organizations for both disciplines. The purpose of the project is to promote and support the teaching of Introductory Data Science, particularly in the final years of K-12 schooling.

[Curriculum Framework for Introductory Data Science](#)  
*Released in Sept. 2019.*

International Association for Statistics Education  
[2021 Satellite Conference:](#)  
*Statistics Education in the Era of Data Science*

These frameworks are endorsed by:

[ACEMS](#)



[American Statistical Association](#)



[BCS The Chartered Institute for IT](#)



[International Statistical Institute](#)



[New Zealand Statistical Association](#)



[Royal Statistical Society](#)



[Statistical Society of Australia](#)



[Teaching Statistics Trust](#)



# What is Happening Across the U.S.?

## INCREASED EMPHASIS ON STATISTICS AND DATA

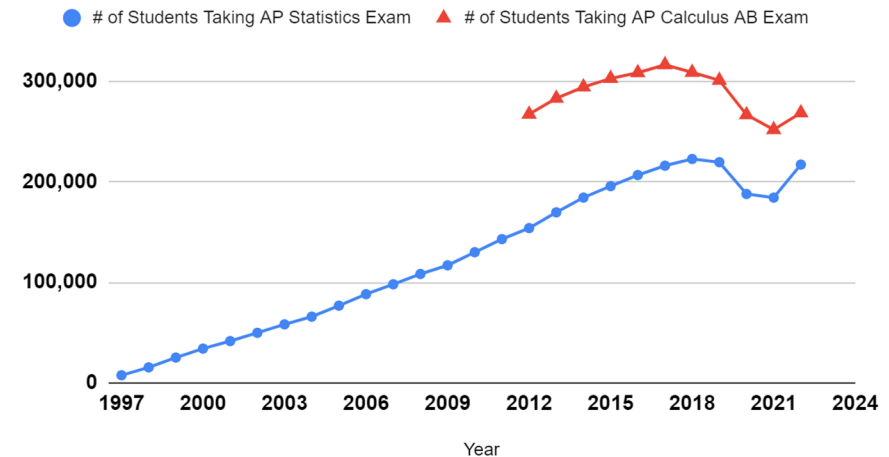
### ASA-NCTM Joint Committee Efforts in K-12 Professional Learning for Teaching Statistics

- “Meeting within a Meeting” for K-12 Teachers held with Joint Statistics Meeting, Typical attendance **15-40** teachers
- Virtual since 2020, with **80-100** teachers attending across 2 days

NSF-funded Mobilize project created an *Intro to Data Science* course in high schools since ~2013

Increase in enrollment in high school statistics classes (AP and non-AP)

Growth of AP Statistics Exam Participation





# What is Happening Across the U.S.?

[Launch Years Initiative](#): *Bringing more applicable and modern content into HS math curriculum; 22 states*



[Data Science Course Framework](#), released 2021

**NCER and IES** Technical Working Group, 2021

- *Catalyzing a New Field: Data Science Education in K-12* [Report and Recommendations](#)

**National Academies of Sciences**

- *Foundations for Data Science in K-12*, September 2022. [Summary report available](#)

[Data Science 4 Everyone](#), since 2019. Organizational commitments, a resource hub, and webinars



[YouCubed K-12 Data Science](#) since 2020; data talks (like number talks), curriculum, PD



# Joint Position Statement

## [Preparing PreK - 12 Teachers of Statistics](#), September 2022

Students, teachers, administrators, employers, and others increasingly recognize statistics and data science as important scientific fields of study. Mathematics content standards emphasize that the development of statistical thinking begins in the early grades and extends into and beyond high school. **To successfully develop students' statistical thinking, teachers must have deep knowledge and understanding of statistics and the way that students learn statistics. Teachers of secondary-level data science must have knowledge of developing students' statistical and computational thinking in the presence of data.** Consequently, the need is critical for high-quality preservice and in-service preparation and professional development that supports PK–12 teachers of mathematics and statistics, new and experienced, in developing their own statistical proficiency as well as their students' understanding of and skill in working with statistics and data science. **The preparation of PK–12 teachers of statistics and data science must also include explicit attention to equitable use of statistics and data and critical data literacy.**



NATIONAL COUNCIL OF  
TEACHERS OF MATHEMATICS



# New Joint Position Statement

**Data Science in K-12 Education** -- to be released  
late 2023-early 2024

- Data science is contextual and multidisciplinary
- Data science is an investigative process
- Data science understandings and experiences are for everyone
- Data science educators must develop and practice ethical uses of data



# Data Science Efforts at the State Level

*Estimated active K-12 Data Science programs:*

**1,600+** schools / districts

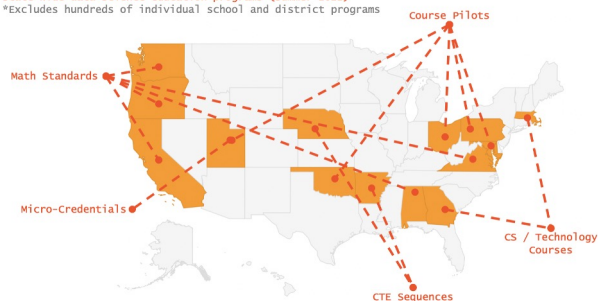
**2,000+** teachers

**180,000+** students

**14** statewide programs

State-wide data science education programs (Summer 2022)

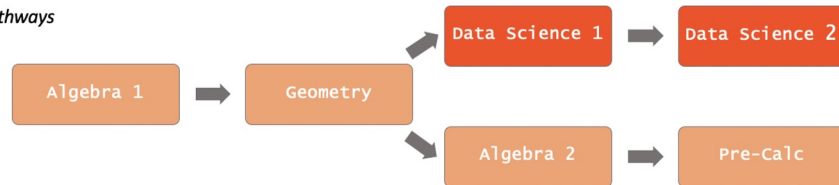
\*Excludes hundreds of individual school and district programs



*Electives*



*Math Pathways*



*Modernized Courses*



Data and images from Zarek Drozda, *Hearing from Practice: What is Happening in and Out of Schools?* September 14, 2022 at National Academies. Slide deck and paper available at <https://www.nationalacademies.org/event/09-13-2022/foundations-of-data-science-for-students-in-grades-k-12-a-workshop-days-1-and-2>

# Examples of State Initiatives

## Virginia

- Updated [Mathematics standards](#) include a course in Data Science in high school, 2023

## California

- New [K-12 Mathematics Framework](#) includes strong focus on data science, 2023

## Oregon

- Added data reasoning throughout [K-12 mathematics curriculum standards](#)
- Data Science course in high school as an alternative to Algebra II

## Ohio

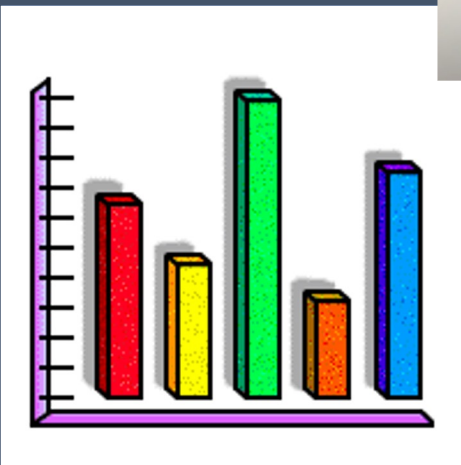
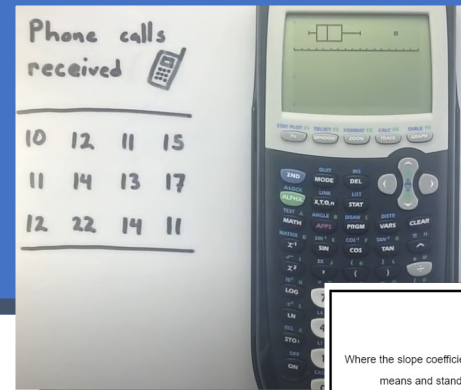
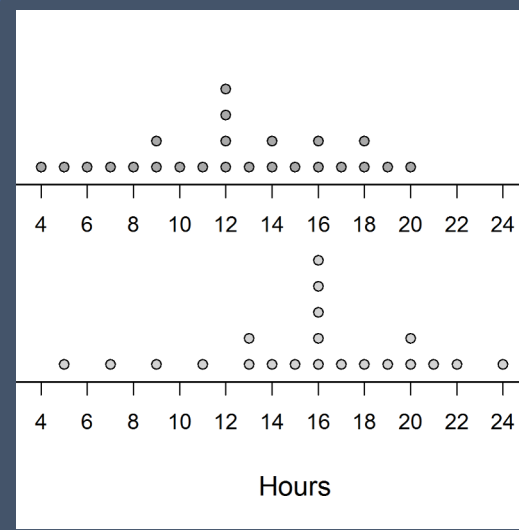
- [5 different math course options](#) after Algebra 1 & Geometry: 1) *Statistics and Probability*, 2) *Data Science Foundations*, 3) *Discrete Math & Computer Sci*, 4) *Quant Reasoning*, or 5) *Algebra 2*
- Data Science Foundations course taught using *Introduction to Data Science* curriculum

