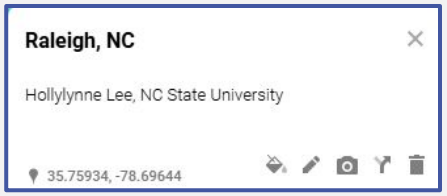
NC STATE UNIVERSITY
College of Education
Friday Institute for Educational Innovation

Impacting Statistics and Data Science Teacher Education in the U.S. Through Broader Scale Efforts

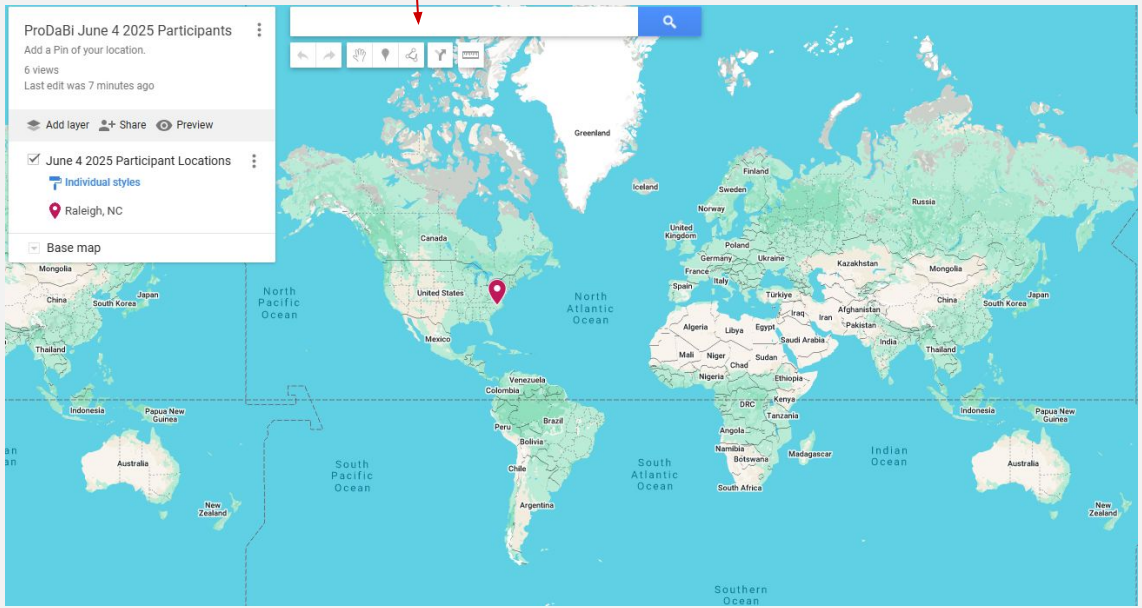
Hollylynne Lee

ProDaBi Colloquium June 4 2025

Where Are We? Let's Collect Data



- Use +- and drag to navigate to your location.
- Choose "Add Marker"
- Then click on the map at the location to drop the marker.
- Put City, Country (or City, State) in Title
- In Note put Name, Affiliation



bit.ly/MapJune4

My Background & Context

To situate my perspectives and purposes

- Former middle and high school math teacher
- All degrees in Mathematics Education
- At NC State since 2000, faculty in STEM Education with collaborations with Statistics Dept.
- Teach undergrad-doctoral students, including
  - **EMS/ST 519 Teaching and Learning Statistical Thinking**
  - **ST 101 Data and Chance for Teachers**
- Senior Faculty Fellow at *Friday Institute for Educational Innovation*
- Directed the Hub for Innovation and Research in Statistics Education
- Consider myself an educational designer

Two Critical Educational Design Projects That Launched the More Recent Efforts

Preparing to Teach Mathematics with Technology funded 2004-current

PTMT has impacted teaching and learning of mathematics through

500+ College Faculty

8000+ Prospective Teachers

50 States

NSF

NC STATE UNIVERSITY

MIDDLE TENNESSEE STATE UNIVERSITY

UNIVERSITY OF NORTH CAROLINA CHARLOTTE

ECU

ptmtproject.com

NSF

PTMT Materials Related to Teaching Statistics

Examining Students' Practices in Algebra and Function

These materials connect with the Teaching Algebra materials to support teachers' development of pedagogical skills related to professional noticing of student thinking and engaging in productive discussions in technology-mediated learning environments. Teachers engage in tasks and analyze videos of students' work.

Teaching Algebra

The Teaching Algebra materials consist of 7 chapters that provide strategies for teaching algebra with dynamic technology explorations of important topics such as variables, equality, rate of change, and functions.

Teaching Statistics Investigations

This set of materials includes four chapters that prepare teachers to use large multivariate data and a new free online tool, CODAP, to engage in similar investigations as in Chapters 1-4 of the Teaching Data Analysis and Probability materials.

Teaching Data Analysis and Probability

This set of materials includes 6 chapters that utilize tools such as TinkerPlots, Fathom, Excel, and graphing calculators to engage teachers in statistics investigations using multivariate data. Topics include learning to teach distributions, variability, bivariate relationships, probability, and simulations.

New Teaching Geometry

Coming Soon.....

Teaching Geometry

The 7 chapters in the Teaching Geometry materials engage teachers with how dynamic approaches to geometry can change students' understanding of concepts such as polygon properties, transformations, similarity, and symmetry.

Voices from the Field

A collection of video clips representing how real teachers use technology in their mathematics classrooms. Some clips illustrate how teachers and students use technology in lessons. Other clips show teachers and experts discussing issues related to their planning and implementation of technology.

Forging Connections Between Geometry and Functions

A collection of materials on an ***external site*** that were developed through a PTMT-related project. Activities use web-based Sketchpad activities to develop deeper understandings of functions through a geometric approach.

ptmtproject.com

MOOC-Ed

MASSIVE OPEN ONLINE COURSES FOR EDUCATORS

Scaling-Up for Online Teacher Learning

NC STATE UNIVERSITY
College of Education
Friday Institute for Educational Innovation

2015-2025

place.fi.ncsu.edu

Free Online Courses for Practicing Teachers

50 states, 106 countries, 8500+ enrolled

	Course Title	Sections	Enrolled
	Teaching Statistics Through Data Investigations	7	3,128
	Teaching Statistics Through Inferential Reasoning	3	789
	Teaching Mathematics with Technology	5	3,644
	Amplifying Statistics and Data Science in Classrooms *(summer 2021)*	1	940 (5/1/2025)

WILLIAM + FLORA Hewlett Foundation

ASA AMERICAN STATISTICAL ASSOCIATION Promoting the Practice and Profession of Statistics®

Build Online Modules to Support Preservice Teacher Preparation

Enhancing Statistics Teacher Education through E-Modules

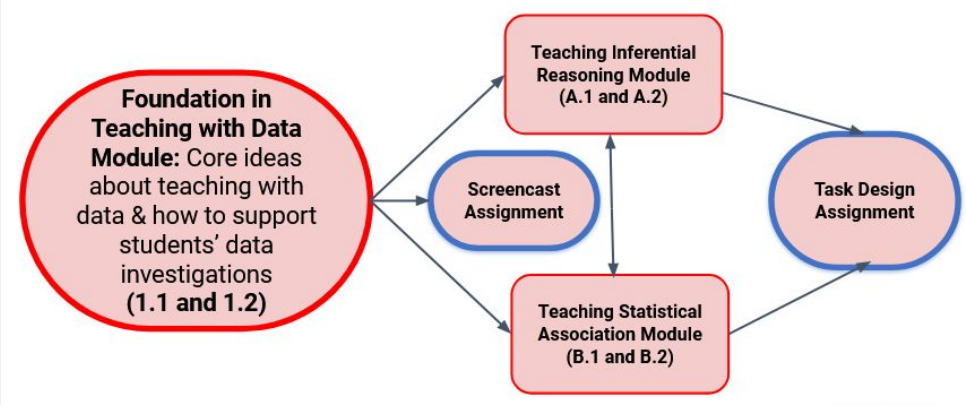
2016 - 2021

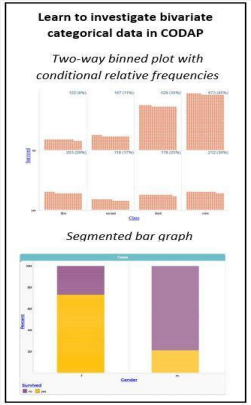
ESTEEM

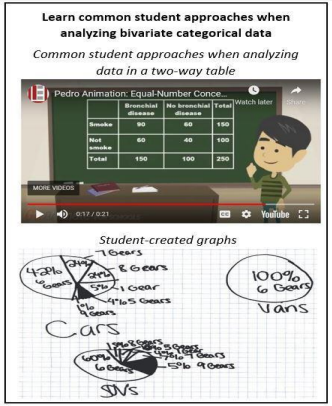
ENHANCING STATISTICS TEACHER EDUCATION WITH E-MODULES

