# entry points :

## Pathways and Possibilities to Support Student Learning about Data and AI



**EVENT #2 | K-12 PROJECTS & OPPORTUNITIES**

Sponsored by the College of Education, Health and Human Sciences at the University of Tennessee, Knoxville

**March 31, 2026**

THE UNIVERSITY OF TENNESSEE KNOXVILLE

COLLEGE OF EDUCATION, HEALTH & HUMAN SCIENCES

# Entry Points Presenters

**Data Science 4 Everyone:**
Into Data Science & AI Education
Mr. Mahmoud Harding

**University of Tennessee, Knoxville:**
Dr. Lynn Hodge, Dr. Rachel Wong, & Dr. Kelly Boles

01

# Into Data Science & AI Education

# Entry Points

## Into Data Science & AI Education

Mahmoud Harding, Instructional Design Director, Data Science 4 Everyone

# Data Science 4 Everyone (DS4E)



# Who we are and what we support

DataScience4everyone is a coalition supporting the advancement of data science education so that every K-12 student is equipped with the data skills needed to succeed in our modern world.

Data Skills = Data Literacy + Data Science

# How does DataScience4everyone define data literacy?

Data literacy refers to the ability to read, understand, interpret, and communicate data or claims derived from data (Sukol 2025).

# How does DataScience4everyone define data science?

Data science is an interdisciplinary field of study that uses concepts and tools from statistics, computer science, and mathematics to ask and answer questions using data (Sukol 2025).

# What is the critical mission of DataScience4everyone?

Catalyze the adoption of **both** data literacy and data science as integrated components of K-12 education by 2030.

Data Skills = Data Literacy + Data Science

# Why do we support data science education?



# Gr. 8 students NAEP mathematics

| Content area | 2019 | 2022 | Change |
|---|---|---|---|
| Number properties and operations | 279 | | ↓ |
| Measurement | 280 | | ↓ |
| Data analysis, statistics, & probability | 279 | | ↓ |

**Source:** Drozda, 2023

# College degree and major matching

Students don’t always work in jobs aligned to their degrees

**The other 2/3 need experience with data skills across disciplines.**

✔ **1/3** work in a job that is aligned with their college degree

**Source:** Federal Reserve Bank of New York, 2013

# Data skills are 4 everyone

22.7% of job postings in the US are asking for at least one skill from the category getting, exploring, and analyzing data.

Designed by Freepik

**Source:** Salerno & Steemers (2024), Burning Glass Institute & ExcelinEd

# How can you facilitate data enabled instruction?



# 3 models of data science instruction

| Dedicated Course | Content Modules | Integration |
| --- | --- | --- |
| A standalone data science course focused on introductory data science skills. | Data literacy & data science are taught through dedicated content modules. | Data literacy & data science concepts integrated across all grade levels and all subject areas. |

**All models rely on data-enabled instructional practices.**

**Source:** Sukol 2025

# 5 themes of dedicated data science

1. Inquiry-based and iterative investigation
2. Integration of technology
3. Multivariate datasets
4. Mathematical modeling
5. Ethical communication with data