## North Carolina

- [Math 4](#), since 2020 is about 1/3 statistics and probability content
- Introduction to Data Science class, started 2021 as part of Career & Technical Education

# What has changed?

## Statistics and Data Science



Recall the equation of the least squares regression line is

$$\hat{y} = a + bx$$

Where the slope coefficient  $b$  and intercept coefficient  $a$  are determined from the sample data, specifically the means and standard deviations for each variable and the correlation coefficient between them:

$$b = r \frac{s_y}{s_x} \quad a = \bar{y} - b\bar{x}$$

$\bar{x}$  is the mean of the  $x$  variable,  $s_x$  is the standard deviation of the  $x$  variable.  
 $\bar{y}$  is the mean of the  $y$  variable,  $s_y$  is the standard deviation of the  $y$  variable.  
 $r$  is the correlation coefficient

The means and standard deviations of sports cars' weight and fuel efficiency and the correlation between them are reported in the table below:

	Mean	Standard Deviation	Correlation
Weight	2997	357.6	-0.816
MPG	20.867	3.044	

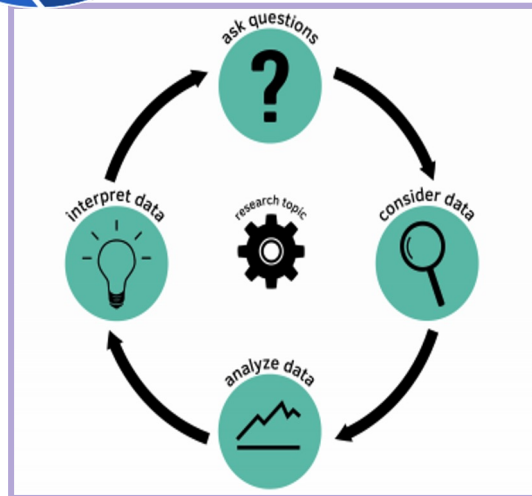
- Use this information to determine (by hand) the coefficients of the least squares line for predicting a car's miles per gallon rating from its weight. Report the equation of this line.
- Use the regression line to predict the city MPG rating for the Audi TT, whose weight is 2655 pounds.
- By how many miles per gallon does the least squares line predict a car's fuel efficiency to drop for each additional 100 pounds of weight? (Use the slope coefficient to answer this question.)
- What proportion of the variability in cars' miles per gallon ratings is explained by the least squares line with weight?

# What are the typical experiences students have in learning statistics in school?

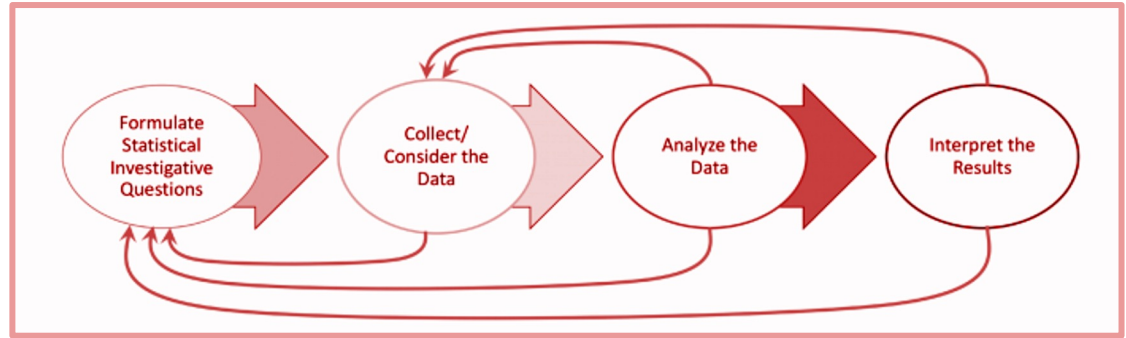
# Statistics as a problem solving process



PCA Model (Friel et al., 2006;  
Graham, 1987; Lee & Tran, 2015)



Data Cycle (Gould et al., 2016)

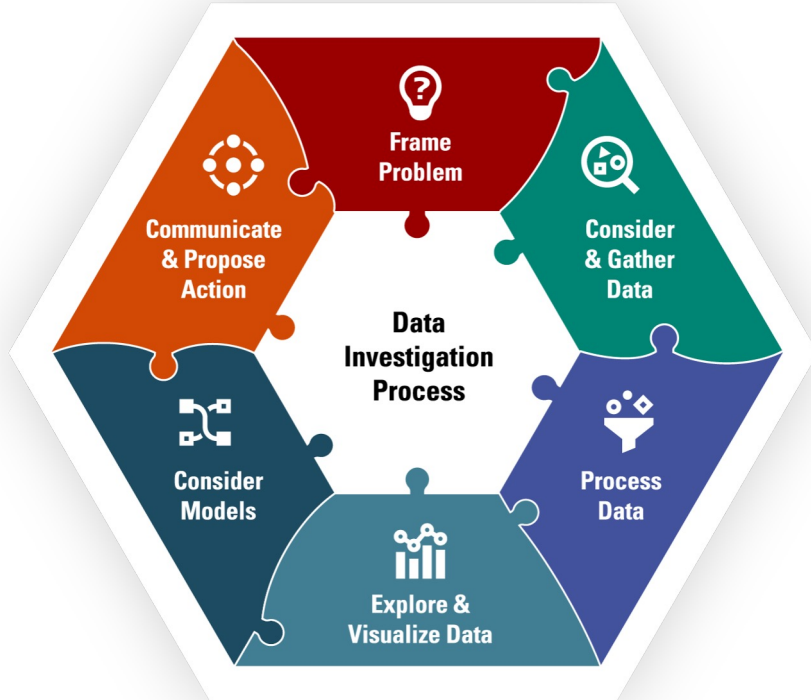


Statistical Problem Solving as an Investigation Process (GAISE II, 2020)