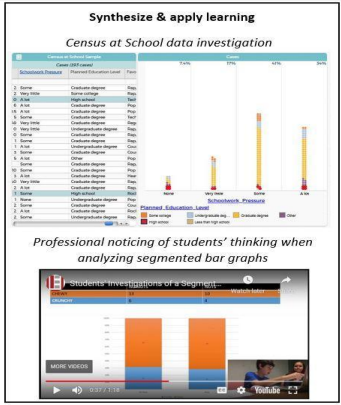
NSF

Enhancing Statistics Teacher Education Through E-Modules



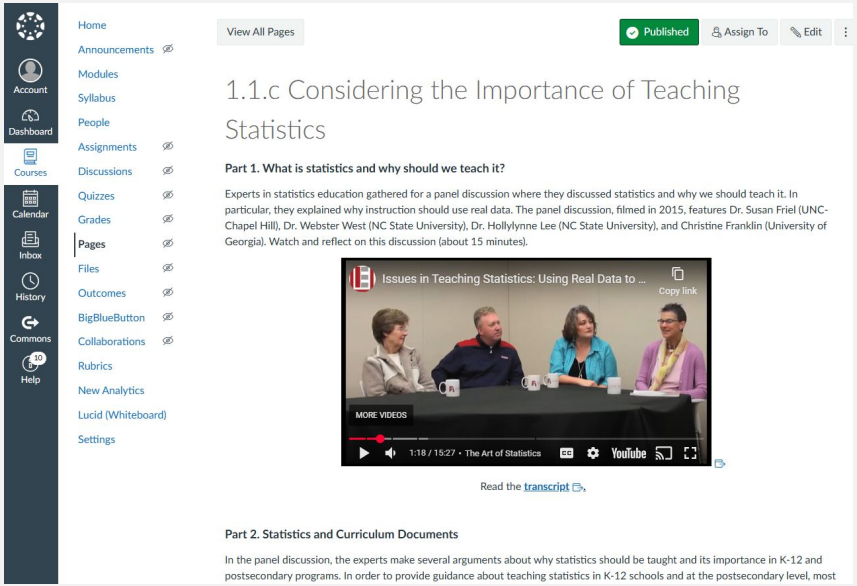


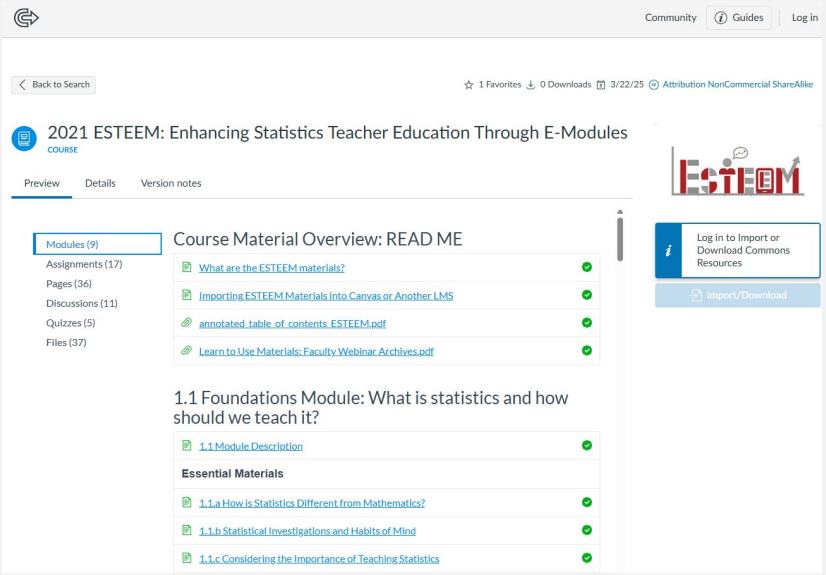




40+ hrs of multimedia material
Data Investigations in CODAP
8 In-Person and Web-based Faculty Workshops
500+ registered users

Materials are FREE on Canvas Commons and can be imported into learning management systems (LMSs)

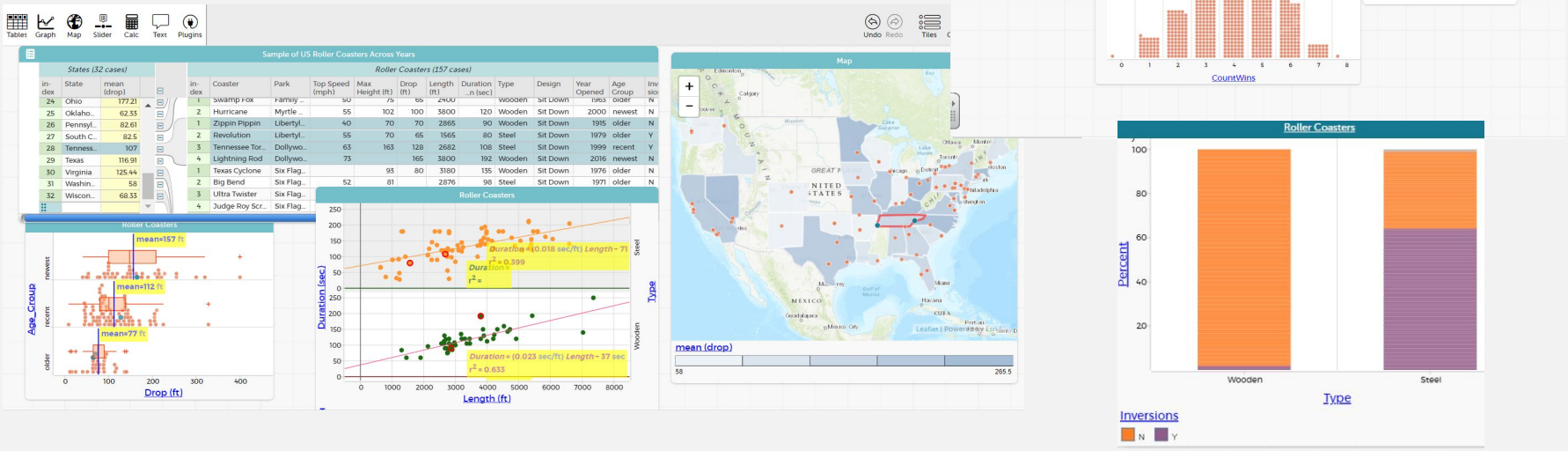


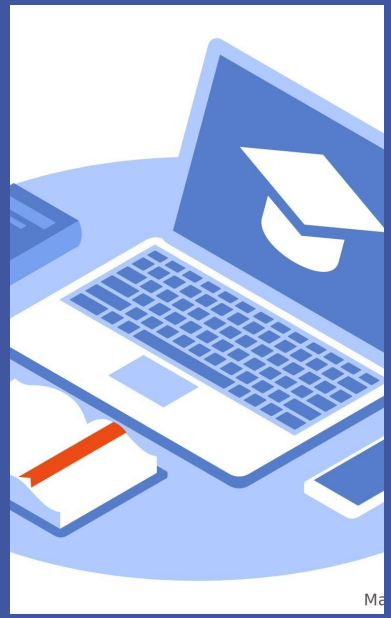


bit.ly/2021Esteem

Contribute to Design of an Online Data Tool

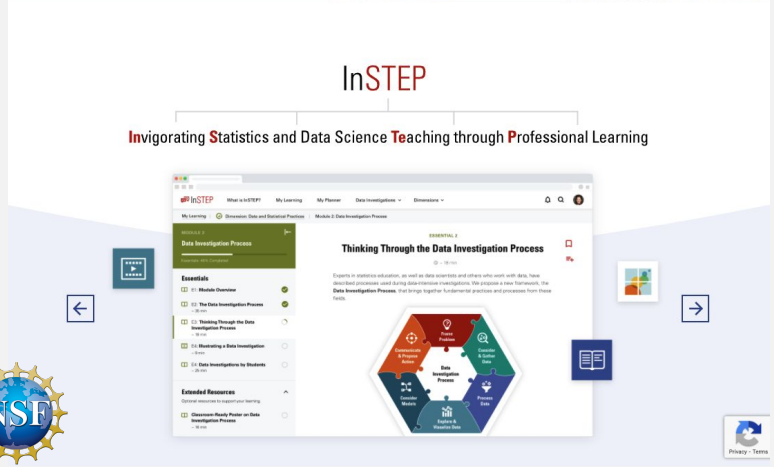
CODAP: Common Online Data Analysis Platform





Taking Online Professional Learning for Practicing Teachers to the Next Level

Personalized Learning for Preparing to Teach Statistics and Data Science for Ages 11-18+



InSTEP

instepwithdata.org

FREE for All!
Public Launch
March 2023

InSTEP

Invigorating Statistics and Data Science Teaching through Professional Learning

instepwithdata.org

Principal Investigators:
Hollylynne Lee
Gemma Mojica
(former Co-PIs: Alex Dreier, Lauren Acree)

Research Scholar/Project Manager
Emily Thrasher

NC State University Project Team:
Bruce Graham, Michelle Pace, Adrian Kuhlman, Matty Grossman

RTI International Project Team:
Patrick Brown, Britta Hansen, Andrzej Proczka
(former lead, John Vavricka)