Designed by rawpixel on Freepik

# Data Science 4 Everyone

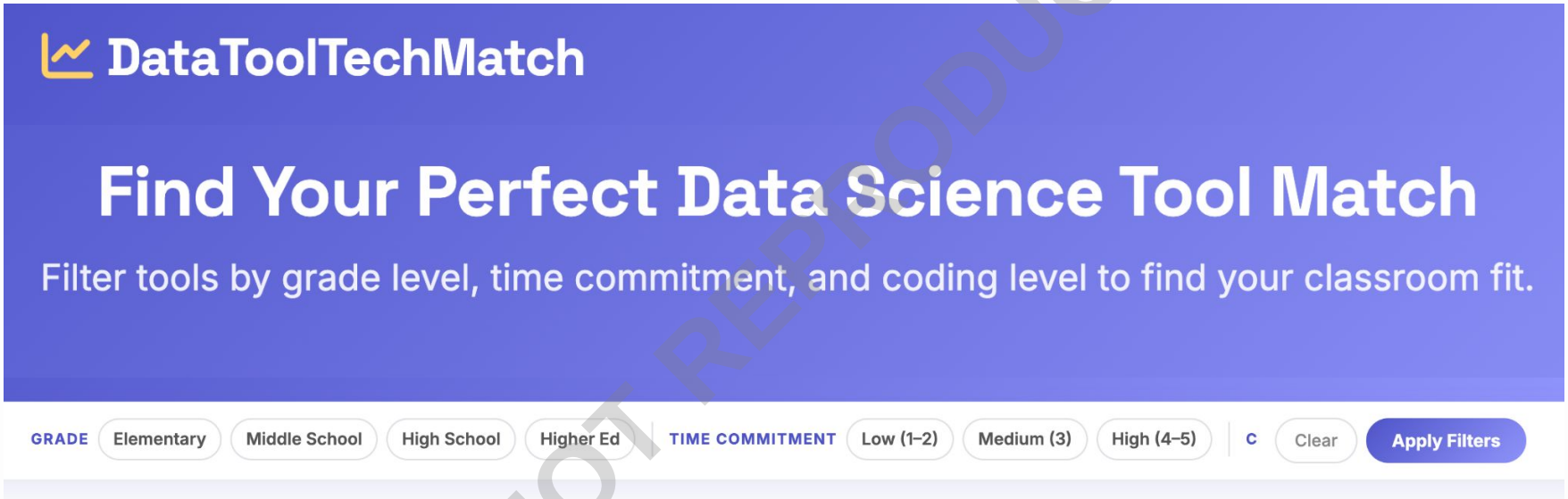
DS4E Content Partners | Evaluation Rubric

## Data Science 4 Everyone Content Partner Network

Comprehensive data science education resources across diverse implementation approaches

| 6 | 6 | 5 |
|---|---|---|
| Full Course Offerings | Modular & Supplemental | Specialized Resources |

## 📚 Full Course Implementations



Home > Five basic concepts for teachers new to data science

# 5 basic concepts for teachers new to data science

... you're probably already doing more data science than you realize.

**https://bit.ly/4doZnwt**

Getting Started 5 min read

# Integration

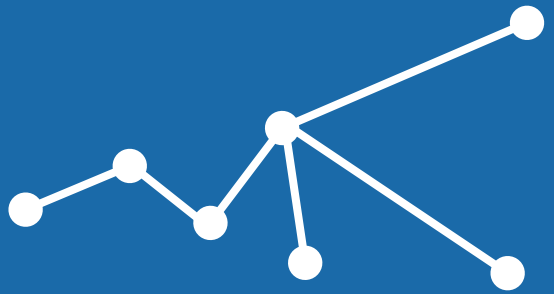
**Educator Professional Development:** Onboarding to the Data Science Learning Progressions

Hannah Kurzweil

1 What is Data Science Education?

# Additional resources for incorporating data skills into your instruction & coursework





DataScience4 everyone datascience4everyone.org/

**Substack ds4e.substack.com/**

- There's More to Data Science than Math and Programming
- Making Data Moves: The Prep Work Behind Every Good Analysis
- Data Investigation Processes: Connected, Iterative, and Cyclic

**DSLPs datasciencelearning.org/**

- Five basic concepts for teachers new to data science

# Data articles & resources we recommend


- Wickham, H. (2014). *Tidy Data*. *Journal of Statistical Software, 59*(10), 1–23. https://doi.org/10.18637/jss.v059.i10
- Erickson, T., Wilkerson, M., Finzer, W., & Reichsman, F. (2019). Data Moves. *Technology Innovations in Statistics Education*, *12*(1). http://dx.doi.org/10.5070/T5121038001
- Kim, A. Y, Ismay, C., & Chunn, J. (2018). The fivethirtyeight R Package: "Tame Data" Principles for Introductory Statistics and Data Science Courses. *Technology Innovations in Statistics Education*, *11*(1). http://dx.doi.org/10.5070/T5111035892
- Hudson, Rick A., Lee, Hollylynne S., et al. (2024). *Data moves as a focusing lens for learning to teach with data and technology*. *Computers in the Schools*. https://doi.org/10.1080/07380569.2024.2411705
- Teach Data Literacy: a guide for primary teachers