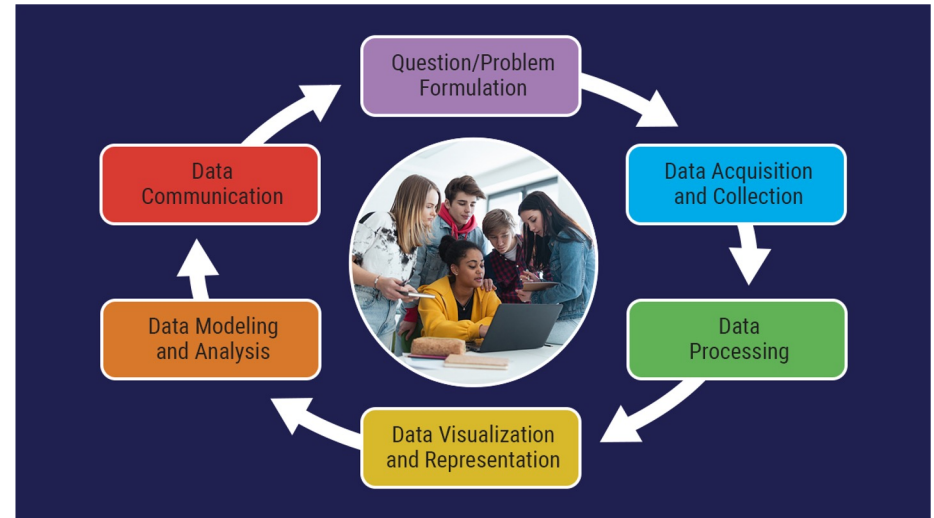


# Data Science Processes

## Data Investigation Process (Lee et al, 2022)



## Virginia's Data Science Cycle



# How Student Expectations and Experiences Have Changed

Recall the equation of the least squares regression line is

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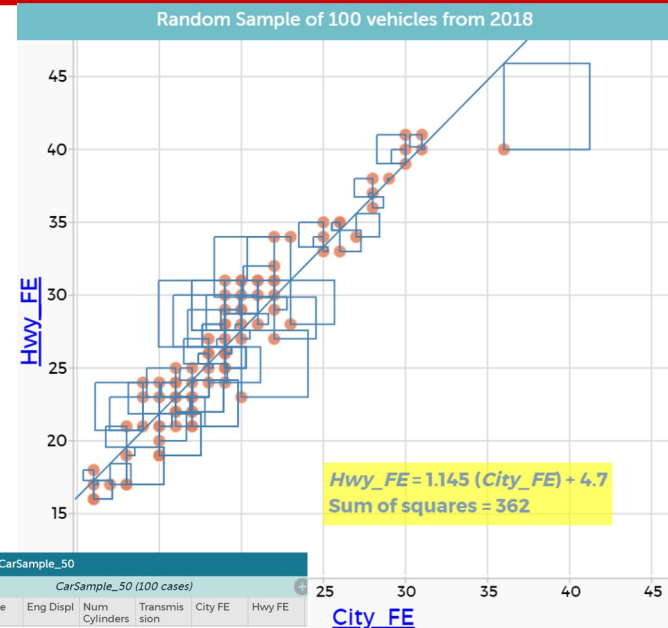
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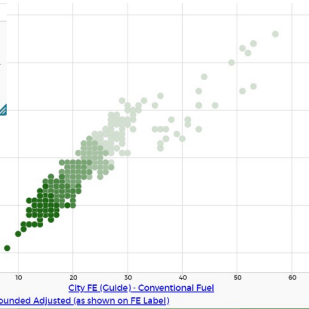
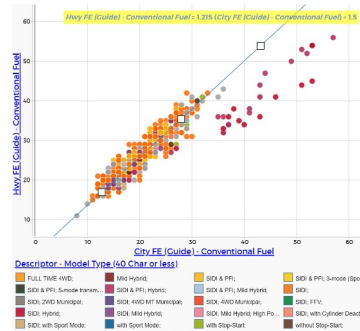
CarSample\_50

Divisions (34 cases)		CarSample_50 (100 cases)						
index	Division	index	Carline	Eng Displ	Num Cylinders	Transmis sion	City FE	Hwy FE
1	Porsche	1	Panama...	4.8	8	Auto	16	24
2	HYUNDAI	2	Macan T...	3.6	6	Auto	17	23
3	LEXUS	3	Cayenn...	3	6	Auto	20	29
4	NISSAN	4	911 Targ...	3.4	6	Auto	19	26
5	KIA MO...	5	Boxster ...	3.4	6	Auto	22	31
6	INFINITI	6	Boxster S	3.4	6	Manual	20	28
7	TOYOTA	1	Sonata...	2	4	Auto	21	31
8	MAZDA	2	Santa F...	3.3	6	Auto	17	22
9	BMW	3	Santa F...	2.4	4	Auto	19	25
10	SCION	1	ES 350	3.5	6	Auto	21	31
11	Ford	2	CX 460	4.6	8	Auto	15	20
12	Honda	3	RC 350	3.5	6	Auto	19	28

# How Student Expectations and Experiences Have Changed

I wonder about the fuel efficiency and CO2 emissions for vehicles in 2024

Model	Mfr	Year	Division	Carline	Verify	Index	Eng Displ	# Cyl
2024 BMW 25i	BMW	2024	BMW	M6 Comm.	BMX	491	3	
2024 Volkswagen Beetle	VWGA	2024	VWGA	M4 Comm.	BMX	480	3	
2024 General Motors Corvete	GMGX	2024	GMGX	M4 Comm.	BMX	492	3	



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**www.fueleconomy.gov**  
the official U.S. government source for fuel economy information

Find a Car: Save Money & Fuel Benefits | My MPG | Advanced Cars & Fuels | About EPA Ratings | Home | Q

**Download Fuel Economy Data**

Fuel economy data are the result of vehicle testing done at the Environmental Protection Agency's National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Michigan, and by vehicle manufacturers with oversight by EPA.

**Attention! Revised Estimates**

- EPA Revises MPG Estimates for 2013-17 Audi, Bentley, Porsche and Volkswagen vehicles
- EPA Revises MPG Estimates for 2014 Honda Cooper and Cooper S
- EPA Revises MPG Estimates for 2013-14 Mercedes C300 4matic
- EPA Revises MPG Estimates for 2013-14 Ford vehicles
- 2012-13 Hyundai Data Revised (November 2, 2012)
- 2012-13 Kia Data Revised (November 2, 2012)

**Datasets for All Model Years (1984-2024)**  
(Updated: Monday October 09 2023)

- In order to make estimates comparable across model years, the MPG estimates for all 1984-2007 model year vehicles and some 2011-2016 model year vehicles have been revised. Learn More
- Fueleconomy.gov Web Services for Developers
- Zipped CSV File (Documentation)
- Unzipped CSV File (Documentation)
- Zipped XML File (Documentation)

**Datasets and Guides for Individual Model Years**

- The MPG estimates in the files below reflect the original estimates shown on the EPA Fuel Economy Label. MPG's and kWh/100 mile estimates for plug-in vehicles include those that occur during charging.

**Downloadable Fuel Economy Data**

Fuel Economy Guide	EPA Green Vehicle Guide	SmartWay Vehicle List
Download	Download	Download
2024 Datafile (PRELIMINARY)	2024 Guide (TEXT)	2024 Datafile (TEXT)

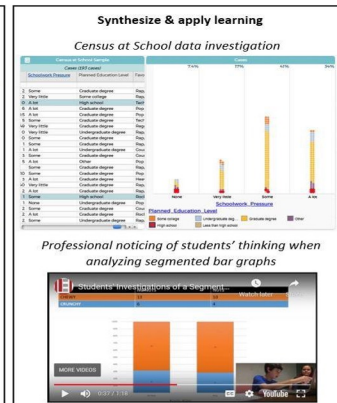
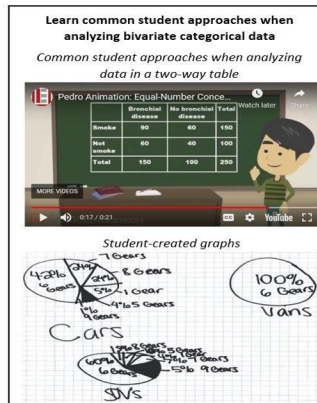
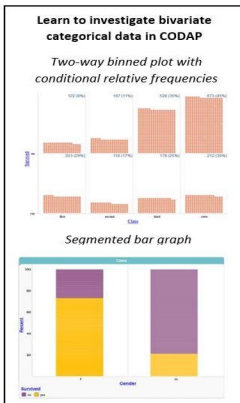
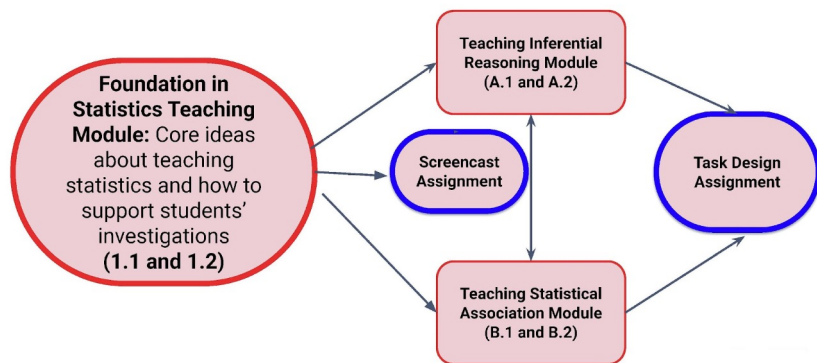
2024 FE Guide for DOE release dates before 10-4-2023-no sales -10-4-2023public

Mfr Name (20 car)	in. dex	Model Year	Division	Carline	Verify	Index	Eng Displ	# Cyl
1 BMW	25	2024	BMW	M6 Comm.	BMX	491	3	
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3 General	27	2024	BMW	M4 Comm.	BMX	492	3	
4 Ferrari	28	2024	BMW	M440i C.	BMX	414	3	
5 Jaguar L.	29	2024	BMW	M440i C.	BMX	410	3	
6 Nissan	30	2024	BMW	M440i x.	BMX	415	3	
7 Porsche	31	2024	BMW	M440i x.	BMX	412	3	
8 Toyota	32	2024	BMW	M6Comm.	BMX	493	3	
9 Ford Mo.	33	2024	BMW	M8 Comm.	BMX	862	4.4	
10 Maserati	34	2024	BMW	M8 Comm.	BMX	860	4.4	
11 Mercedes	35	2024	BMW	M840i C.	BMX	503	4.4	
12 Mitsub...	36	2024	BMW	M850i x.	BMX	850	4.4	
13 Volvo	37	2024	Mini	COOPE.	BMX	32	15	
14 FCA US ...	38	2024	Mini	COOPE.	BMX	33	15	
15 Honda	39	2024	Mini	COOPE.	BMX	34	15	
16 Hyundai	40	2024	Mini	COOPE.	BMX	35	15	
17 Kia	41	2024	Mini	COOPE.	BMX	54	2	
18 MAZDA	42	2024	Mini	COOPE.	BMX	55	2	
19 Subaru	43	2024	Mini	COOPE.	BMX	56	2	



# Where We Began in 2016

## Enhancing Statistics Teacher Education Through E-Modules



40+ hrs of multimedia material

150+ faculty as ESTEEM users

Materials are FREE and can be imported directly into LMSs



# BROAD GOAL FOR ESTEEM II

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**Transform *undergraduate teacher preparation* to support developing teachers who are knowledgeable and confident in teaching Data Science & Statistics (DS&S)**

Primary focus:

Preparation of middle and high school mathematics teachers

Secondary focus:

Preparation of other content teachers where data and statistics is utilized for learning (e.g., science, social studies, computer science, engineering)

# In 2022, ESTEEM II launched...

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**Goal A:** Investigate the current systems in undergraduate teacher preparation for teaching data science and statistics [DS&S].