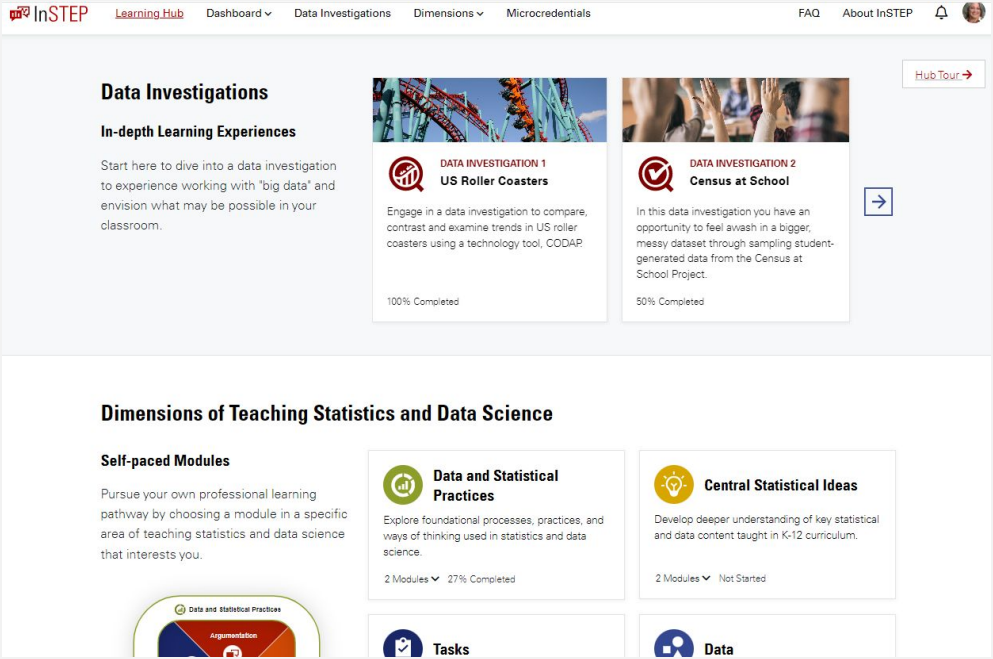
NC STATE Friday Institute for Educational Innovation

2019 - current
3.1 million

fi.ncsu.edu

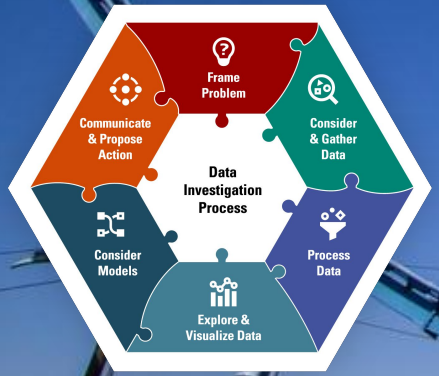
Two Primary Learning Experiences: Learn to Do Data Investigations & Modules to Learn to Teach with Data

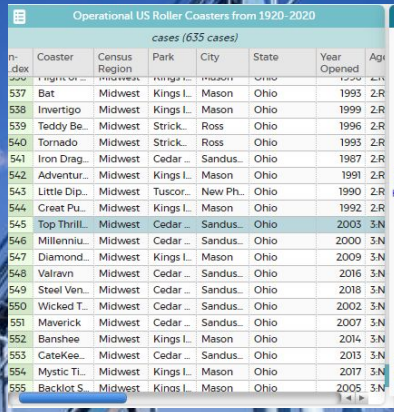
Use Variety of Tech Tools, but primarily CODAP



Learning Experience 1:

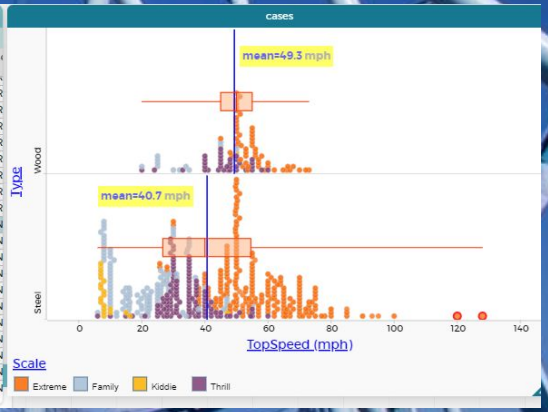
Data Investigations with “Big” Multivariate Data




Operational US Roller Coasters from 1920-2020

cases (635 cases)

n- dex	Coaster	Census Region	Park	City	State	Year Opened	Ag
537	Bat	Midwest	Kings I...	Mason	Ohio	1993	2.R
538	Invertigo	Midwest	Kings I...	Mason	Ohio	1999	2.R
539	Teddy Be...	Midwest	Strick...	Ross	Ohio	1996	2.R
540	Tornado	Midwest	Strick...	Ross	Ohio	1993	2.R
541	Iron Drag...	Midwest	Cedar ...	Sandus...	Ohio	1987	2.R
542	Adventur...	Midwest	Kings I...	Mason	Ohio	1991	2.R
543	Little Dip...	Midwest	Tuscor...	New Ph...	Ohio	1990	2.R
544	Creat Pu...	Midwest	Kings I...	Mason	Ohio	1992	2.R
545	Top Thrill...	Midwest	Cedar ...	Sandus...	Ohio	2003	3.N
546	Millenniu...	Midwest	Cedar ...	Sandus...	Ohio	2000	3.N
547	Diamond...	Midwest	Kings I...	Mason	Ohio	2009	3.N
548	Valravn	Midwest	Cedar ...	Sandus...	Ohio	2016	3.N
549	Steel Ven...	Midwest	Cedar ...	Sandus...	Ohio	2018	3.N
550	Wicked T...	Midwest	Cedar ...	Sandus...	Ohio	2002	3.N
551	Maverick	Midwest	Cedar ...	Sandus...	Ohio	2007	3.N
552	Banshee	Midwest	Kings I...	Mason	Ohio	2014	3.N
553	CateKee...	Midwest	Cedar ...	Sandus...	Ohio	2013	3.N
554	Mystic Ti...	Midwest	Kings I...	Mason	Ohio	2017	3.N
555	Backlot S...	Midwest	Kings I...	Mason	Ohio	2005	3.N



Learn to Do Data Investigations with CODAP

DATA INVESTIGATION 1

US Roller Coasters

Engage in a data investigation to compare, contrast and examine trends in US roller coasters using a technology tool, CODAP.

100% Completed

DATA INVESTIGATION 2

Census at School

In this data investigation you have an opportunity to feel awash in a bigger, messy dataset through sampling student-generated data from the Census at School Project.

63% Completed

DATA INVESTIGATION 3

Popular Cereals

Engage in a data investigation to examine trends in nutritional characteristics of over 200 popular cereals in a multivariate dataset using CODAP, a technology tool.

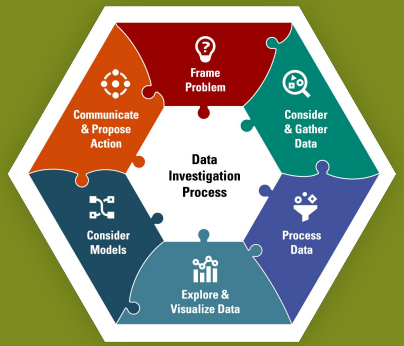
100% Completed

DATA INVESTIGATION 4

Fish Catch Data

Through investigating fish catch data from the NOAA, you will learn how to use linear regression to model relationship between length and weight of different species of fish.

100% Completed



DATA INVESTIGATION 5

Democratic Representation Part 1

In this data investigation, explore what it means to be representative using data from the 117th US Congress and the US Census.

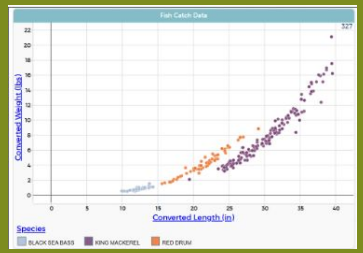
Not Started

DATA INVESTIGATION 6

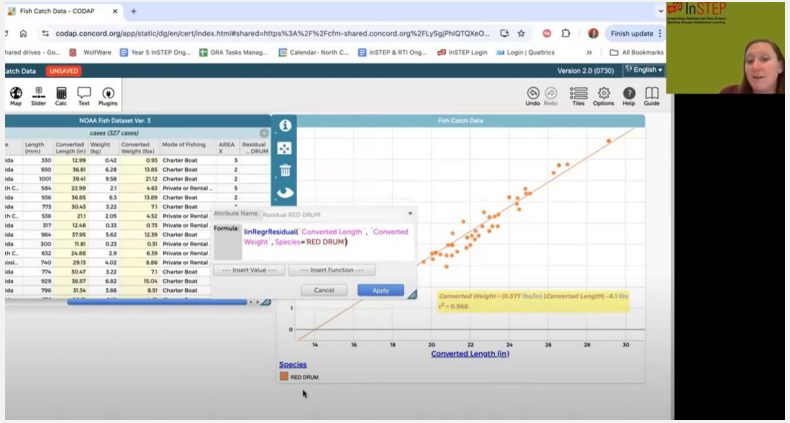
Democratic Representation Part 2

In this data investigation, use simulations & sampling distributions to determine whether the 117th US House of Representatives is representative of the Asian population.