# AI resources we recommend


- Chiu, T. K. F. (2025). AI literacy and competency: definitions, frameworks, development and future research directions. *Interactive Learning Environments*, *33*(5), 3225–3229. https://doi.org/10.1080/10494820.2025.2514372
- Modern Language Association of America. (2024). *Student guide to AI literacy*. https://d1oemxqau9vshd.cloudfront.net/app/uploads/sites/6/2024/11/AI-Student-Handout-November-2024.pdf
- Teaching Responsible AI Literacy in Schools

# Sites, papers, articles, etc. mentioned in the presentation

- DS4E Content Partner Network
- DS4E Technology Tools for Data Science
- 5 Basic Concepts for Teachers New to Data Science
- Data Science Starter Kit

02

# UTK: Developing Partnerships with Local Communities

# Developing Partnerships with Local Communities: An Overview of Three Projects

Dr. Lynn Hodge and
Dr. Rachel Wong

THE UNIVERSITY OF TENNESSEE KNOXVILLE

DEPARTMENT OF THEORY & PRACTICE IN TEACHER EDUCATION

# Strengthening and Developing Partnerships in East Tennessee for Community Engagement in Artificial Intelligence Education (PARTNER-AI)

THE UNIVERSITY OF TENNESSEE KNOXVILLE

DEPARTMENT OF THEORY & PRACTICE IN TEACHER EDUCATION

This material is based upon work supported by the National Science Foundation under Grant No. 2405213. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.

# Project Background

- Funded by a yearlong U.S. National Science Foundation partnership development grant (Award #2405213)
- **Three project goals:**
  - strengthen and expand existing research-practice partnerships (RPPs) with East Tennessee teachers and school leaders,
  - develop new RPPs with parents and students enrolled in East Tennessee middle and high schools, and
  - co-construct a shared vision for AI that aligns with the needs and assets of the partner community.

# PARTNER-AI Project Team

- **UTK Researchers**
  - Rachel Wong (TPTE)
  - Lynn Hodge (TPTE)
  - Katie Schuman (EECS)
  - Joan Williams (TPTE)

- **RPP Team**
  - Megan Reece (Parent)
  - Jessica Moore (Parent)
  - Patricia Bowling (Parent)
  - Student 1
  - Student 2
  - Jessica Chambers (School Leader – Sevier County)
  - Amy Jeffers (School Leader – Scott County)
  - Eddie Patton (Teacher – Roane County)
  - Joyce Keeton (Teacher – Scott County)