**Goal B:** Build and sustain a DS&S teacher education networked improvement community.

**Goal C:** Reach a broad, large, and diverse teacher education audience through developing, curating and disseminating high quality DS&S teacher education curriculum materials.



# ESTEEM II Goals

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**Goal A:** Investigate the current systems in undergraduate teacher preparation for teaching data science and statistics [DS&S].

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**Goal C:** Reach a broad, large, and diverse teacher education audience through developing, curating and disseminating high quality DS&S teacher education curriculum materials.



# How prepared are novice mathematics teachers to teach statistics and data science? Preliminary results

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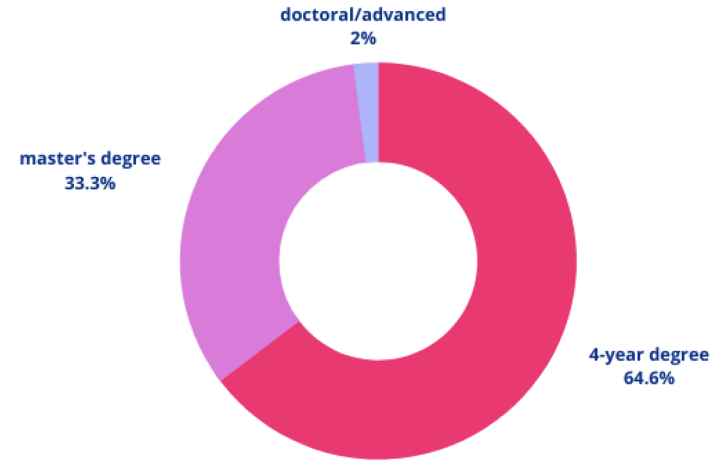
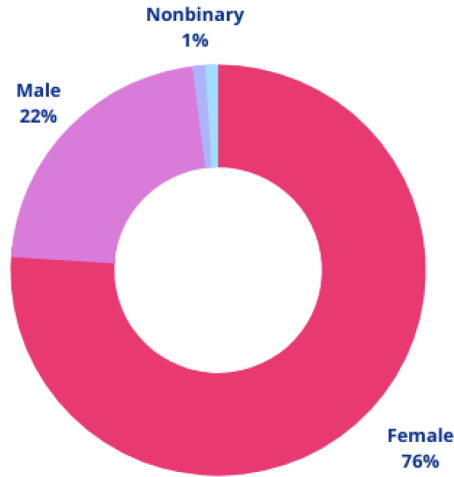
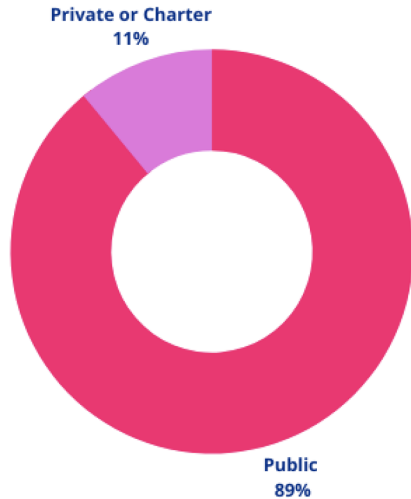
## **Early Career Mathematics Teacher (ECMT) Study**

- **Collected Data in Spring-Summer 2023**
- **Participants: 70+ grades 6-12 teachers within their first three years of teaching career**
- **Study included examining:**
  - **Practices for Teaching Statistics**
  - **Content Knowledge (LOCUS)**
  - **Pedagogical Content Knowledge**
  - **Attitudes towards Statistics (I-SOMAS)**
  - **Self-efficacy for Teaching Statistics (SETS)**



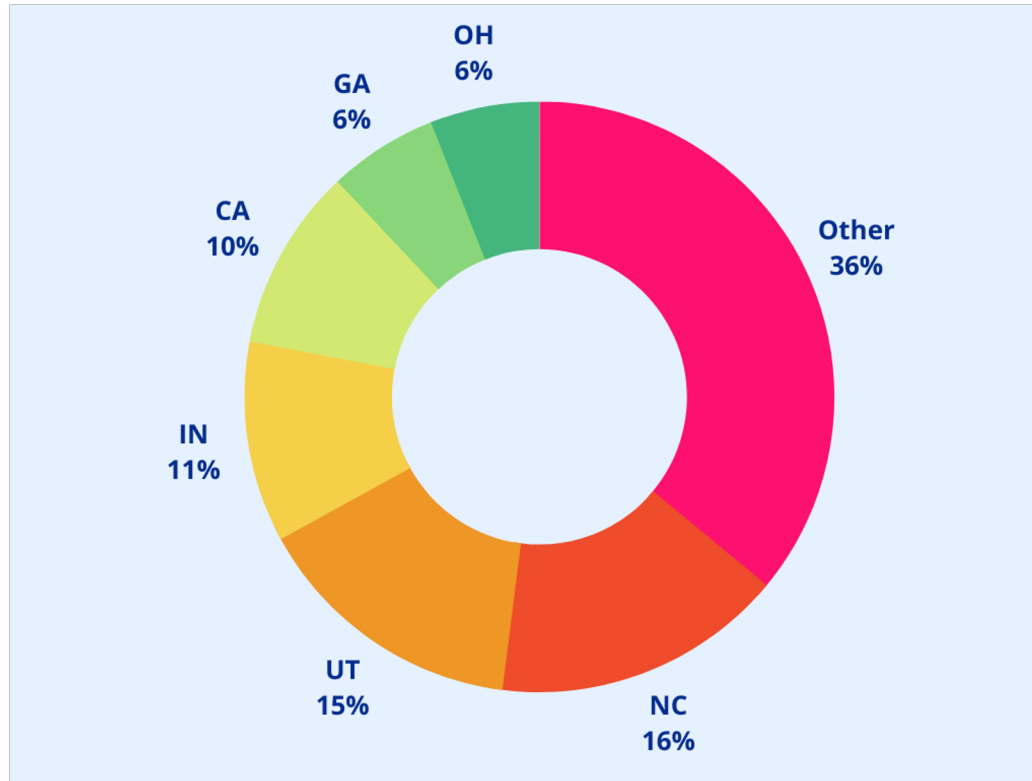
# Participant Demographics

81 ECMTs shared demographic data



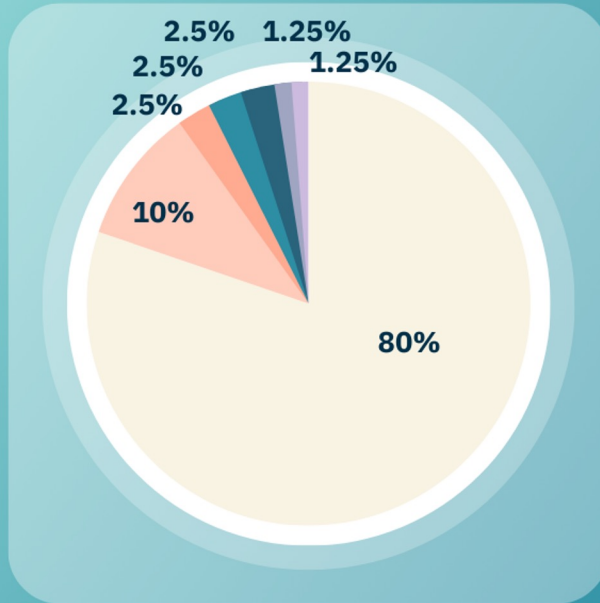
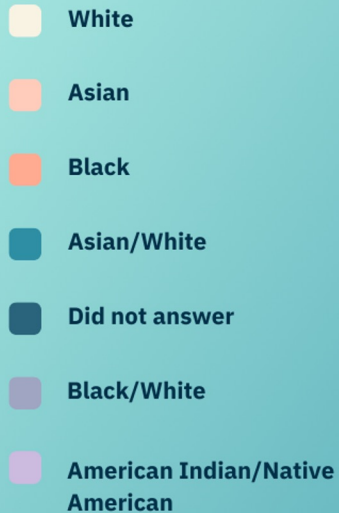
# Where do they teach?