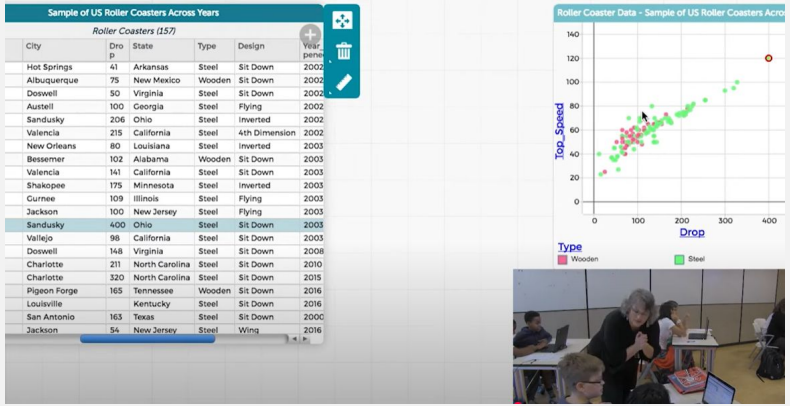
10% Completed



“Expert Insights” for Examining Data in CODAP



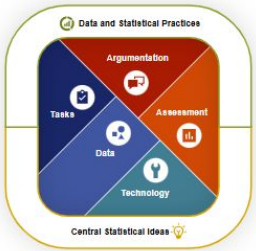
Examples of Pedagogical Moves for Helping Students Work with Data



Dimensions of Teaching Statistics and Data Science

Self-paced Modules

Pursue your own professional learning pathway by choosing a module in a specific area of teaching statistics and data science that interests you.



Learn More About Dimensions →

Data and Statistical Practices

Explore foundational processes, practices, and ways of thinking used in statistics and data science.

2 Modules 64% Completed

Central Statistical Ideas

Develop deeper understanding of key statistical and data content taught in K-12 curriculum.

2 Modules Not Started

Tasks

Learn to use classroom activities that support developing statistical ideas through engaging students in data and statistical practices.

3 Modules Not Started

Data

Develop strategies and skills for collecting and using real, motivating data to engage students in investigations.

1 Module 17% Completed

Technology Tools

Use tools that support students with data and statistical practices and develop advanced skills to apply technology in your classroom.

1 Module Not Started

Argumentation

Examine ways to promote discourse focused on data-based arguments and how to facilitate productive classroom discussions.

2 Modules 25% Completed

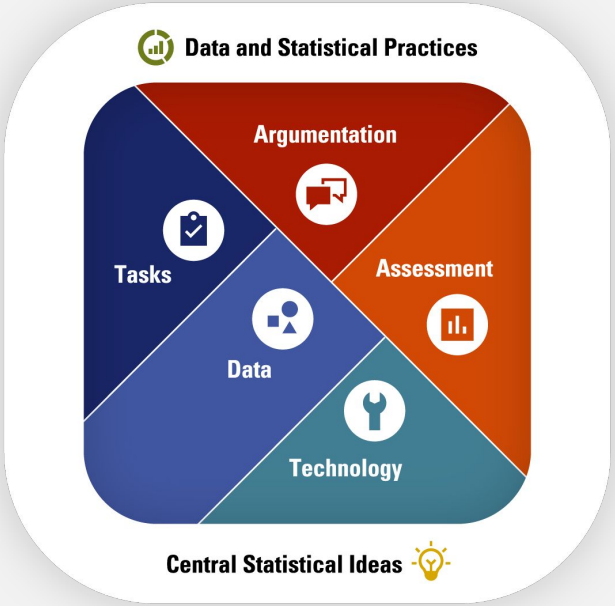
Assessment of Student Thinking

Learn to evaluate students' thinking about data and statistics to inform instructional decisions.

1 Module Not Started

Learning Experience 2: Self-Paced Multimedia Modules

InSTEP Modules are organized by anchoring professional learning in **Seven Dimensions of Teaching Statistics and Data Science** which describe important aspects that support teaching and learning environments for statistics and data science (adapted from Ben-Zvi et al., 2018)



Effective Learning Environments for Statistics and Data Science

Learn about data practices and investigation cycles

Data and Statistical Practices

Explore foundational processes, practices, and ways of thinking used in statistics and data science.

There are 2 Modules in this Dimension:

MODULE 1

What is Statistics and Data Science?

In this module, you will learn about the big ideas, habits of mind and dispositions of statistics and data science.

~1.8 hours

Continue →

6 Essentials | 10 Extended Resources

Saved to Playlist

MODULE 2

Data Investigation Process

In this module, you will be introduced to a 6-phase data investigation process that extends the statistical problem solving process to incorporate the processes and practices of data scientists and other professionals who work with big data.

