Big Sky Standards

Real World Data Webinar Series

Assessing data skills

+

Analyzing assessment results

MONTANA OFFICE OF PUBLIC INSTRUCTION

THE GREAT SEAL OF THE STATE OF MONTANA

ORO Y PLATA

DataScience4

MEET YOUR HOSTS

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DIRECTOR OF POLICY

DataScience4 everyone

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DataScience4 everyone

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MEET TODAY'S GUEST

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GENESEE INTERMEDIATE SCHOOL DISTRICT
LEADERSHIP ◆ SERVICE ◆ INNOVATION
Partnering for success!

Former MS/HS Math Teacher

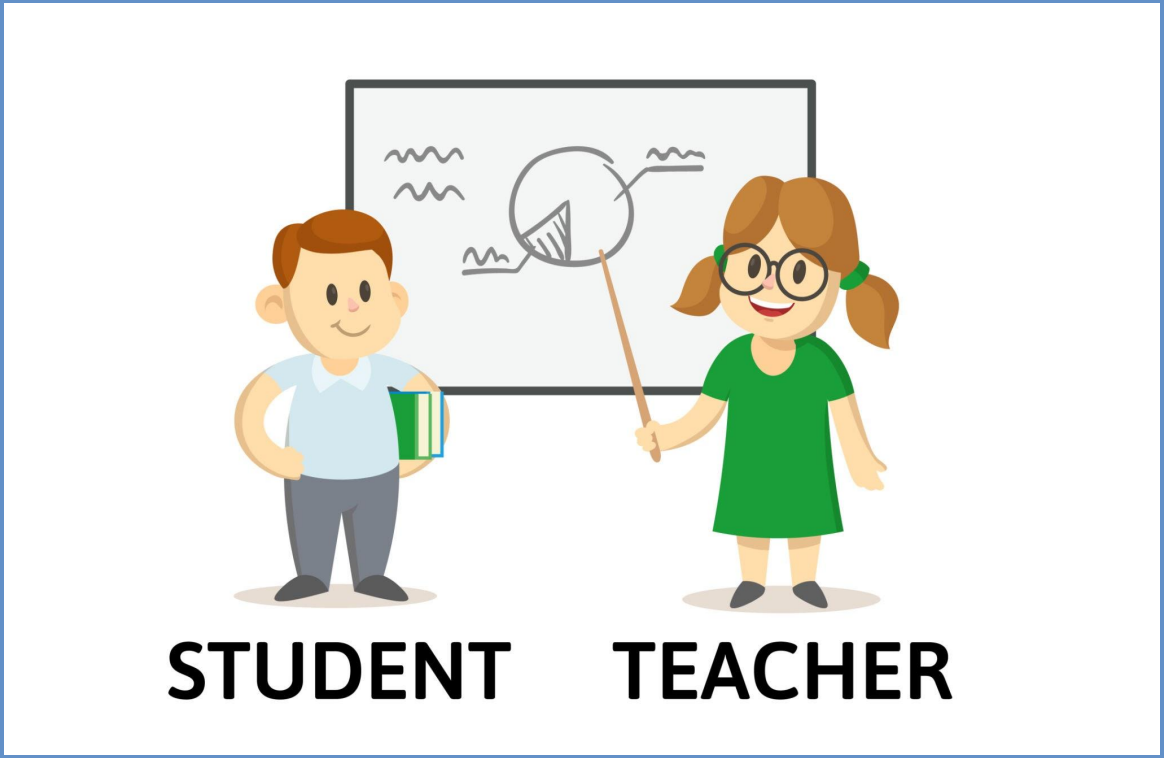
Serves 21 districts across Genesee County, MI

Recipient of $100K State of Michigan Grant

Piloted YouCubed Data Science with 14 educators


ASSESSMENT
GOAL
MEASURE
CRITERION
IMPACT
COMPARE
VS
VALIDITY
LIMITATIONS
EVALUATION
ANALYSIS
RESULT

Assessing in the Classroom



Assessing Student Data Skills

Rethinking Our Practice

What makes our classrooms different:

- Project Based, rubrics
- Social Action embedded
- Student voice and choice prioritized
- Technology focused