Participants represent 22 states in the U.S.



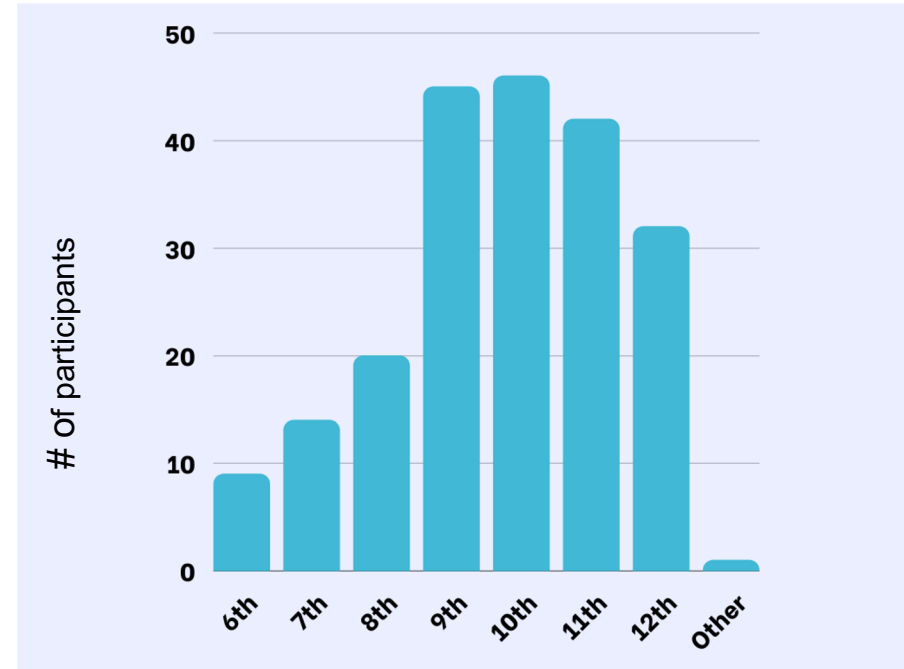
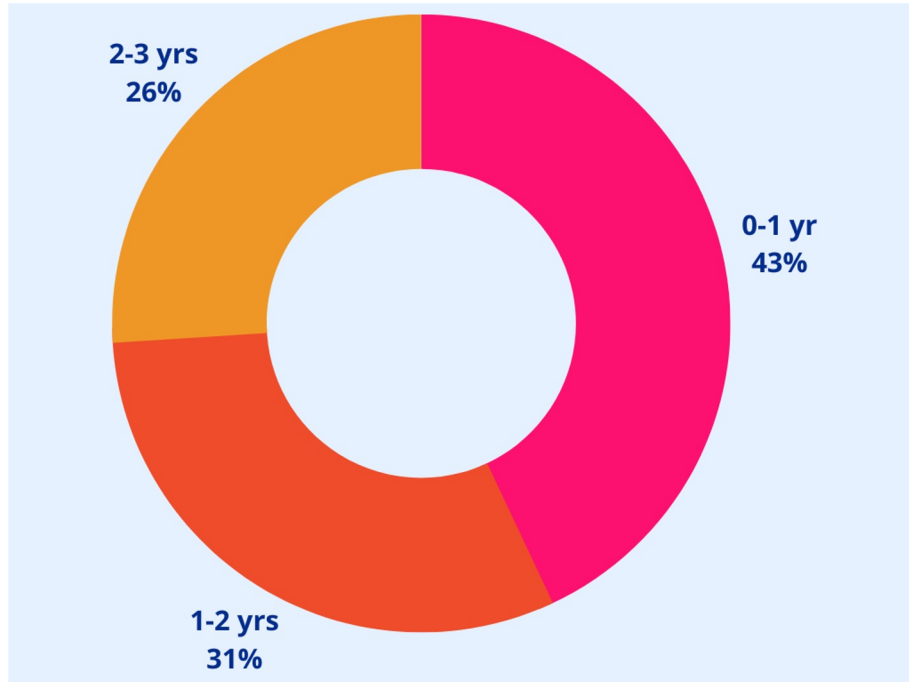
# What are their ethnicities and racial identities?

## Racial Identity

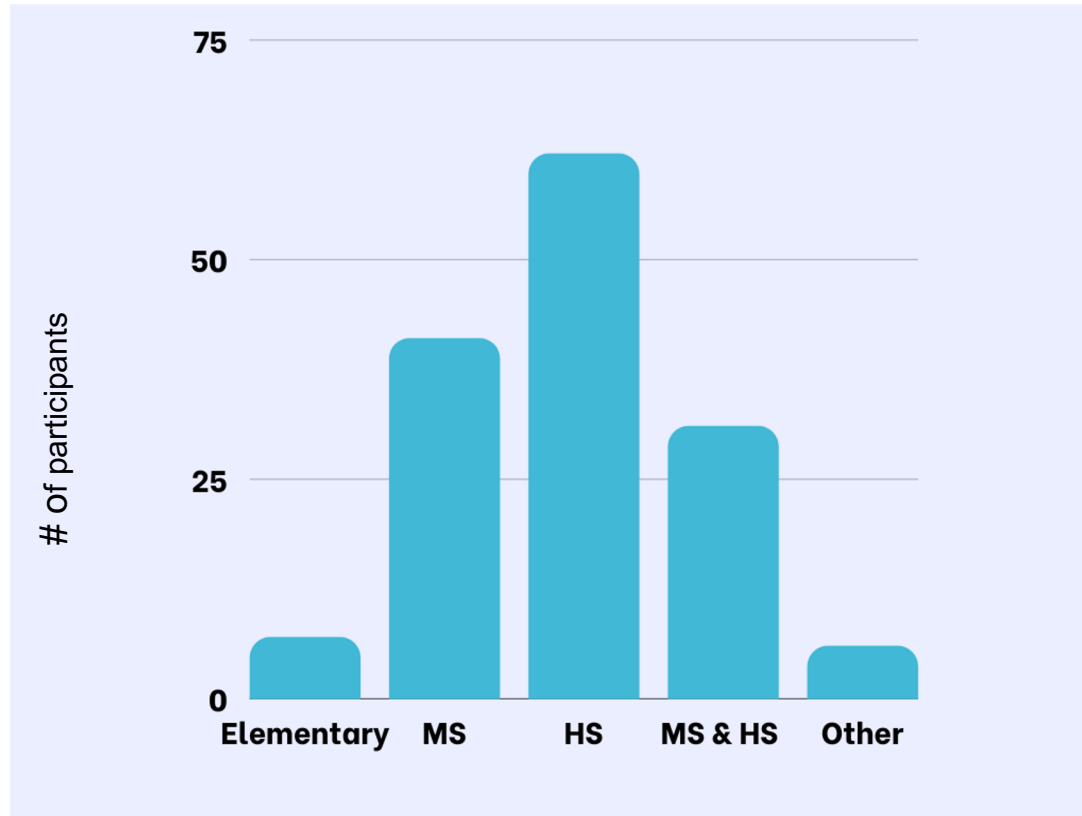


- **10% identify as Hispanic/Latino/Spanish Origin**
- **90% identify as Non-Hispanic/Latino/Spanish Origin**