# Project Participants

- 19 Teachers
- 4 Parents
- 1 School Leader
- 4 Students

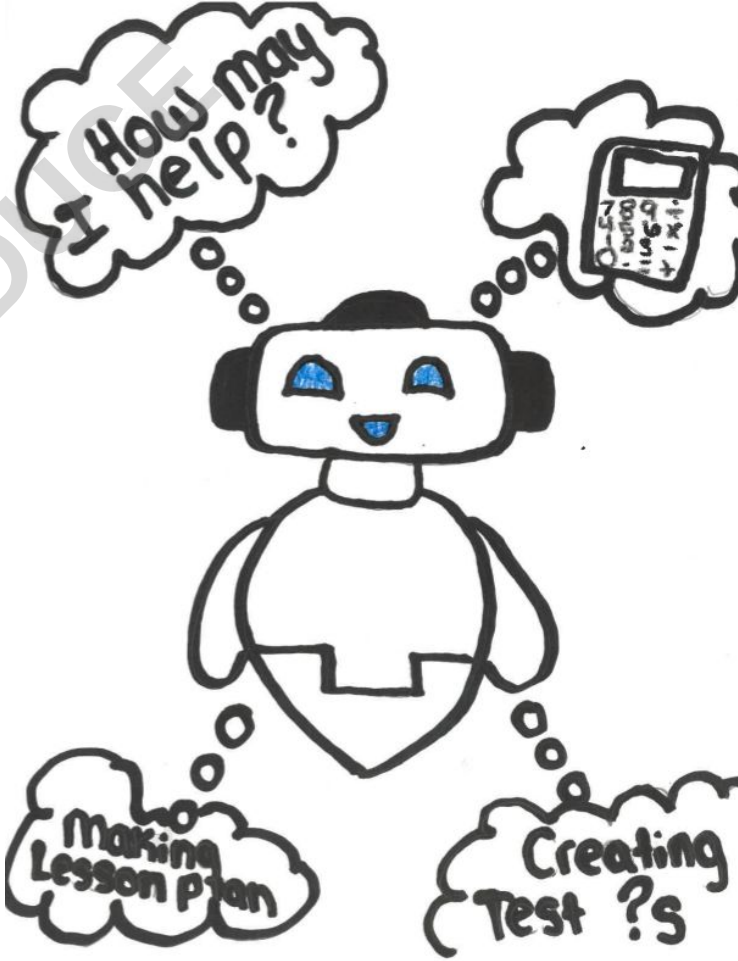
# Project Structure

Phase One


Phase Two

# Phase 1 Activities

- Value Mapping
- Gallery Walk
- Mission and Vision Statements
- Making Sense of Data from Phase 2 Participants



# Mission Statement

- Our mission is to strengthen educational experiences across East Tennessee by using AI as a supportive tool for teaching and learning. We are committed to cultivating collaborative learning communities—whether virtual or in person—where students and teachers can meaningfully engage with emerging technologies. By prioritizing critical thinking, transparency, and ethical use of AI, we aim to equip all learners with the skills to analyze, evaluate, and apply AI responsibly and effectively.

# Vision Statement

- To thoughtfully integrate AI to enhance education, uphold ethical and responsible practices, and inspire innovation. We aim to empower students and educators by equipping them with the skills to think critically, collaborate effectively, solve real-world challenges, and use AI thoughtfully and responsibly.

# Phase 2 Activities

- Initial Survey
- Interview
- Focus Group
- Final Survey

# Common Themes Across All Activities

- Concerns about Over-Reliance
- Need for Clear Policies, Boundaries, and Training
- AI as a Tool for Efficiency and Support
- Concerns about Erosion of Critical Thinking
- Mixed Feelings/Views on AI

# Next Steps

- Themes point to the need for intentional training and support:
  - Strengthen and further our work with Roane County Schools to co-design and implement AI PD curriculum for teachers that directly address some of these concerns

# MATHEMATIZING, VISUALIZING, AND POWER (MVP): APPALACHIAN YOUTH BECOMING DATA ARTISTS FOR COMMUNITY LEARNING



This material is based upon work supported by the National Science Foundation under Grant No. DRL-2215004. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.