These things require a shift in how we assess student understanding

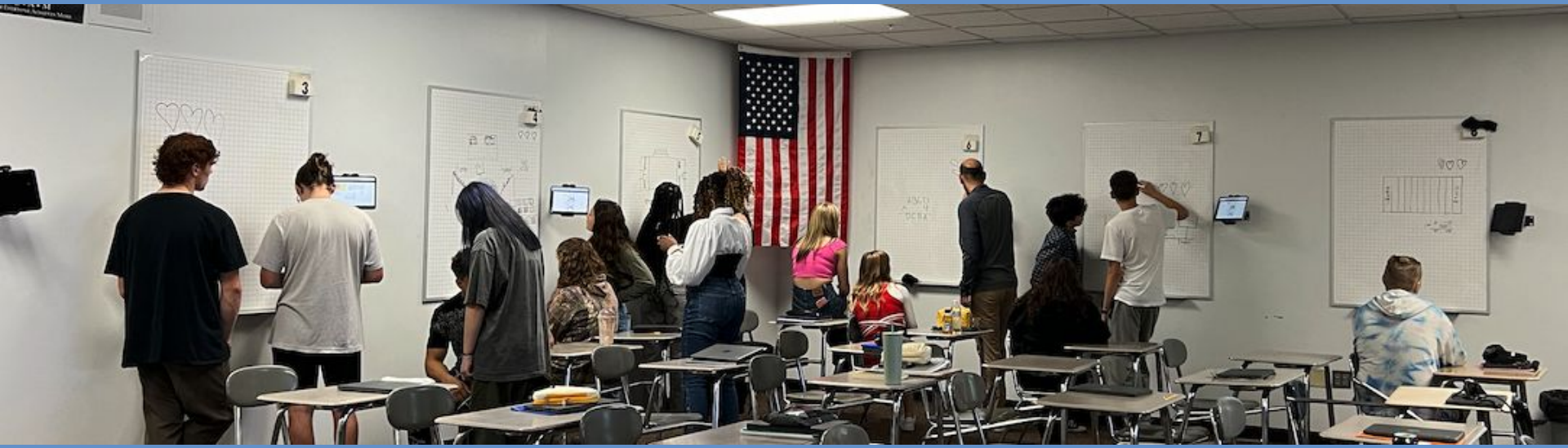
Assessments

How we assess in a PBL classroom

In a PBL classroom, our assessments look like:

- Journal entries and vocabulary
- VNPS’s
- Real Time Feedback- Docs/Slides
- Data Talks/Discussion

Welcome to Data Science!




DATA COLLECTION PROJECT
What I drink in a School day
Height of box = how much
6:00 am
10:00 am
11:00 am
12:00 pm
2:00 pm
Timeline
4:00 pm
5:00 pm
7:00 pm
9:00 pm
10:00 pm
KEY
water
home
school
given to me
bored
Didn't drink anything
Cranberry juice
In my car
Refilled
Taking pills
Thirsty

Using Rubrics

Example Rubric- Unit 2

Includes:

Student reflection

Peer reflection

Evidence based scores

Includes ethical considerations

Criteria	Self-Assessment /Peer Feedback (Evidence and comments for growth and strength areas)	Instructor Assessment (Evidence and comments for growth and strength areas)	Criteria Met Y/N
Asking Questions			
Formulates the questions that can be answered based on the data given (What is the story I can tell from this data?)			
Gathering and Organizing Data			
Links a copy of group spreadsheet in the report (Yes/No) Organizes, merges, and joins the three months of sample and temperature data into a newly organized format (Data cleaning) Cleans spreadsheet through merging cells, adding columns, and/or other techniques (Data cleaning)			
Modeling			
Provides visuals to support the claim(s) (Creating visual representations & Univariate and bivariate data) Demonstrates patterns in data set with thorough			

Student Work

What does it look like?

Formats:

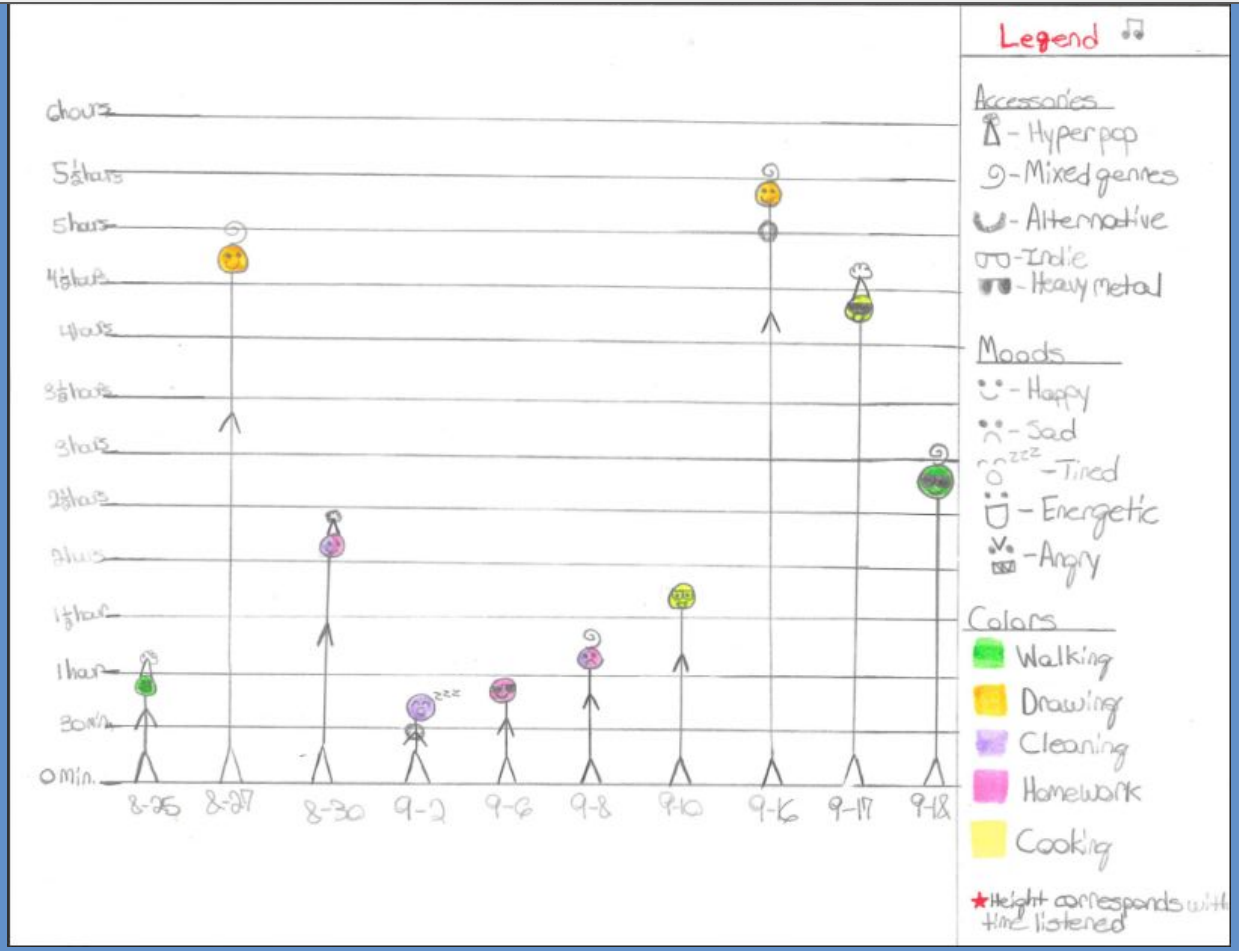
Google Slides/Docs

Spreadsheets

Posters/Diagrams

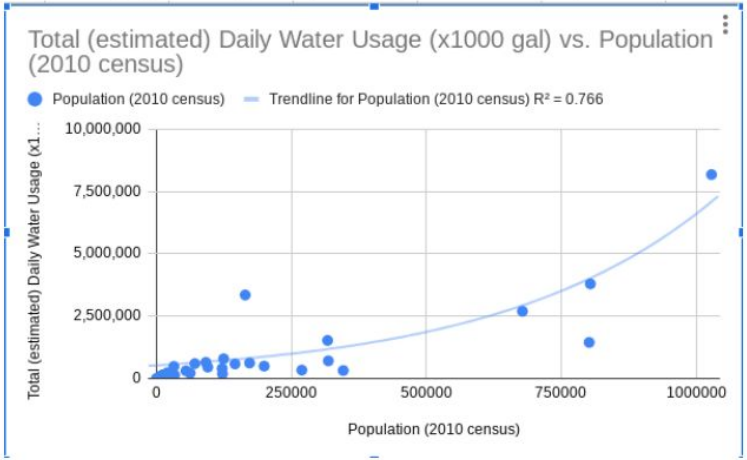
Word Wall

Daily Music Listening Trends

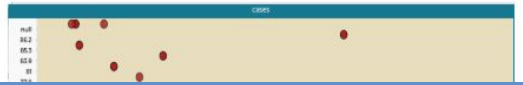


Water in your life

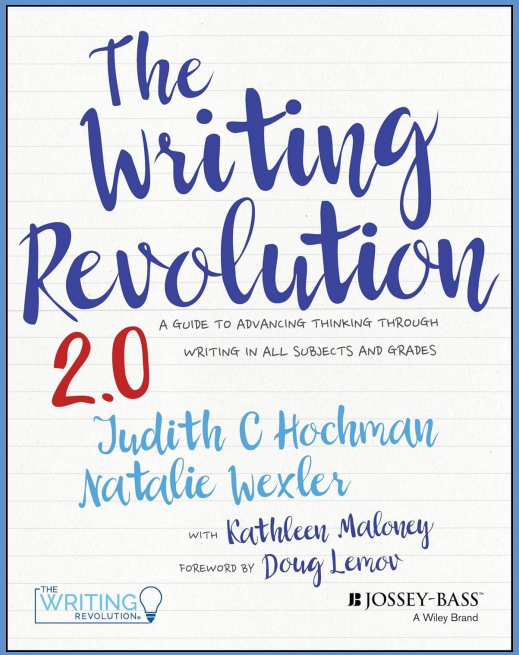
Yes, I can make the claim that the relationship between city population and the city's residential water usage is causal. Using Codap I created a scatterplot that shows that as the population goes up, the city's water usage grows.



As we look at the graph we see that this scatterplot is exponential, this seems to be the best function for this graph. This scatterplot shows us that when the population is larger, more water is being used, there is not a strong match because of the outliers, it still shows us the information that we need to say it is causal, meaning that more water is being used because the population is going up. We can compare other things that may factor into the higher/lower water usage that may be causing the outliers , for for example, max temperature. This may cause people to use more water when temperatures are extremely high or low, it seems that there may be a correlation but these two ideas are



This student's final project came together after regular feedback from her teacher. She made both a slideshow presentation and a written summary of her findings.



Intro

This project will represent tom brady's completion percentage under pressure and how it compares to how he does without pressure and how he compares to other quarterbacks.