# How many years of teaching experience do they have and what grade levels do they teach?



# What type of teacher preparation program did they complete?



# Practices

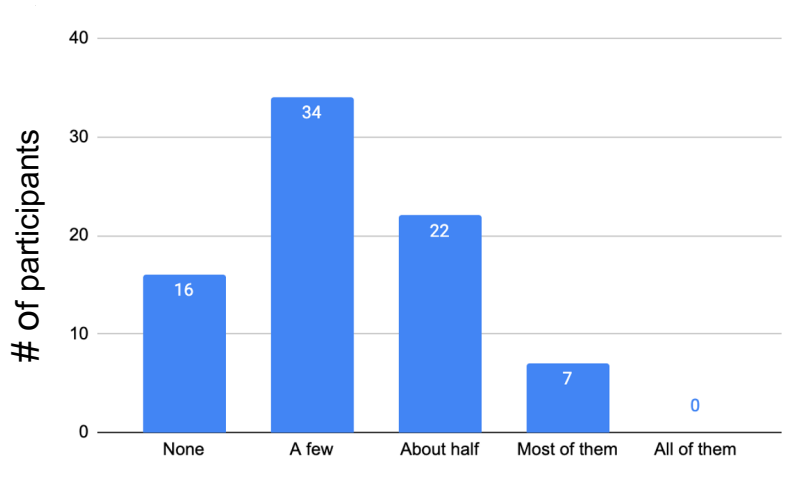
## *What type of technology do ECMTs use?*

Technology Tool	ECMT uses for deomonstration	Students use
Spreadsheets	38%	27%
Web apps (e.g., Rossman & Chance)	15%	11%
Data visualization/analysis tools (e.g., CODAP)	15%	10%
Statistical software (e.g., StatCrunch, JMP)	6%	1%
Open source programming tools (e.g., R, Python)	6%	1%

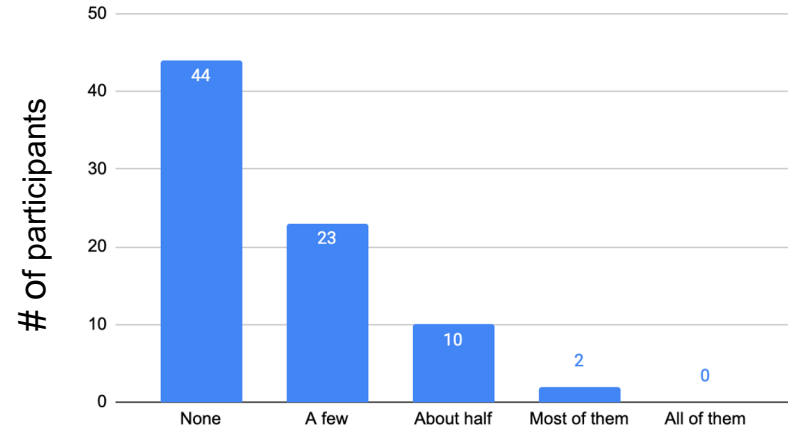
81% indicated their students use technology tools, **other than the GC**, to explore, visualize or analyze data

# Practices

***Do ECMTs provide opportunities for students to engage with “large data”?***



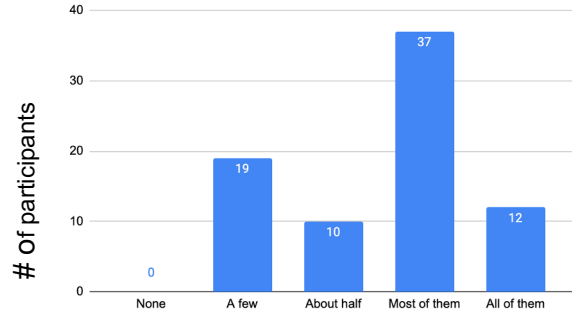
Data contain 26-100 cases



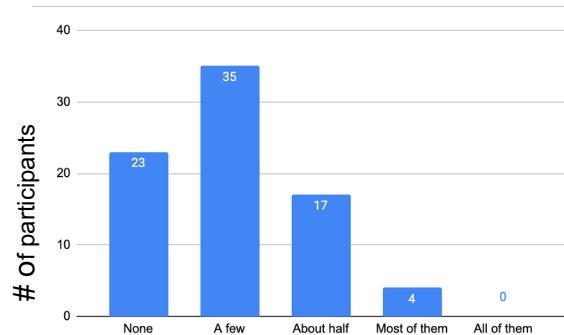
Data contain 101-1000 cases

# Practices

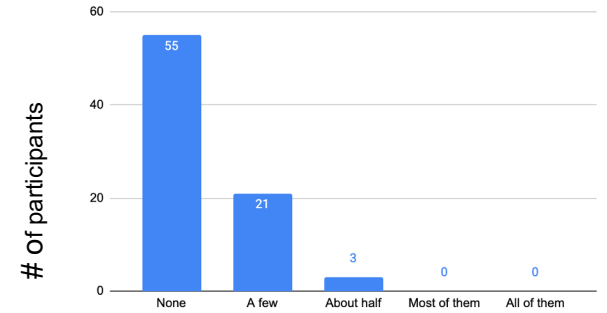
***Do ECMTs provide opportunities for students to engage with multivariate data?***



Data contain 1 or 2 attributes



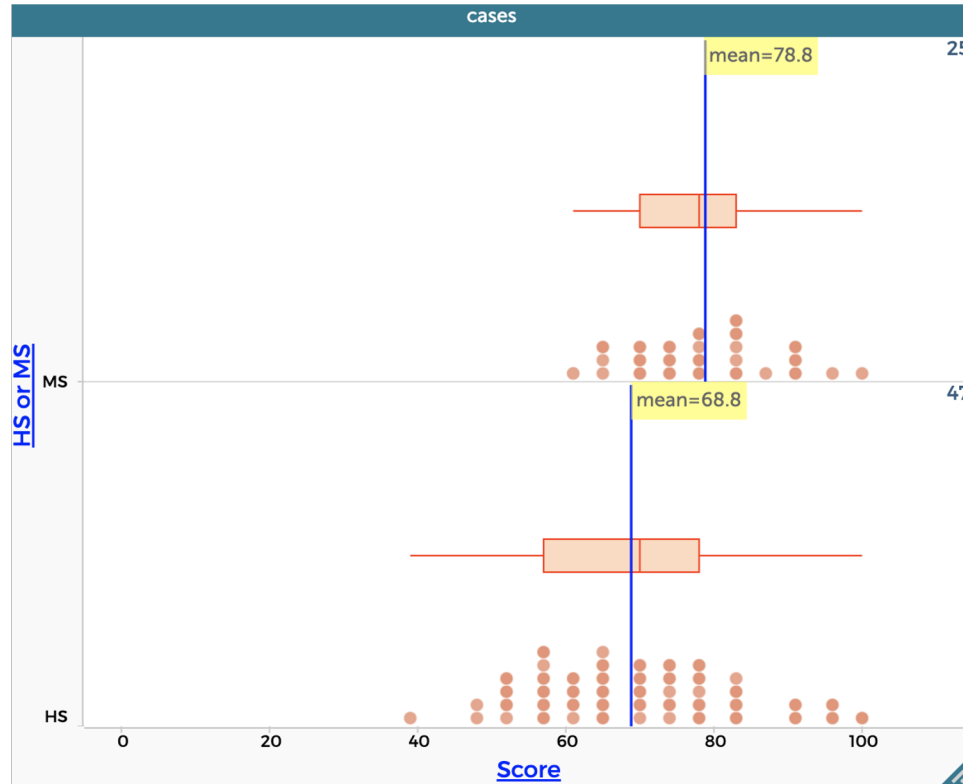
Data contain 3-10 attributes



Data contain more than 10 attributes



# Content Knowledge ( $n = 72$ )

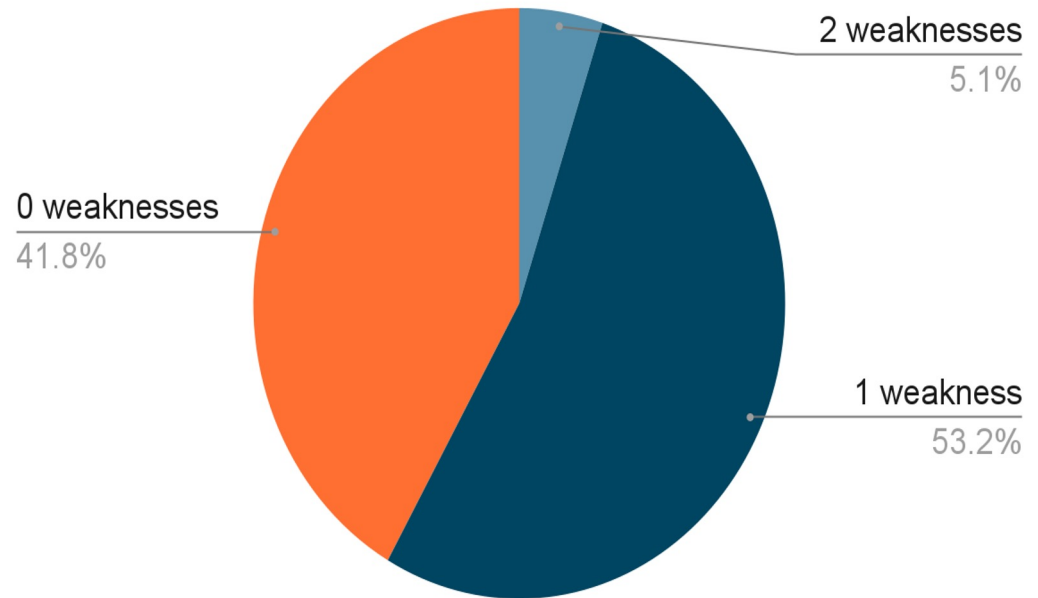


# Pedagogical Content Knowledge ( $n = 79$ )

ECMTs' analyzed a side-by-side bar graph created by a student to analyze the association of two categorical variables with two weaknesses