~1.5 hours

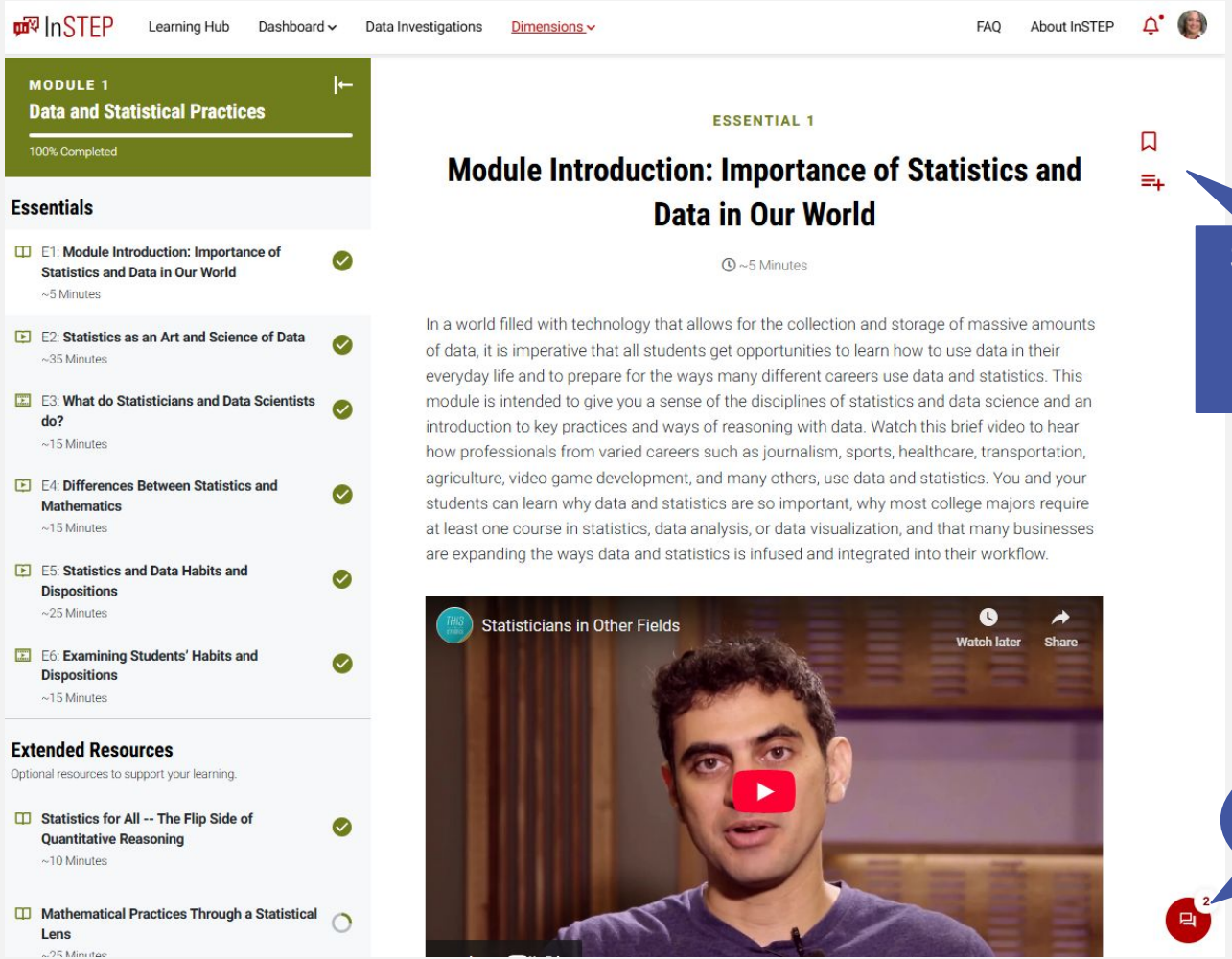
Continue →

5 Essentials | 11 Extended Resources

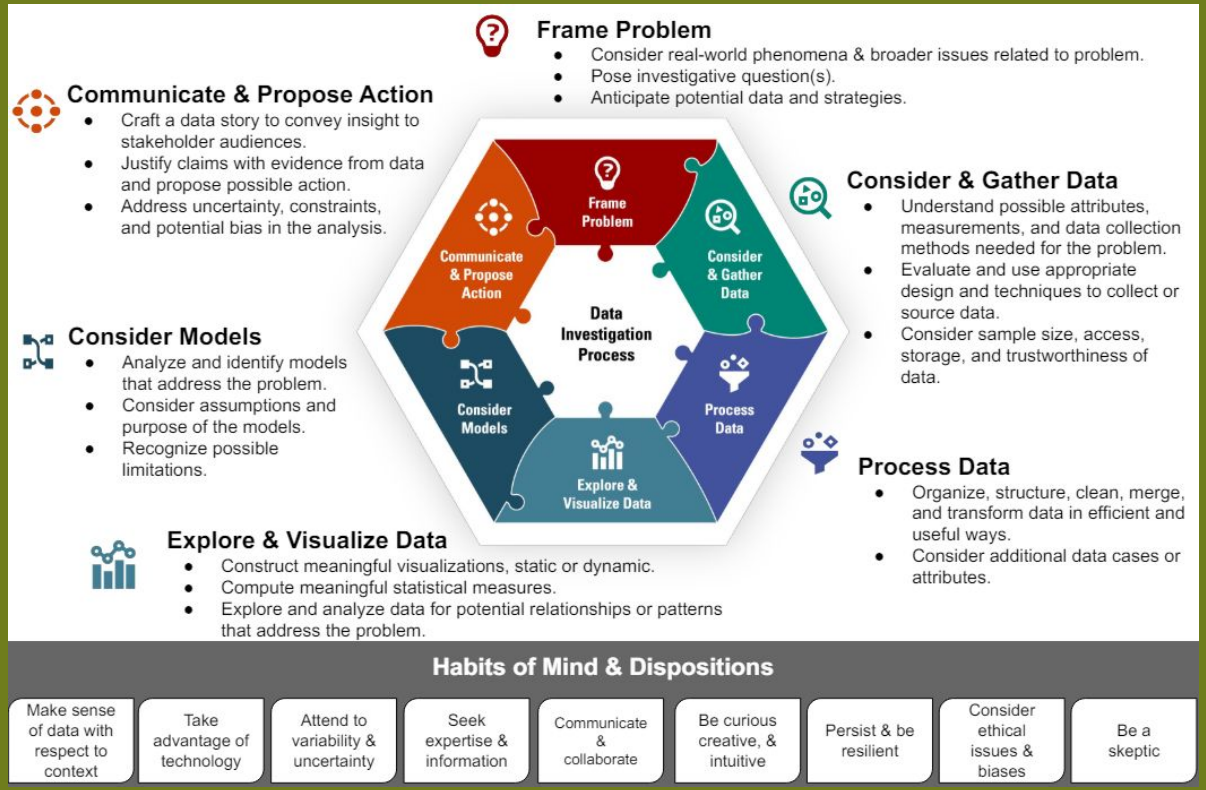
Save to Playlist

5-6 “Essentials” with completion tracking

3-10 “Extended”



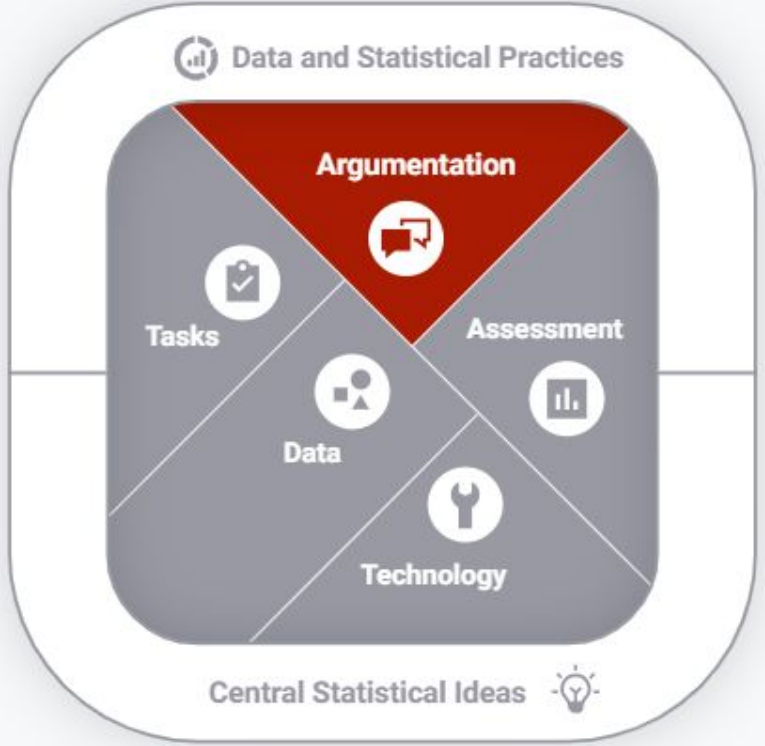
Extended Resources Are Often “Classroom Ready”



cdn.instepwithdata.org/DataInvestigationProcessPoster.pdf

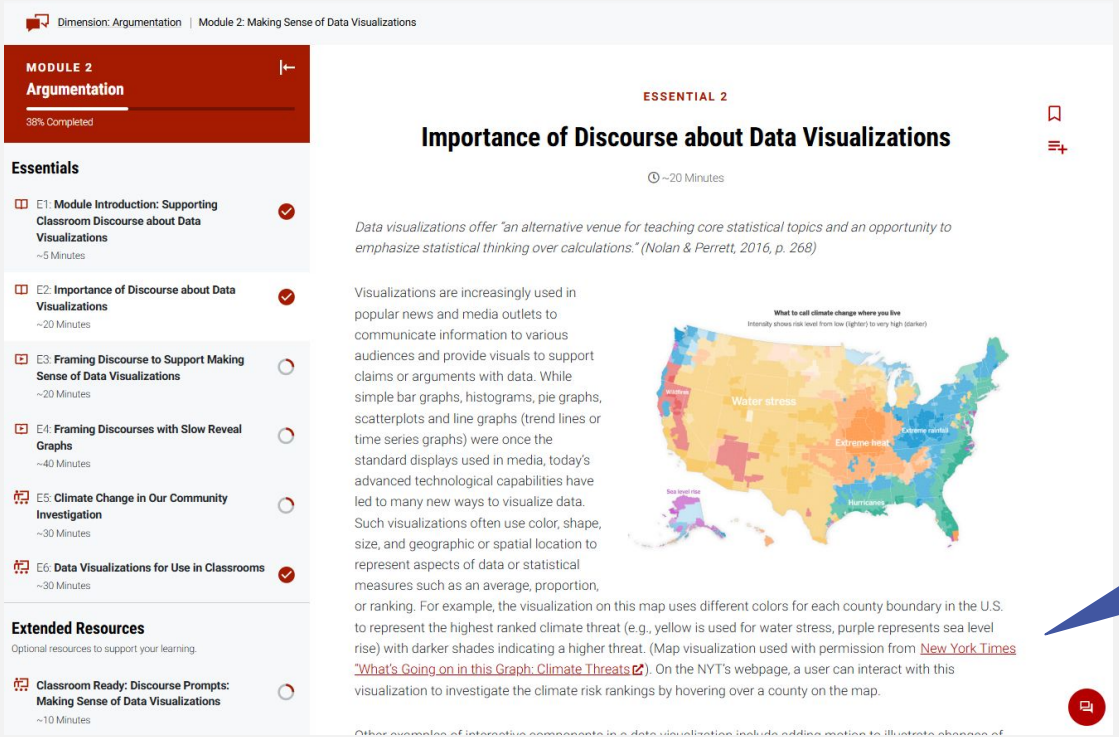
Lee et al., 2022
Statistics Education Research Journal

Learn to orchestrate discussions with and about data



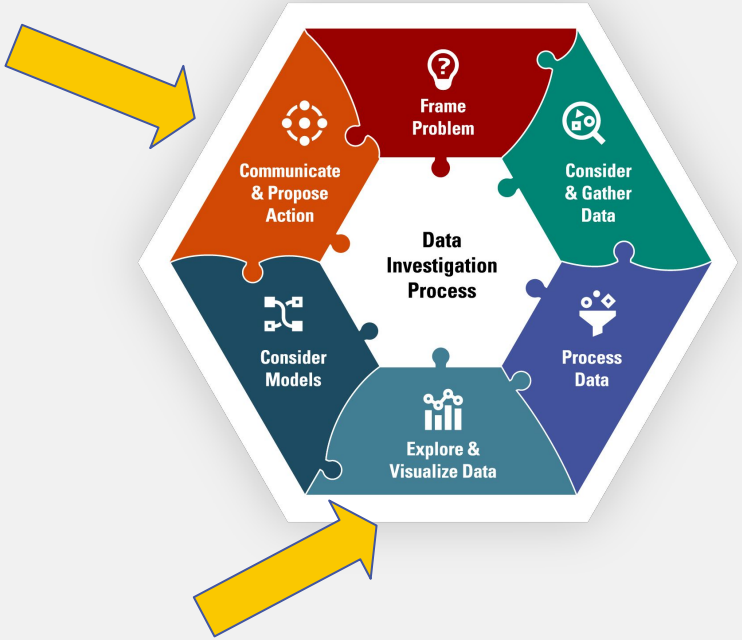
Argumentation Module 2: Making Sense of Data Visualizations