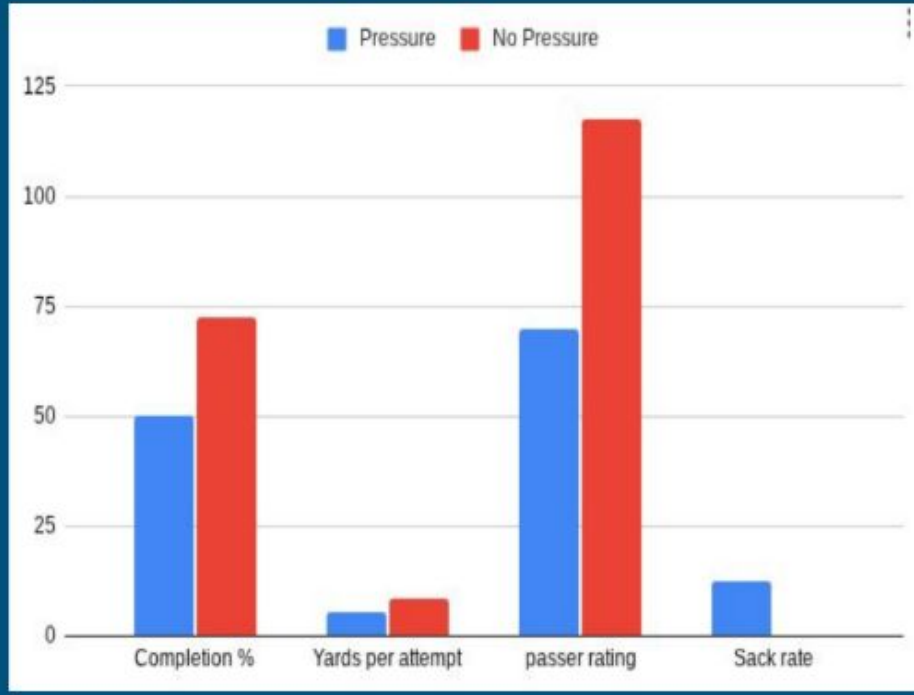
Background information

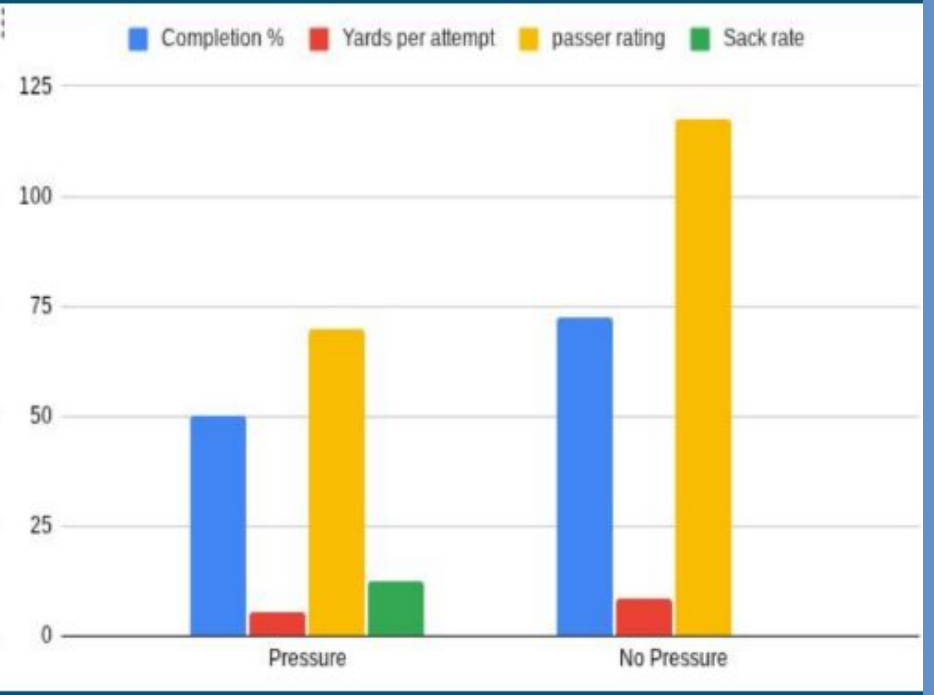
- Tom Brady is widely considered one of the greatest quarterbacks in NFL history.
- Quarterbacks often face pressure from the defense, which can affect their decision-making and accuracy.
- This project focuses on how Brady's completion percentage changes when he is under pressure compared to when he is not.
- The purpose is to gain insights into how pressure impacts performance and to practice using basic statistical analysis in a sports context.

Data

Pressure	No pressure
Completion % 45-55	Completion 70-75%
Yards per attempt 5-6 yrds	Yards per attempt 8-9 yards
Passer rating 60-80	Passer rating 110-125
Sack rate 10-15%	N/A (not avalive if there is no pressure)

Graphs


Pressure
No Pressure
125
100
75
50
25
0
Completion %
Yards per attempt
passer rating
Sack rate


Completion %
Yards per attempt
passer rating
Sack rate
125
100
75
50
25
0
Pressure
No Pressure

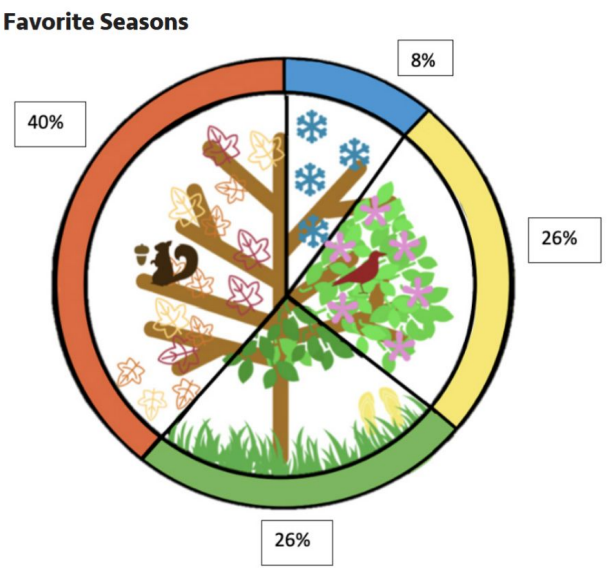
Analyzation and Communication

Tom Brady's performance metrics show a clear decline when under pressure compared to when he has a clean pocket. However, even under pressure, his completion percentage, yards per attempt, and passer rating remain relatively strong, demonstrating his exceptional ability to manage and perform under challenging conditions. His lower sack rate under pressure, compared to the league average, further underscores his ability to avoid negative plays when facing a pass rush.