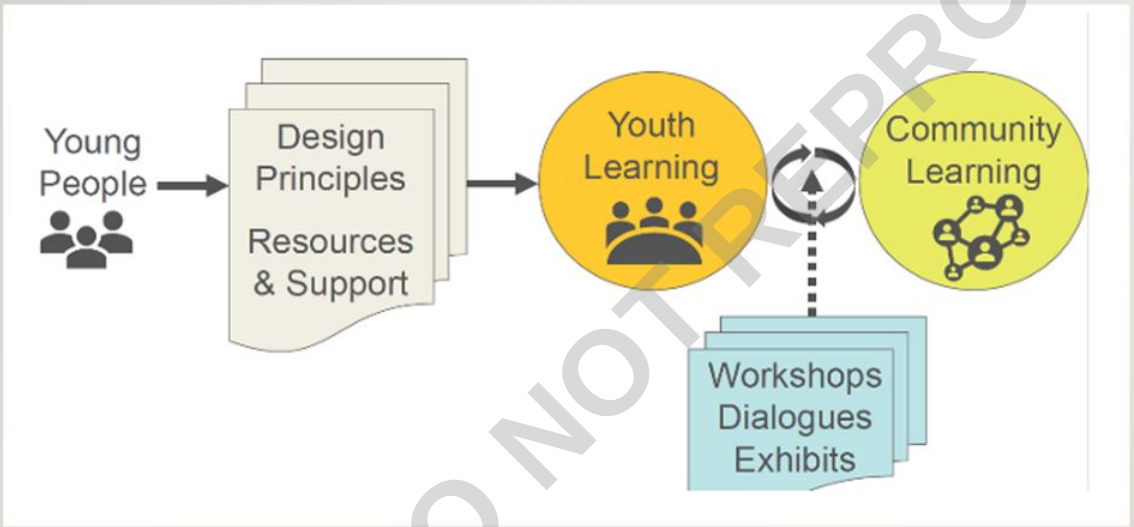
# MVP PROJECT TEAM

- Joy Bertling (UTK)
- Rhea Carmon (UTK)
- Chulin Chen (UTK)
- Carlye Clark (Boys and Girls Club)
- Caroline Covington (Pellissippi State Community College - PSCC)
- Mary Katherine Dailey (Knox County Schools)
- Lauren Farkas (Knox County Schools)
- Kristina Givens (Knox County Schools)
- Carlos Gonzalez (UTK)
- Rio Gonzalez (PSCC)
- Amy Maples (UTK)
- Megan Mundie (UTK)
- Kylee Pace (Knox County Schools)
- Ethan Pignataro (Knox County Schools)
- Lee Reinert (Knox County Schools)
- Matt Riddle (UTK)
- George Schafer (Drexel)
- Jessica Schwind (Knox County Schools)
- Ashley Stroud (UTK)
- Trey Smith (Philadelphia Public Schools & U. of Pennsylvania)
- Christopher Wright (Drexel)
- Yilang Zhao (University of Buffalo)

# MVP PROJECT BACKGROUND

- Funded by a three-year U. S. National Science Foundation grant (Award #2215004); PI Team: Hodge, Dyer, Bertling, & Clark
- Overarching purpose: Test, implement, and study a model for community data engagement catalyzed by youth and their self-created data visualizations
- Theoretical framing: Social and Cultural perspectives with an emphasis on critical and community-centered approaches to working with data (D'Ignazio & Klein, 2020; Philip et al., 2016; Rubel et al., 2021); hybridity (Gutierrez et al., 1999), and youth agency (Moses & Cobb, 2021)
- Currently in year 4 (extension year)

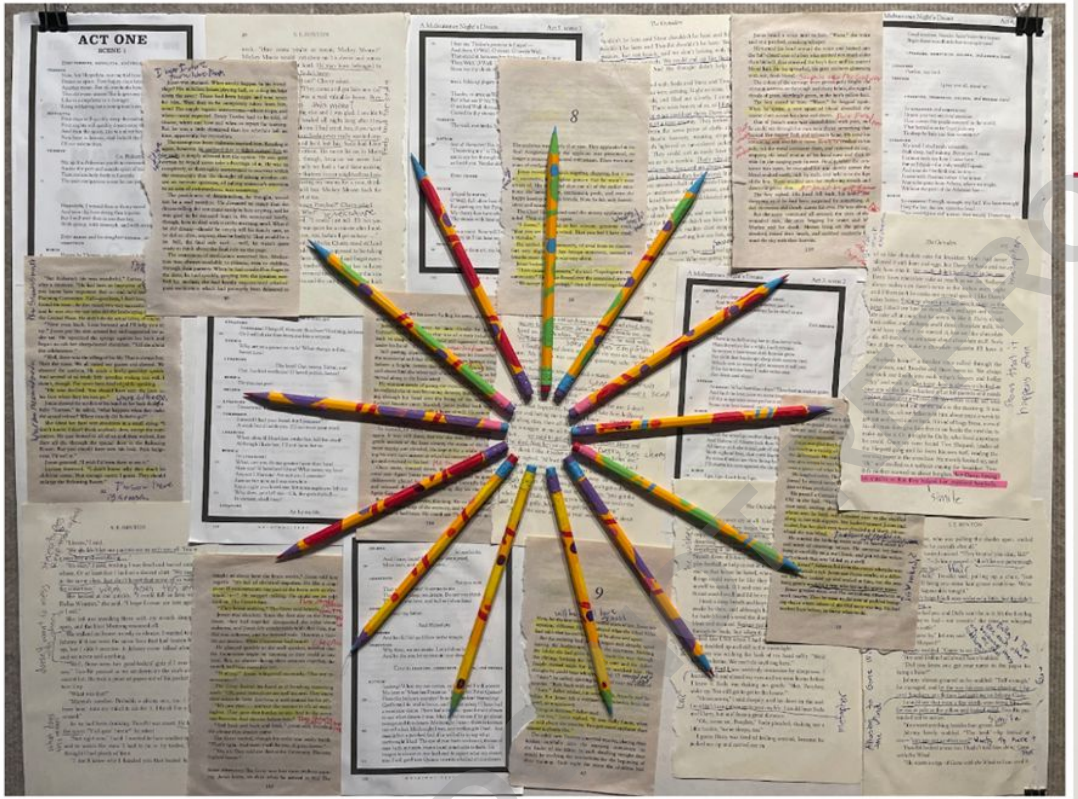
# MVP MODEL AND CONTEXT




Timing: Cycles 1-4, Spring 2023 – Summer 2024

Youth Learning:
82 youth participants – known as data artists – ages 12-17) across 4 cohorts participated in weekly sessions