Completion Does Not Need to be Linear and is Tracked

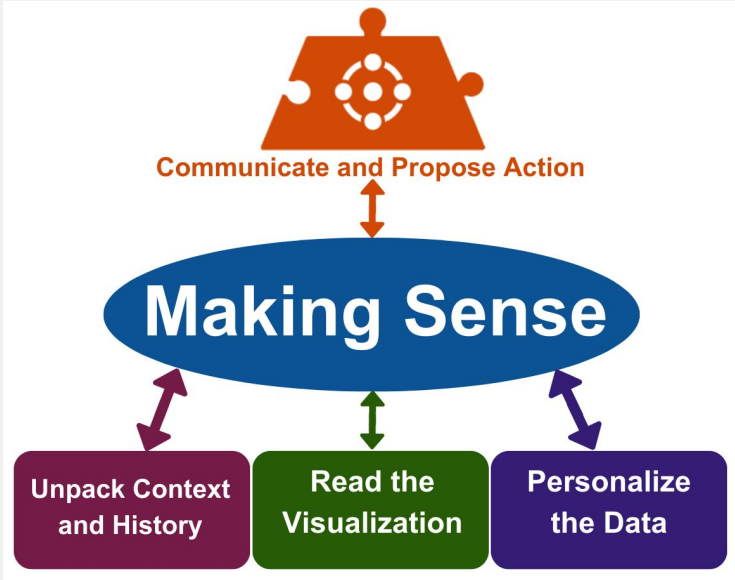


Links to Many External Resources

Making Sense of Data Visualizations



Framework for Discourse



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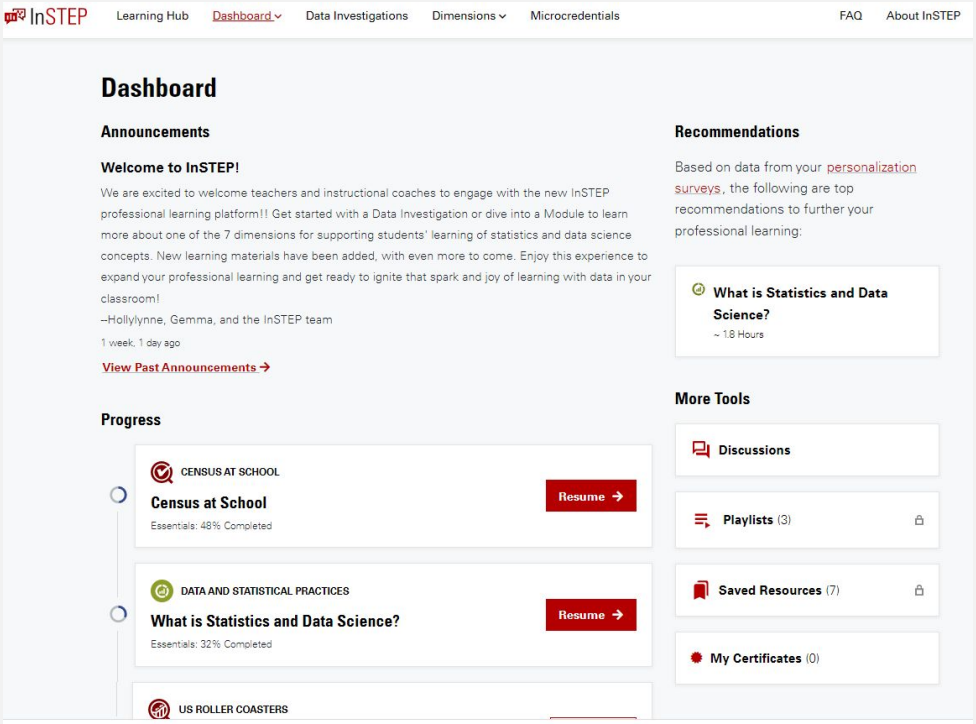
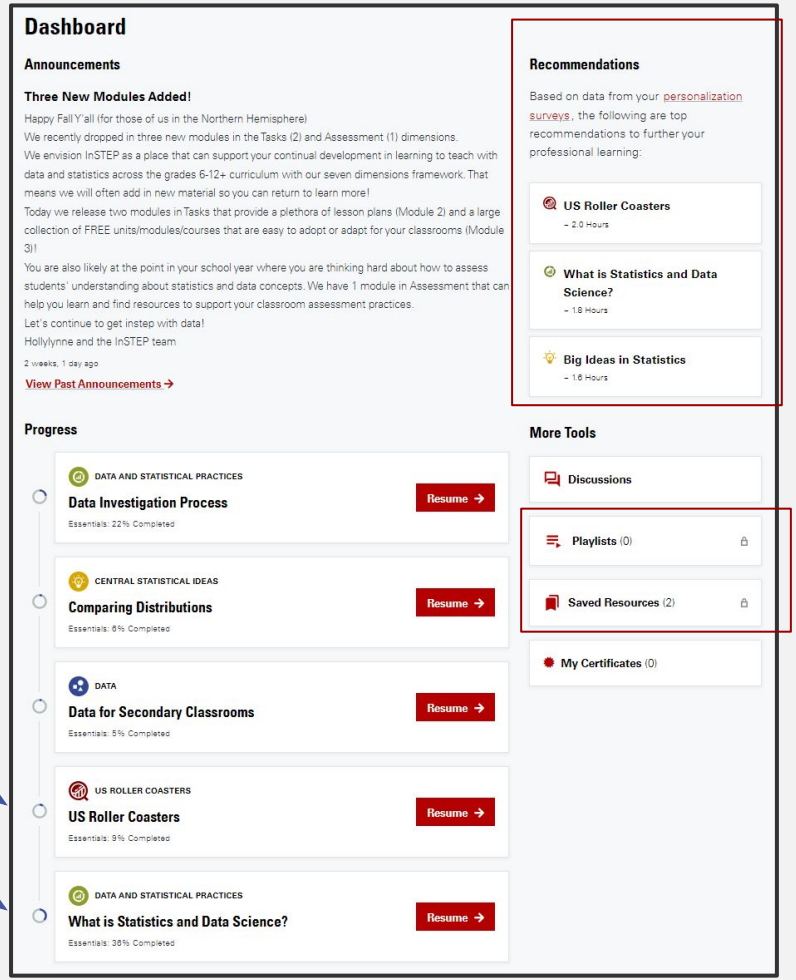
Friday Institute for Educational Innovation