Data Talks

Youcubed Data Talk
Favorite Season

What do you notice?
What do you wonder?
What is going on in this data visualization?



https://www.youcubed.org/resource/data-talks/

Analyzing Assessment Results to Improve Instruction

What is your comfort level in using classroom/assessment data?

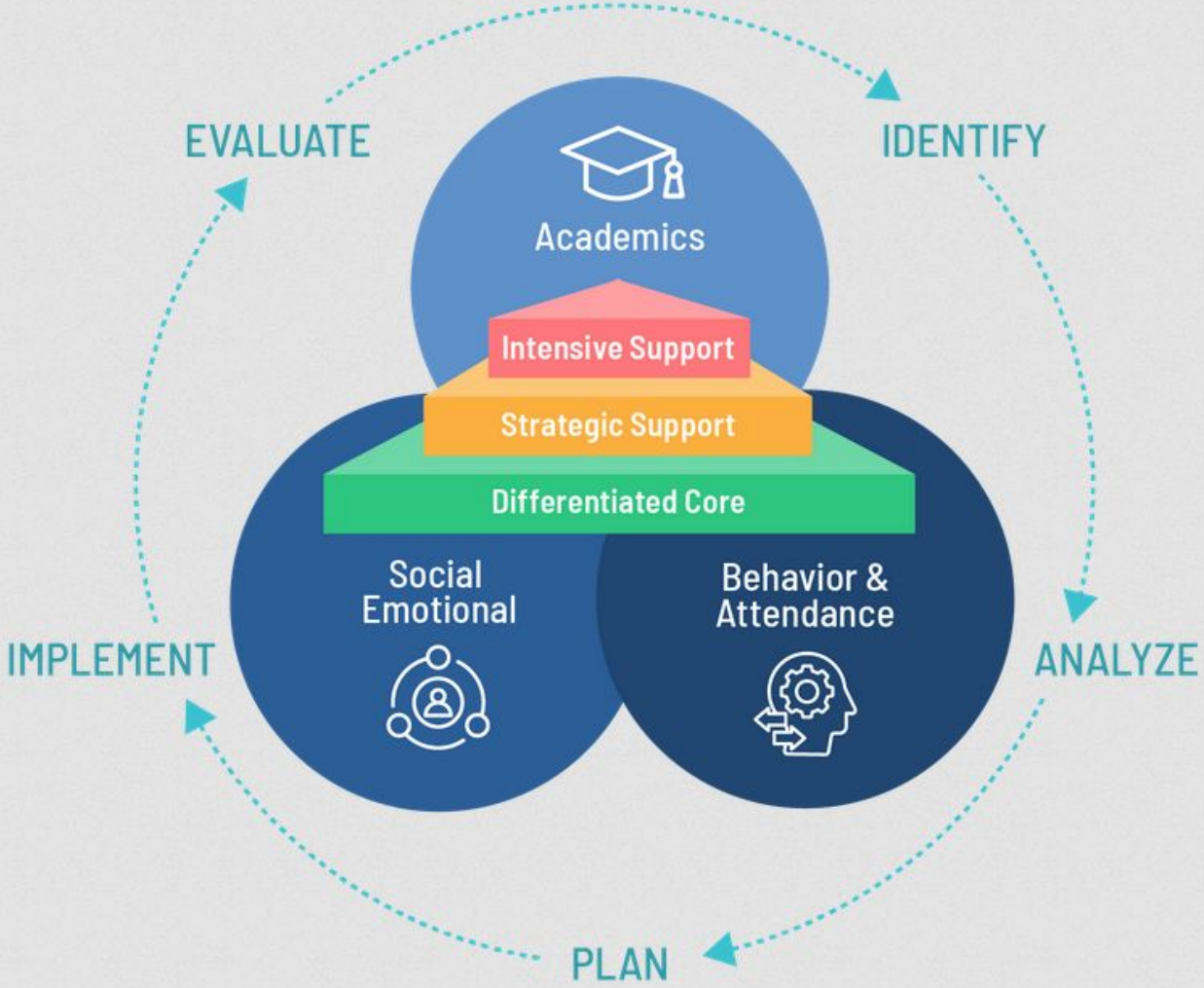
1. **Novice:** I have the data, but I'm not sure what to do with it.
2. **Comfortable:** I can spot trends and try to adjust, but I'd like to be more strategic.
3. **Confident:** I regularly use data to plan small groups and adjust my teaching.