- No label on vertical axis
- Comparison of raw frequencies rather than conditional relative frequencies

Weaknesses Identified



# Attitudes ( $n = 78$ )

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**I am confident in my ability to teach statistics.**

**73.1% agreed, 18.0% disagreed.**

**It is important to me to be a good statistics teacher.**

**79.5% agreed, 9.0% disagreed.**

**Teaching statistics is easier than teaching other courses.**

**16.7% agreed, 61.5% disagreed.**

**I would rather teach statistics than other courses.**

**37.2% agreed, 50.0% disagreed.**

**Teaching statistics is part of who I am.**

**20.5% agreed, 48.7% disagreed.**

# Self-Efficacy for Teaching Stats ( $n = 77$ )

More Confident

- Using summary values (e.g., mean) to compare groups
- Identifying trends in scatterplots
- Recognizing if a sample is representative
- Creating graphical visualizations

Less Confident

- **Building and using simulations**
- **Interpreting two-way frequency tables**
- Comparing two treatments from a randomized experiment using numerical and graphical summaries
- Assessing the fit of a model using residuals

# Future Research Plans

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## You can help!

### Study of Mathematics Teacher Education Programs

- Currently collecting data about the status of mathematics teacher preparation programs and how they are preparing teachers for data science and statistics (instep

### Second Study of ECMTs

- Follow-up study involving classroom visits and data from practice

*What in the current*  
**Data Science & Statistics**  
**Secondary Teacher Preparation**  
**System**

*produces the current outcomes re: the*  
*teaching & learning of*  
*data science & statistics?*

# Let's Discuss

---

Given a standard that a secondary math teacher in 2023 would be expected to teach, *where* in your teacher preparation program do they (or could they) have an opportunity to develop *content*, *technological*, and *pedagogical* knowledge for teaching this standard?

[bit.ly/teachsd](https://bit.ly/teachsd)

# ESTEEM II Goals

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**Goal A:** Investigate the current systems in undergraduate teacher preparation for teaching data science and statistics [DS&S].

**Goal B:** Build and sustain a DS&S teacher education networked improvement community.

**Goal C:** Reach a broad, large, and diverse teacher education audience through developing, curating and disseminating high quality DS&S teacher education curriculum materials.





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# Mathematics Teacher Educator Resources for DS&S Teacher Preparation

# Teacher Education Curriculum Materials



## MODULE(S<sup>2</sup>)

Mathematics Of Doing, Understanding, Learning  
and Educating for Secondary Schools



The Mathematics Of Doing, Understand, Learning, and Educating Secondary Schools (MODULE(S<sup>2</sup>)) project is made possible through funding from the National Science Foundation IUSE (Improving Undergraduate STEM Education) multi-institutional collaborative grant #1726707 (APLU), #1726098 (University of Arizona), #1726252 (Eastern Michigan University), #1726723 (Middle Tennessee State University), #1726744 (University of Nebraska - Lincoln), and #1726804 (Utah State University).

**Statistical Investigations of  
Systemic Racism**

<https://pages.charlotte.edu/datamodulesandsystemicracism/>



# ESTEEM

The ESTEEM materials are designed to be used with **preservice middle and secondary mathematics teachers** and are delivered in learning management system formats (Canvas, Blackboard, Moodle, & Common Course Cartridge). There are 3 modules available: Foundation, Inferential Reasoning, and Association.

## 1.2.i Supporting Statistical Discourse with the Roller Coaster Task

While selecting a statistically rich task that ties together the learning goal, data, context, and investigative cycle is foundational in providing students opportunities to develop more sophisticated statistical thinking, it is as important that teachers consider the implementation of the task and how that implementation might promote reasoning that builds on productive habits of mind. Teachers can support students in developing statistical thinking by encouraging them to communicate their own ideas about engaging with data and consider the thinking of others through discourse.

### Part 1. Learn about the Five Practices model for productive classroom discourse

Smith and Stein (2011) developed a model for supporting classroom discourse about students' work on tasks which involves the following Five Practices: *anticipating* students' responses to a task; *monitoring* students' responses to a task; *selecting* specific students to present mathematical ideas; *sequencing* students' responses that will be publicly displayed; and *connecting* between student responses and to key ideas. To learn more, read this [three page paper](#).

### Part 2. Watch a Classroom Statistical Investigation

Watch the following video, where a teacher launches a statistical investigation about roller coasters in a seventh grade classroom and students use CODAP for the first time. The sixth and seventh grade students in the video were doing an investigation similar to the one you did with older roller coasters in assignment 1.1.g. The videotaped class session was at the beginning of their school year; they had not yet engaged in a formal statistics unit. As you watch the video, note how the teacher implements the 5 Practices model as she monitors student work, selects and sequences several students' findings to discuss, and leads a whole class discussion connecting students' statistical ideas.

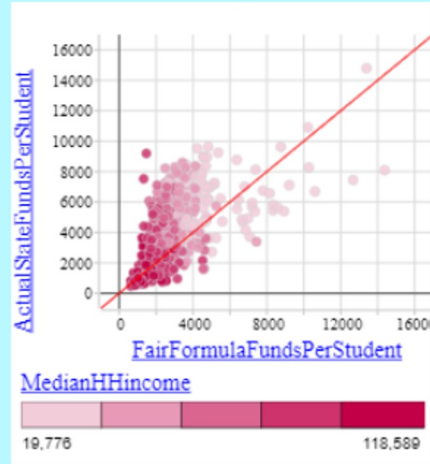


Read the [transcript](#).

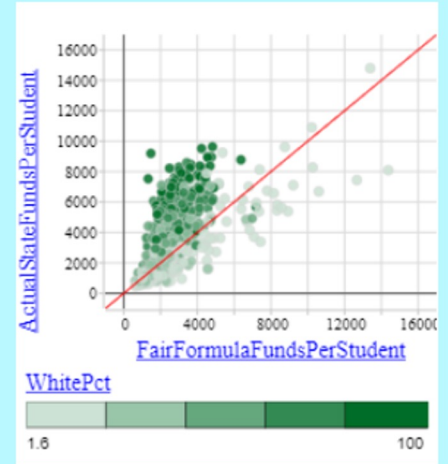
# MODULE(S2)

- Develop deep understanding of both statistics and teaching statistics.
- Focus on study design, exploratory data analysis, inference, and quantitative and categorical association.
- Attention is given to developing an understanding of equitable teaching practices and equity issues in education.

Which 3rd variable (coloring) best helps predict which schools get less than their fair share?



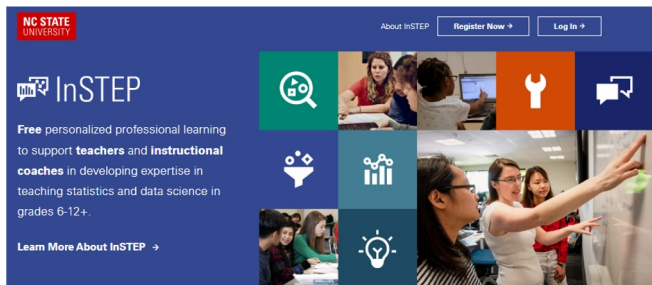
**MedianHHIncome:** Median Household Income in the district



**WhitePct:** Percentage of White-identifying students in the district

# InSTEP with Data

## Personalized Learning for Teaching Statistics and Data Science



[instepwithdata.org](https://instepwithdata.org)

A screenshot of the InSTEP dashboard. The title is 'InSTEP: Invigorating Statistics and Data Science Teaching through Professional Learning'. The dashboard is divided into several sections: 'Assessments' with a 'Module 2 Building and Advancing Students' Use of Data Moves' card; 'Vehicles' with a 'Let's Investigate 2' card; 'Recommendations' with several course cards; and 'Main Tools' with 'Send Resources' and 'Shared Profiles' options. Below the dashboard is a section titled 'How is InSTEP different from other online learning platforms?' with three columns of text.