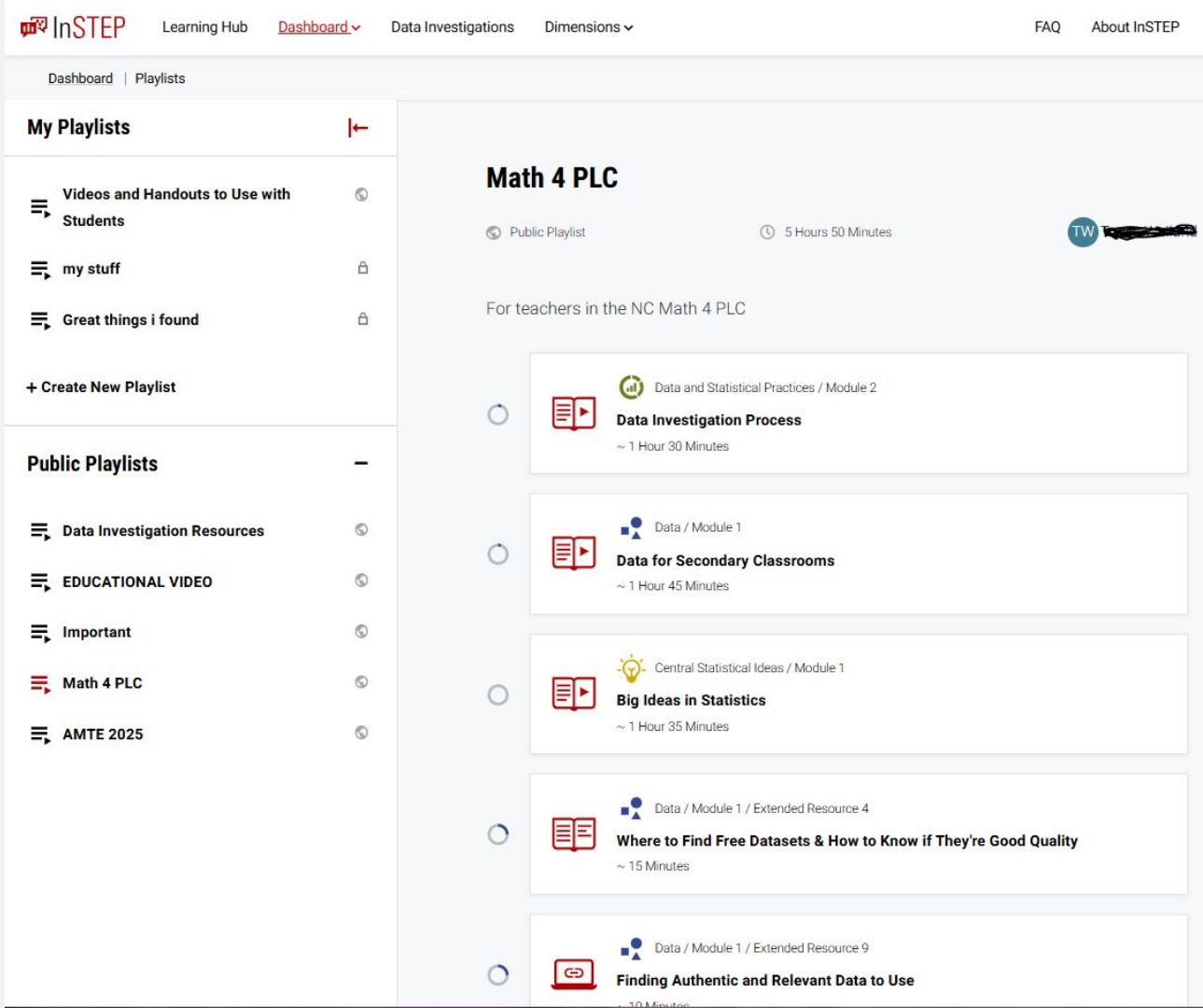
Personalized Dashboard





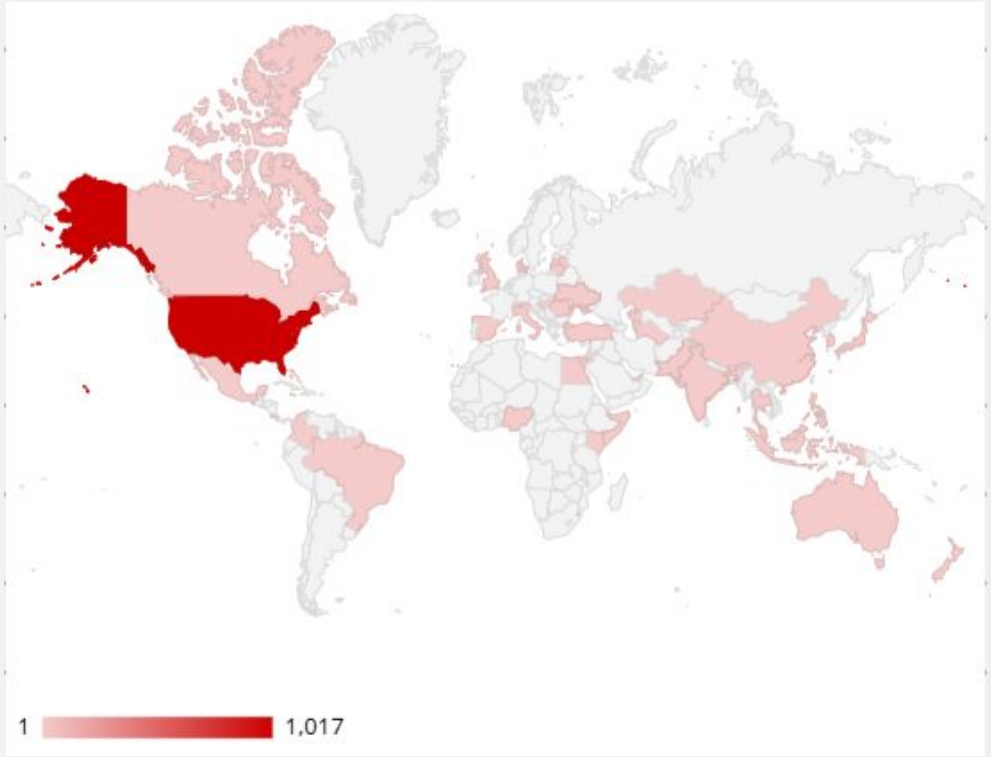
Internal Tracking and Dashboard

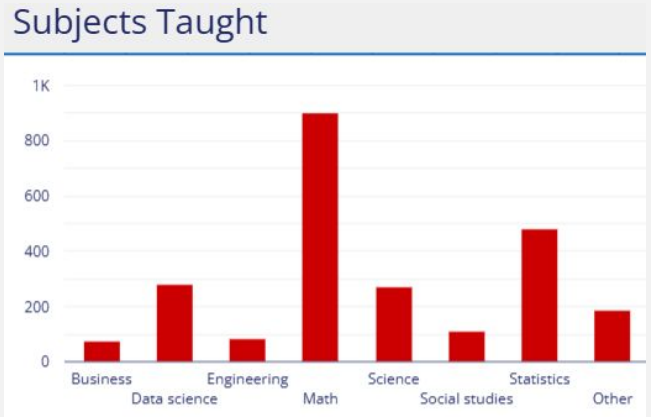
Creating and Sharing Playlists



Who is Getting InSTEP with Data?

1371 registered users





As of May 31, 2025

Recent Paper Published in Education Sciences

Lee, H. S., Thrasher, E., Mojica, G. F., Graham, B. M., Lee, J. T., & Kuhlman, A. (2024). Examining teachers' professional learning in an online asynchronous system: Personalized supports for growth and engagement in learning to teach statistics and data science. *Education Sciences*, 14(11), 1236. https://doi.org/10.3390/educsci14111236.

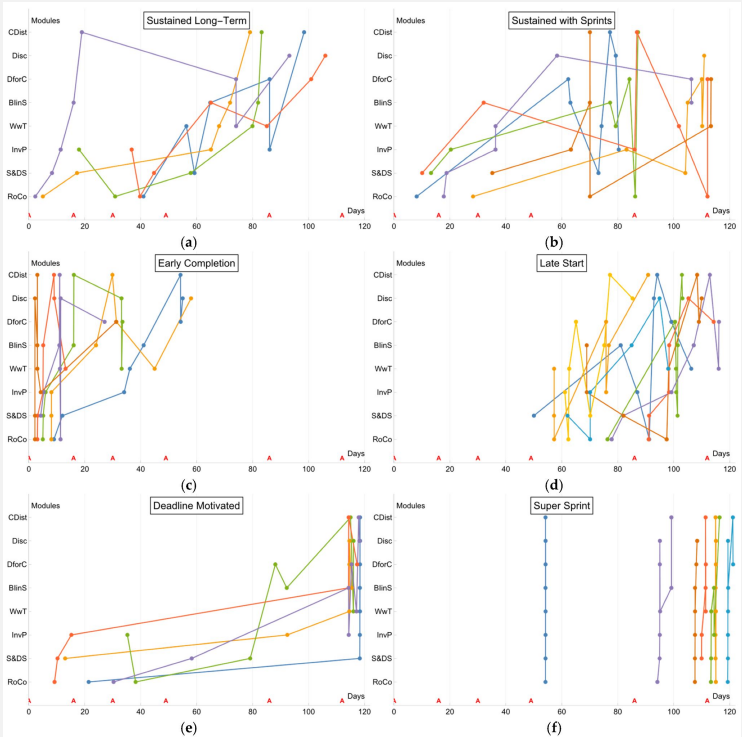
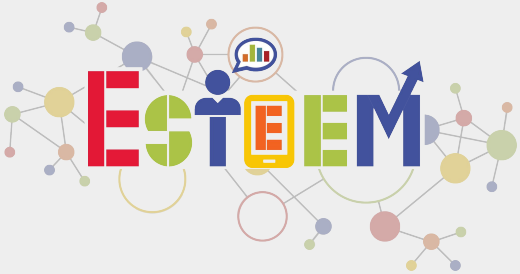


Table 2. Distribution of agreement that participation in InSTEP professional learning helped them make progress towards specific learning goals.

n = 37	Percent of Teachers					
	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Strengthening my understanding of key statistics and data concepts and skills. (BIiS)	0%	5.4%	0%	18.9%	48.6%	27.0%
Engage in real world data investigations myself with large data using technology. (RoCo)	0%	2.7%	8.1%	10.8%	43.2%	35.1%
Strengthening my understanding of how to engage students in practices related to statistics and data science. (IniP)	0%	0%	2.7%	8.1%	51.4%	37.8%
Deepening my ability to help students use data to make evidence-based claims. (IniP)	0%	2.7%	2.7%	10.8%	51.4%	32.4%
Improving my ability to lead productive discussions about important ideas related to data and statistics. (Disc)	0%	2.7%	2.7%	13.5%	56.8%	24.3%
Improving my ability to design, modify, and implement tasks to promote deeper understanding of ideas related to data and statistics. (WwT)	0%	2.7%	2.7%	27.0%	45.9%	21.6%
Improving my ability to make sense of students' thinking through assessing their work, including written, verbal and technological. (Assessment 1, not available at the time of the study)	0%	0%	2.7	32.4%	51.4%	13.5%
Improving my ability to collect and use real-world data to support students' learning in statistics and data science. (DforC)	2.7%	0%	2.7%	24.3%	51.4%	18.9%
Improve my ability to use technology tools to collect, process, visualize, and analyze data. (Technology Tools 1, not available at the time of the study)	0%	5.4%	2.7%	18.9%	54.1%	18.9%

Getting Back to Preservice Teacher Preparation

Enhancing Statistics and Data Science Teacher Education: Transforming & Building Community



Began 2022

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Broad ESTEEM II Goal 2023-2028

Transform

undergraduate teacher preparation

to support developing teachers who are knowledgeable and confident in teaching Data Science & Statistics (DS&S)

ESTEEM Network: Sample of Key Partners

CODAP

DataScience4 everyone

SCORE NETWORK

CAUSE

MODULE(S²)

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

NCSM

EDC Education Development Center

North Carolina School of Science and Mathematics

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

ASA AMERICAN STATISTICAL ASSOCIATION

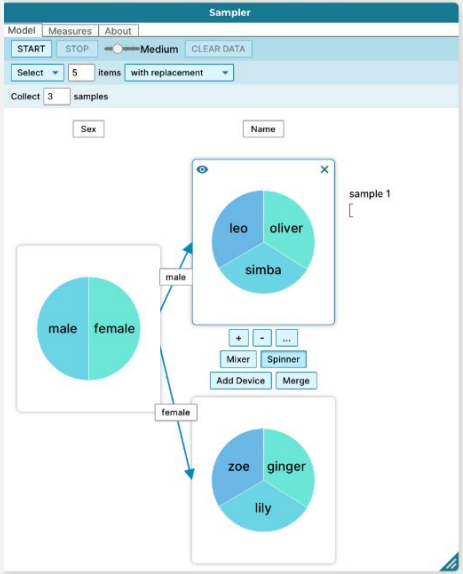
Promoting the Practice and Profession of Statistics