It’s Not “What did they miss?”
It’s “Why did they miss it?”

Then: Seeing low scores and thinking, "They didn't get it."

Now: Seeing low scores and asking, "How could *I* teach it differently?"

The Goal: To shift from figuring out what went wrong to figuring out what to try next.


EVALUATE
IDENTIFY
Academics
Intensive Support
Strategic Support
Differentiated Core
Social
Emotional
Behavior &
Attendance
IMPLEMENT
ANALYZE
PLAN

WHAT ARE MISCONCEPTIONS AND COMMON ERRORS?

Persistent misunderstandings or misinterpretations that occur during problem solving. **Errors might self-correct** with practice while **misconceptions can persist for years**.

WHY DO THEY HAPPEN?

The Journal of the Learning Sciences and The Mathematics Educator explain that students build new knowledge atop what they already know.

Misconceptions can occur when:

- Prior knowledge doesn't align with new concepts
- Students form overgeneralizations
- Students rely on surface level patterns instead of deeper reasoning
- Students apply familiar ideas in ways that seem logical but don't always hold true (false conjectures).

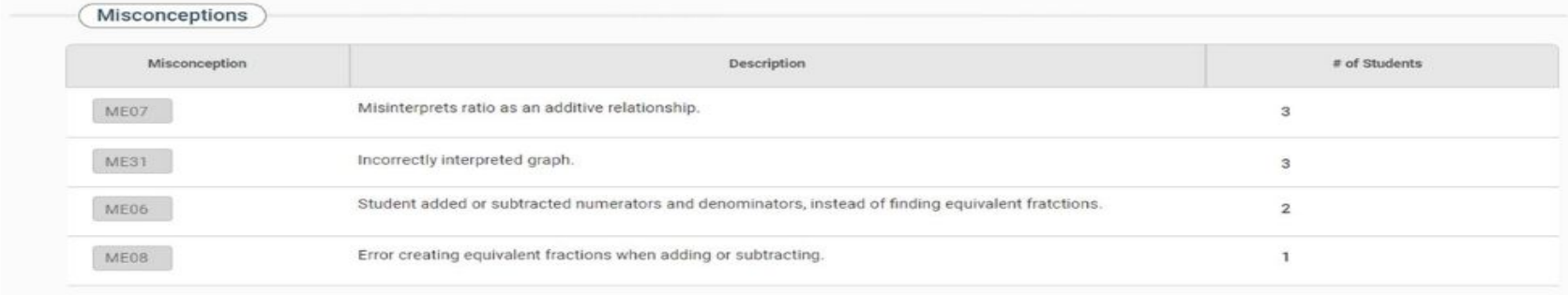
GENERAL STRATEGIES

A study published in The Mathematics Educator Journal identifies some general strategies for addressing misconceptions:

- Use data to interpret and diagnose misconceptions.
- Use tiered interventions as appropriate (Tier 1: all students, Tier 2: some students, Tier 3: individual students)
- Consider student strengths as a tool for building understanding (e.g., passions, hobbies, interests, natural talents in math)
- Use peer tutoring or collaborative learning activities
- Use multiple representations to build understanding
- Use mistakes as springboards for learning (e.g., justify and prove)
- Use clear and concise mathematical language

Classroom Reports

Misconceptions (Math)



Misconceptions

Misconception	Description	# of Students
ME07	Misinterprets ratio as an additive relationship.	3
ME31	Incorrectly interpreted graph.	3
ME06	Student added or subtracted numerators and denominators, instead of finding equivalent fratctions.	2
ME08	Error creating equivalent fractions when adding or subtracting.	1

What is it?

The frequency of identified misunderstandings or common errors based on patterns of incorrect responses across students at the classroom level.

How does it help?

Misconceptions help identify areas where students might be struggling in relation to a specific skill. This supports targeted instruction on a smaller group of skills.

https://opi.mt.gov/LinkClick.aspx?fileticket=G12IUM0yEwg%3d&portalid=182

ACTIVITY: MISCONCEPTIONS

Consider the misconceptions below:

Grades K-2:
The student confuses the *number of units* with the *size of the unit*, not understanding the inverse relationship: when units get longer, the number of units needed to measure the same object gets smaller. (Achieve the Core)

Grades 3-5:
Students may be confused when a bar or line graph starts above zero or has a truncated scale, thinking it's "wrong" or interpreting it as starting from zero.