Community Learning
1-3 events per cycle




*In Our Words*
Paint, paper, pencil

"My piece shows how my friends and I feel about middle school and high school. The pages are words that we read through middle school, while the paint and pencils represent the emotions we feel."
-Karen, grade 8

*Parental Styles and Relationships*
Paint, marker

"This artwork represents the responses gathered from those primarily aged 12-16 about whether or not their parents are strict or whether they get along with said parents."

-Nina, grade 11


*Losing Sleep*
*Embroidery hoop, suede leather lace, hemp cord, and beads*

"…My piece is about sleep schedules and the impact school/work has on them. My data is visualized in a dream catcher to represent hopes for peaceful nights of sleep. The beads display the data with each bead type representing a different answer choice from my survey. Each string is a person who took the survey…"
-Dakota, Grade 12

# CURRENT WORK

- Planning for a community Workshop in May to revisit the curriculum and facilitators guide
- Research:
  - What are data artists identities in relation to community as reflected in their data visualizations?
  - How is the integration of data and art reflected in the student-created visualizations? How do the data visualizations sustain viewers' interests?

- https://mvp-project.com

# AI Presidential Challenge

THE UNIVERSITY OF TENNESSEE KNOXVILLE

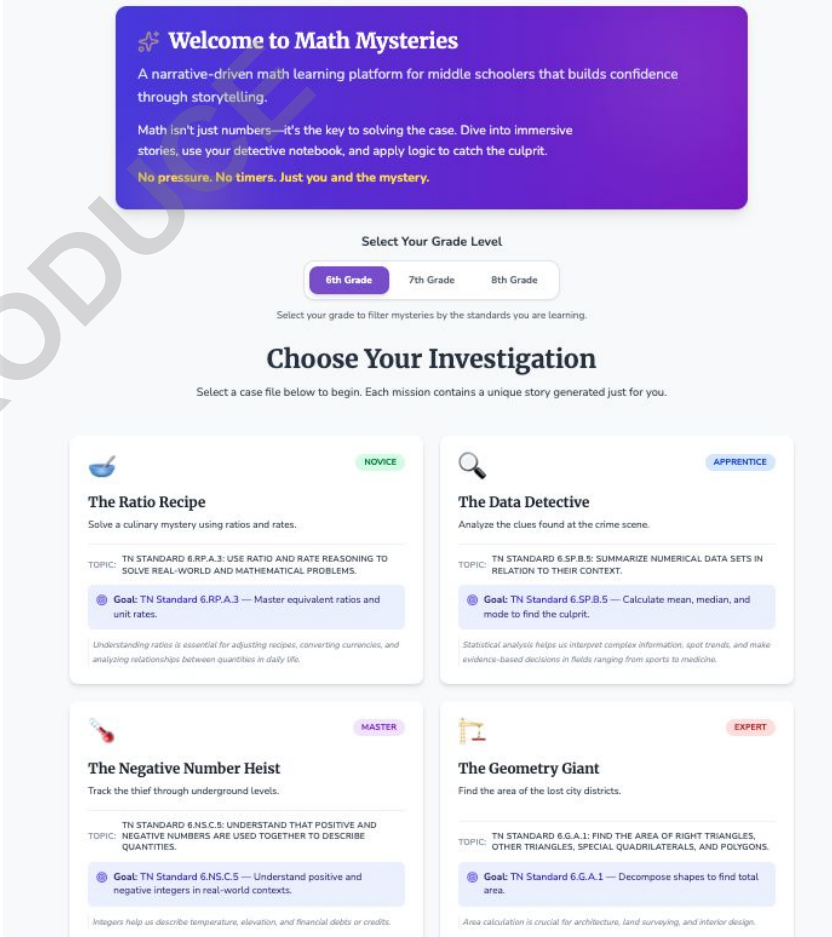
DEPARTMENT OF THEORY & PRACTICE IN TEACHER EDUCATION

# AI Presidential Challenge Project

- Led by Dr. Yukyeong Song
- Mentors included Dr. Rachel Wong, Dr. Vinhthuy Phan (UM), and Dr. Jewoong Moon (UA)
- National challenge where educators, mentors, K-12 students, and community teams come together to solve real-world problems in their community using AI-Powered solutions.