AMTE

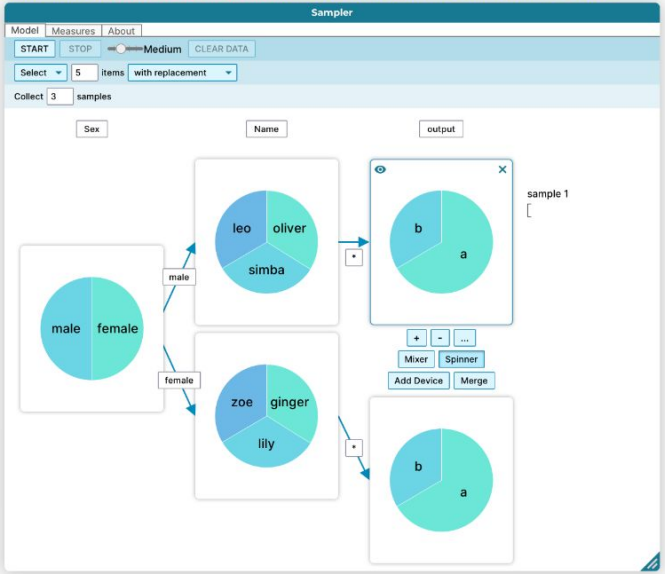
ESTEEM

CODAP Sampler Enhancements to Support Multiple Devices

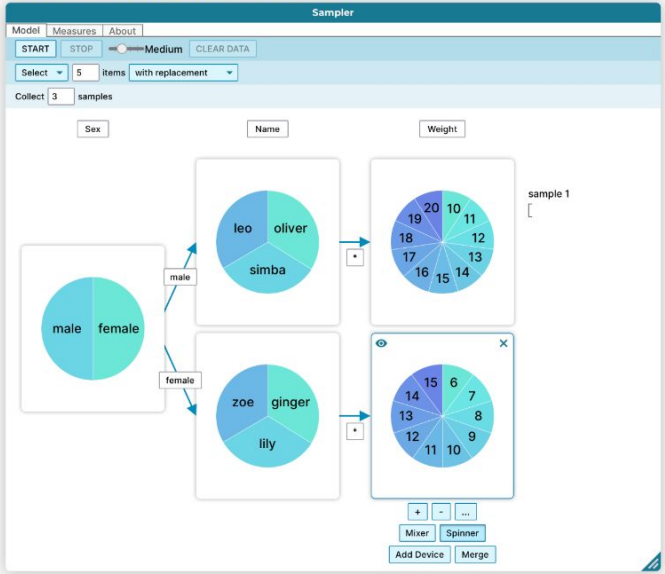
4a: Male Names device selected and its "Add Device" button is pressed …



4b: … which adds 2 devices (*see note below), one for each device from the Name column of devices



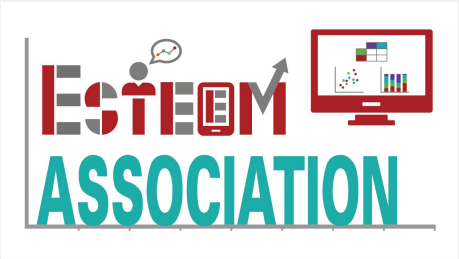
4c: labels updated in the new Weight column of devices



Revised Curriculum Materials

bit.ly/EsteemModules

Available Now!



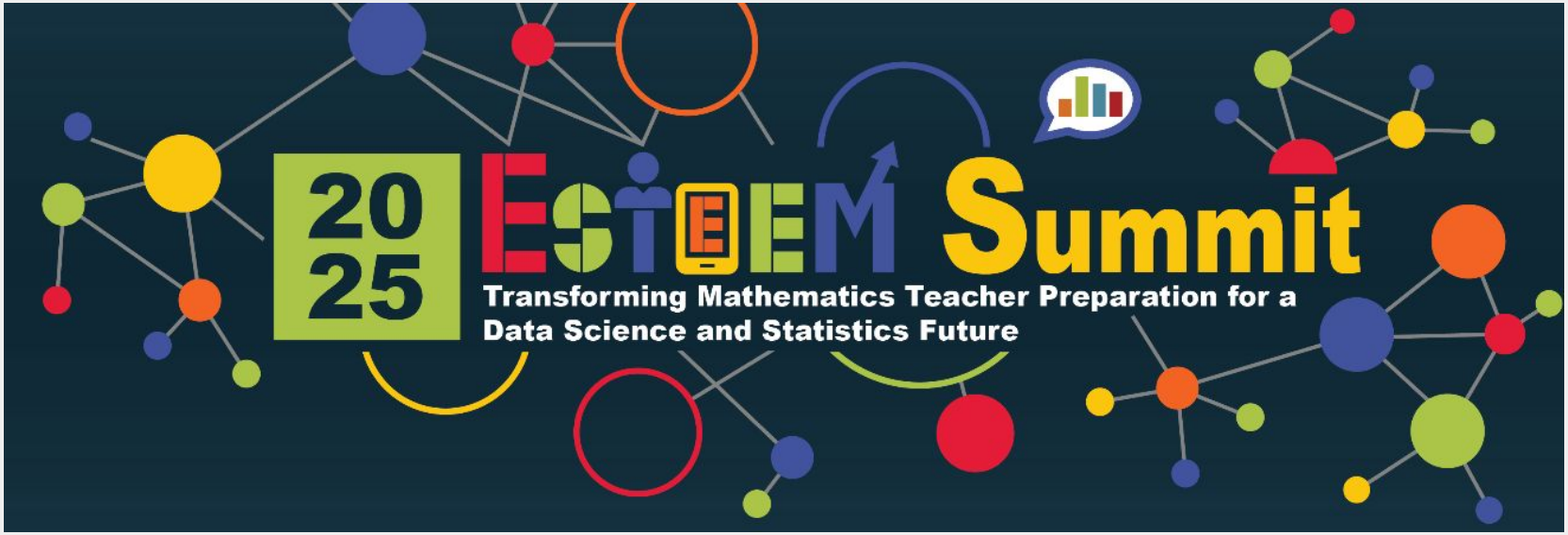
To be released June 2025

To be released Fall 2025

Professional Growth for Teacher Educators

research.ced.ncsu.edu/esteemhub

Professional Growth for Teacher Educators



80+ Faculty

2 Days

40+ Universities

research.ced.ncsu.edu/esteemhub

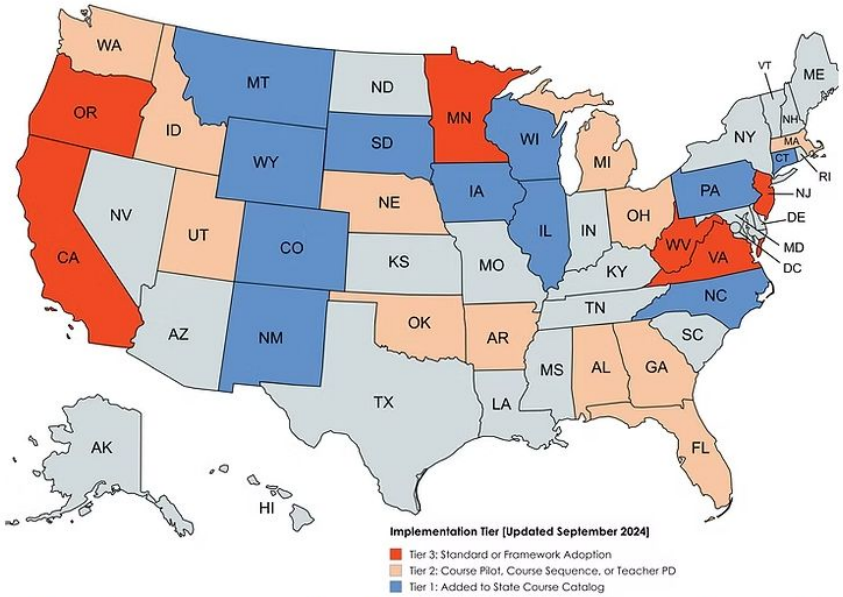
research.ced.ncsu.edu/esteemhub/resources

Find one resource you did NOT know about before today!

DataScience4everyone

datascience4everyone.org

Data science is spreading across the country...



State-wide data science education implementation (September 2024)

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Teaching Data Science in High Schools

Position statement --March 2024

Data science is a rigorous, engaging, and practical field of study and can be a significant part of a high school student's mathematical experience. Knowledge of data science is important, and a data science course should be accepted as a high school mathematics course that can be used for credit towards graduation...

All students should have the opportunity to take four years of high school mathematics, and data science content should be available to all students in order to complete their high school mathematics graduation requirement.

Data Science in K-12 Education

Data Science in K-12 Education -- April 2024

Data science bridges disciplines and thus should be introduced and taught across the curriculum in K-12 schools to help develop informed users of data....

All subjects in school should recognize the contribution of data to their discipline and take curricular approaches that integrate data with disciplinary lessons where appropriate.

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

nsta National Science Teaching Association

CSTA

National Council for the Social Studies

ASA AMERICAN STATISTICAL ASSOCIATION Promoting the Practice and Profession of Statistics

InSTEP

Conversation and Collaboration

How can InSTEP help support teacher learning in your context?

What are some successes and struggles in teacher education in your country?

How can ESTEEM + InSTEP connect with DATASETUP?

DATASETUP

ESTEEM

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THANK YOU TO THE FUNDERS!

Stay Connected

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Google Scholar Profile