**How is InSTEP different from other online learning platforms?**

- Personalize learning to meet your professional needs through **customized recommendations**, **collaborative spaces**, and **choice of learning modules** and **microcredentials**.
- Build your skills in **data investigations** and **innovative teaching approaches** based on practices of data professionals and research on students' learning with data.
- Expand your **professional collection of resources and technology** vetted by experts in statistics and data science education.



# Teaching Statistics Through Investigations of Issues of Systemic Racism

*Anthony Fernandes, Travis Weiland, Ksenija Simic-Muller*

Two modules - Traffic stops and School discipline. Materials include,

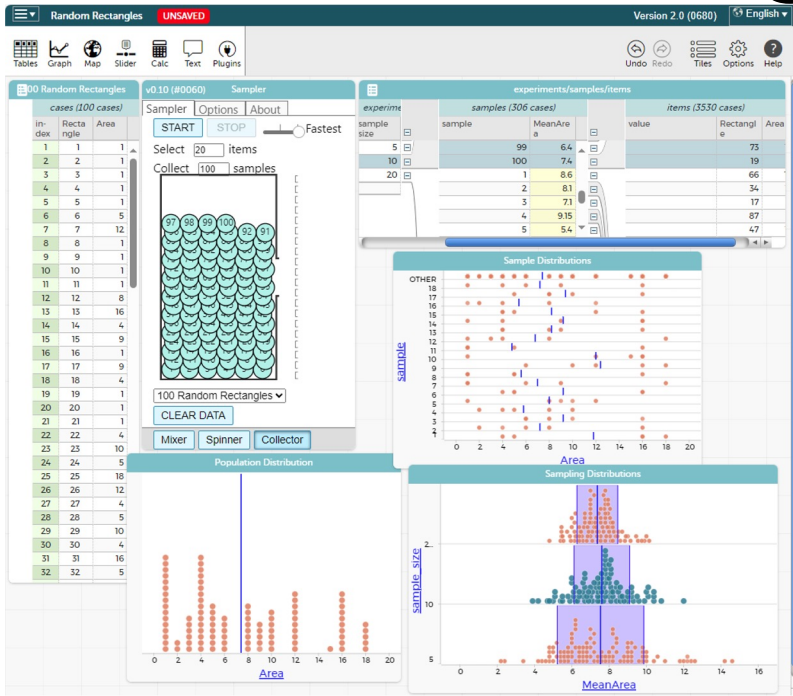
- Detailed instructor guide with a deep dive into the context
- Slide decks that can be adapted to your class
- Resources for understanding race and racism, and talking about these issues in class

Website to learn about the project and request the modules:

<https://pages.charlotte.edu/datamodulesandsystemicracism/>

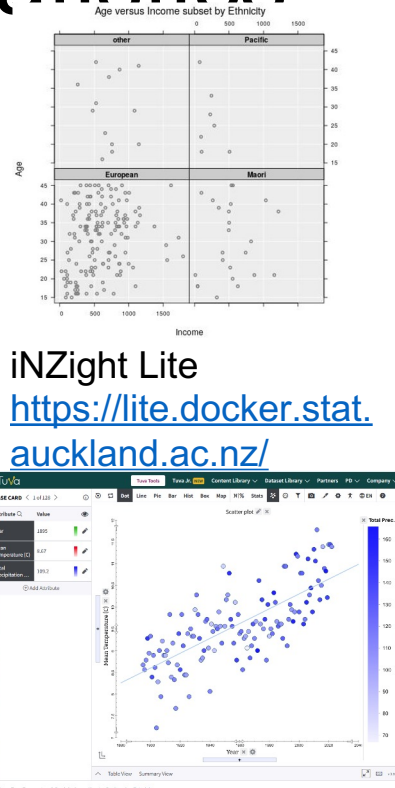


# Technology Tools for Teaching Statistics



CODAP

<http://codap.concord.org>



Tuva

<https://tuvalabs.com/>

- Excel/Google Sheets
- Tableau Public
- NZ Grapher
- TinkerPlots 3.0
- Plotly
- The Art of Stat Web Apps
- Rossman/Chance Applets
- Desmos Stats Activities
- StatKey Applets
- Mathigon Polypad
- Shodor Interactives
- NumWorks Online Calculator



# ESTEEM II Goals

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**Goal A:** Investigate the current systems in undergraduate teacher preparation for teaching data science and statistics [DS&S].

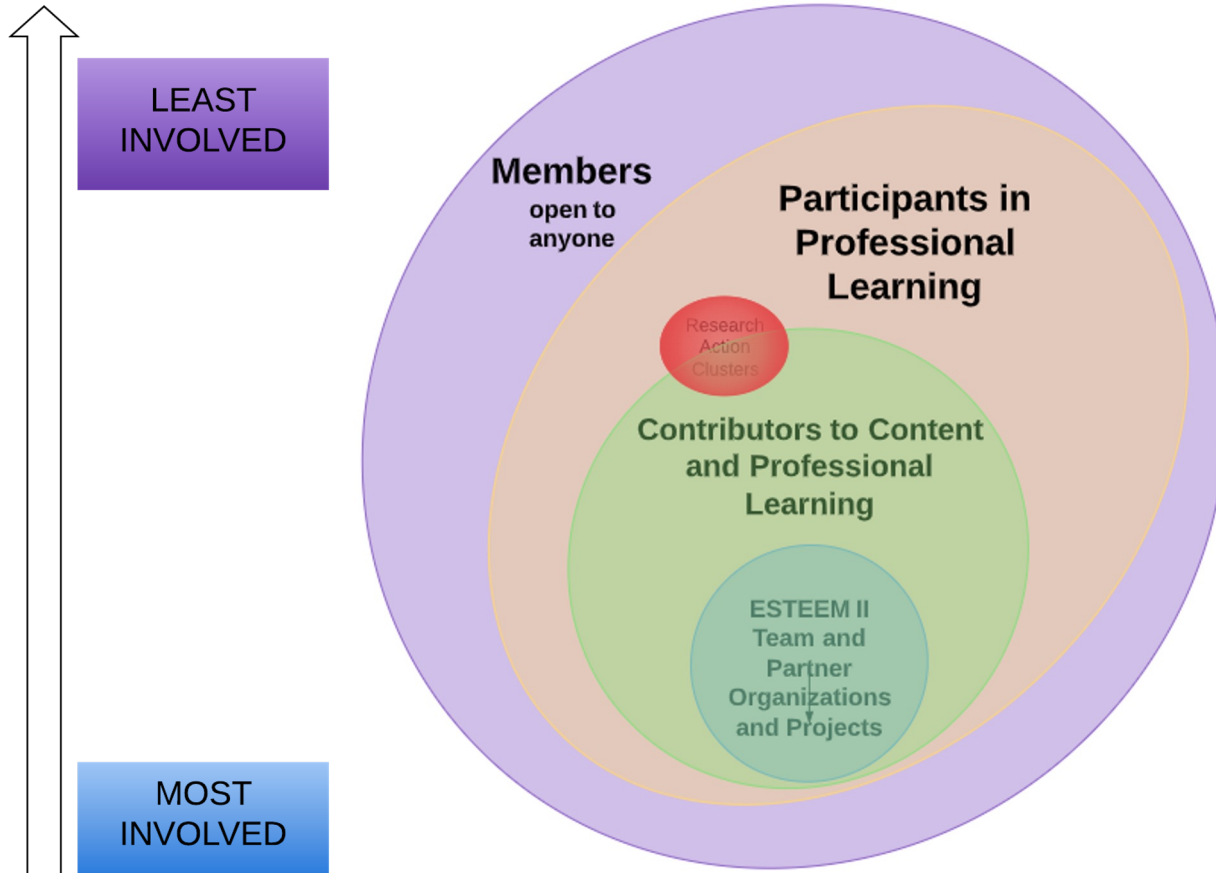
**Goal B:** Build and sustain a DS&S teacher education networked improvement community.

**Goal C:** Reach a broad, large, and diverse teacher education audience through developing, curating and disseminating high quality DS&S teacher education curriculum materials.





# DS&S Teacher Education Networked Improvement Community



# Communities



Networked Improvement Community:

Contact Emily Thrasher ([epthrash@ncsu.edu](mailto:epthrash@ncsu.edu)) to join



Statistics and Data Science Teacher Education  
Community Circle:

Contact Travis Weiland ([tweiland@central.uh.edu](mailto:tweiland@central.uh.edu)) to join