# AI Presidential Challenge

- Three K-12 teachers from Roane County Schools
- 8-week-long weekly online structured workshop
- Design thinking framework
- Math Mysteries



03

# UTK: Data Science and AI Education within Community Contexts

# Appalachian AI Corps

## Empowering Appalachia Through Artificial Intelligence



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DEPARTMENT OF THEORY & PRACTICE IN TEACHER EDUCATION

TENNESSEE

THE UNIVERS TENNES KNOXVILLE
MIN H. KAO DEPARTMEN ELECTRICAL ENGINEERIN COMPUTER SCIENCE

Students who have opportunities to deeply **learn** about, **use**, and **build with AI tools** in **authentic community contexts**

Students who have opportunities to deeply **learn** about, **use**, and **build with AI tools** in **authentic community contexts**

are students who will be **empowered to make informed decisions** about AI use

Students who have opportunities to deeply **learn** about, **use**, and **build with AI tools** in **authentic community contexts**

are students who will be **empowered to make informed decisions** about AI use

and

**positioned to leverage it for the good of their communities and families.**

# CURRENT WORK:

## Water Quality Monitoring

# Project Context

- Pilot year 1
- Partnership with a local high school:
  - CTE: Agricultural Science (Agriscience)
  - Environmental Science
- Co-designed six workshops around curricular standards and local community contexts
- Will hold workshop #5 next week

# Curricular Alignment

TN Department of Education | College, Career and Technical Education

Agriscience

## Supervised Agricultural Experience

- Student-driven
- Should implement multiple science and engineering practices:

# Curricular Alignment

TN Department of Education | College, Career and Technical Education

## Agriscience

### Supervised Agricultural Experience

- Student-driven
- Should implement multiple science and engineering practices:

a. AQDP - asking questions and developing problems
b. MOD - developing and using models
c. PCI - planning and carrying out investigations
d. AID - analyzing and interpreting data
e. UMCT - using mathematics and computational thinking
f. CEDS - constructing explanations (for science) and designing solutions (for engineering)
g. EAE - engaging in argument from evidence
h. OECI - obtaining, evaluating, and communicating information

# SMOKEY BUOY

As Entry Point

# Smokey Buoy

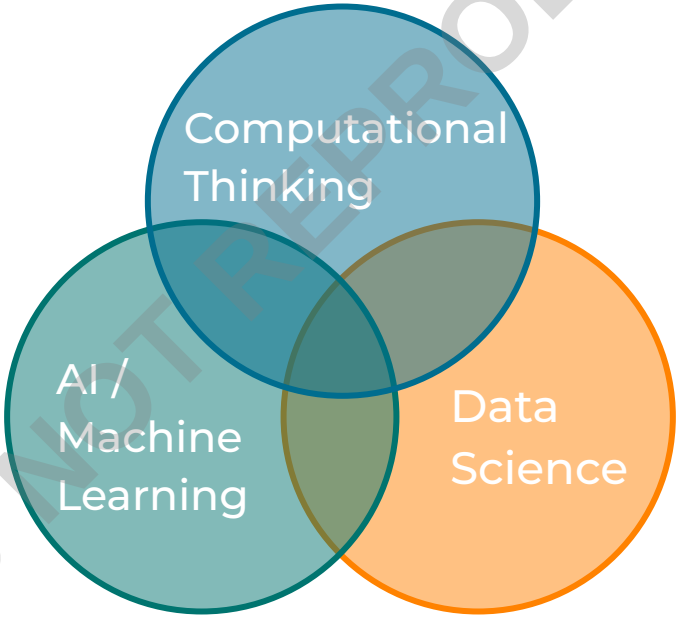
THE UNIVERSITY OF
TENNESSEE

Min H. Kao Department of Electrical Engineering and Computer Science

Department of Theory & Practice in Teacher Education

# THE WORKSHOPS

# The Workshops: Technical Content



# The Workshops: Materials

Each workshop has a robust set of curricular materials, including:

- Slide deck
- Accompanying slide deck with facilitator annotations
- Facilitator overview video
- Facilitator guide with standards alignment, preparation tips, and additional resources
- Student handout and (optional) notetaker
- Online student module with interactive Python code blocks

# The Workshops: Topics

| | |
|---|---|
| **W1** | Intro to Water Quality & Statistics Fundamentals |
| **W2** | Intro to Convolutional Neural Nets (CNNs) & Classification |
| **W3** | CNNs & Regression |
| **W4** | Physical Computing (Arduinos, Motors, Sensors, etc.) |
| **W5** | Asking Questions of & Analyzing Buoy Data |
| **W6** | Presentation of Findings & Career Connections |

# The Workshops: Topics

**W1** Intro to Water Quality & Statistics Fundamentals

**W2** Intro to Convolutional Neural Nets (CNNs) & Classification

**W3** CNNs & Regression

**W4** Physical Computing (Arduinos, Motors, Sensors, etc.)

**W5** Asking Questions of & Analyzing Buoy Data

**W6** Presentation of Findings & Career Connections

# Buoy Deployment

# What's Next

- Pilot Year 1 completed by Summer 2026
- Workshop materials will be refined and released for public use
- Plans to expand to more regional schools/districts next year
    - Contingent on additional funding

# AAIC

This work is funded through an AI Tennessee seed grant.

It would be impossible to do this work without our UTK team!

Dr. Sukanya Moudgalya
Dr. Kelly L. Boles
Dr. Sai Swaminathan
Dr. Michela Taufer
Dr. John S. Schwartz
Dr. Ian M. Simpson
Dr. Amanda Zeller
Breanna Slessman
Ronald Rupard
Jacob Foltz

**And a special thank you to our wonderful school, teacher, and student partners!**

# COMMUNITY DATA LIBRARIES

Data *about* the community *for* the community.

# Motivation

- In data science education, it is recommended that data used in instructional activities be contextually-relevant and proximate to the learner
    - Can be achieved in different ways and to different degrees
        - Did the learner generate/create the data set?
        - Is the data about the learner?



(Lee & Delaney, 2022; Weiland & Williams, 2024)

# Motivation

- Large cities often have open data repositories for citizens
  - Makes finding data a bit easier, but…
  - Expensive, must be maintained
  - Difficult/impossible for small town and communities




data.cityofchicago.org

# The Project: Community Data Libraries

- Under active development
- Community data libraries will provide a selection of open data sets that contain data about a given community
    - Include features making dataset selection and use easier for particular pedagogical purposes/curricular standards
- An interested community member will be able to create their own local data library using our tools

# The Project: Timeline

| Phase One | Phase Two | Phase Three | Phase Four |
| --- | --- | --- | --- |
| **Active development of Community Data Libraries** | **Creation of curricular materials to integrate CDLs across content areas.** | **Teacher professional learning opportunities and training around CDL data and resources** | **Community member workshops using CDL data and resources.** |

# The Project: Timeline

**Soon: Searching for schools and teachers interested in using CDLs.**



| Phase One | Phase Two | Phase Three | Phase Four |
| --- | --- | --- | --- |
| **Active development of Community Data Libraries** | **Creation of curricular materials to integrate CDLs across content areas.** | **Teacher professional learning opportunities and training around CDL data and resources** | **Community member workshops using CDL data and resources.** |

# Acknowledgements

This project is made possible by the support of the BelleJAR Foundation.

**Thank you to the CDL team!**

Dr. Kelly Boles
Aadya Sharma
Molly McKenzie
Ariel Thompson

# Panel Discussion

# Q & A

# entry points :

## Pathways and Possibilities to Support Student Learning about Data and AI



**EVENT #3 | NATIONAL FRAMEWORKS & RECOMMENDATIONS (APR 28)**

- Data Science Learning Progressions
- National Academies' Competencies for the Future of Data and Computing
- 2025 GAISE College Report Revision (to include Data Science)

**entrypointsutk.org**

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