Grades 6 - 8:
The student confuses the terms mean and median and may use them interchangeably. (From MAST)

Grades 9-12:
The student believes correlation implies causation.

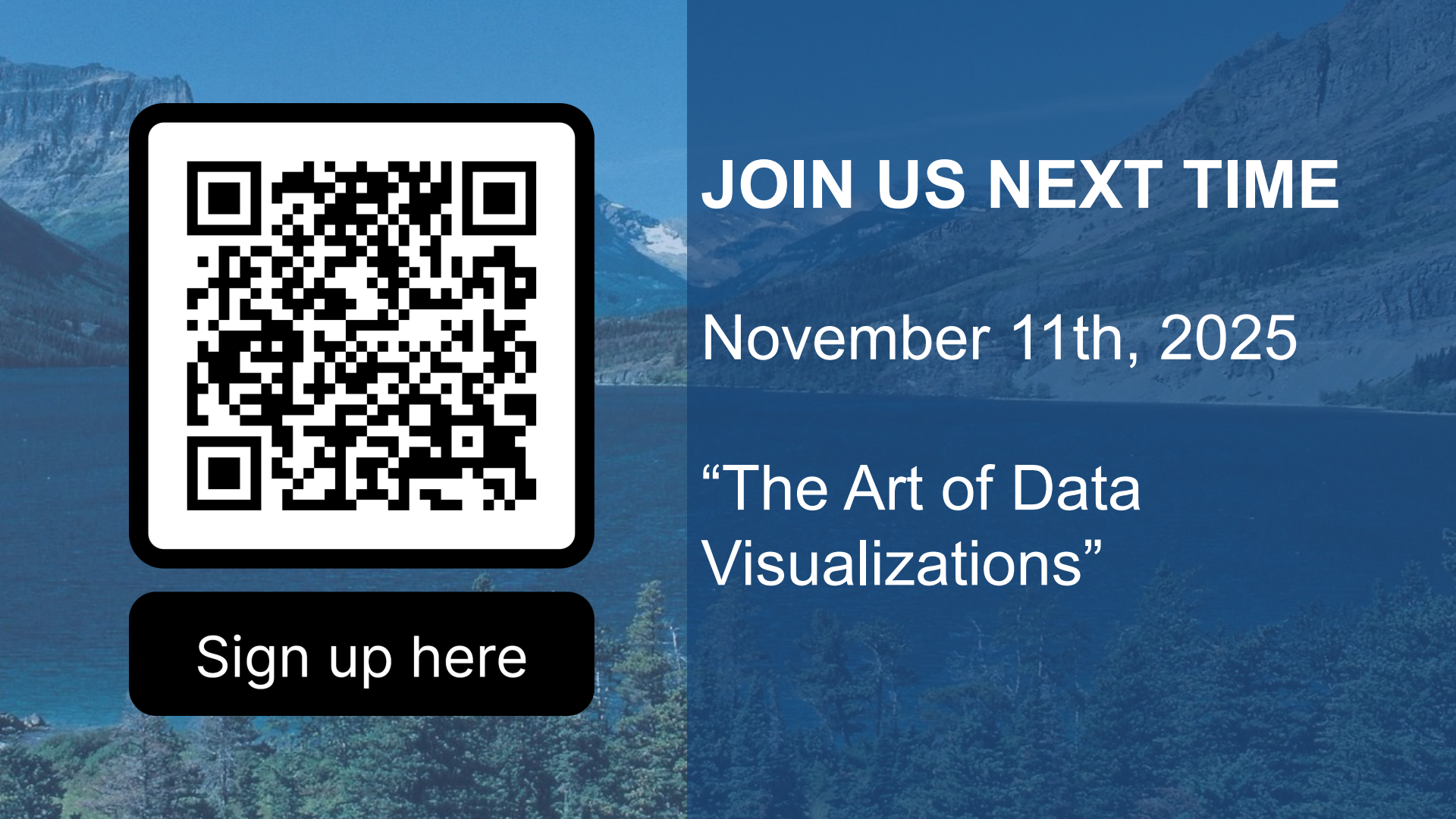
ACTIVITY

Breakout Groups!

Select the breakout group that corresponds with your preferred grade level.

As a group, **discuss the assigned misconception**.

- If this misconception appeared on **a single student report,** what would you do to support that student?
- If this misconception appeared on **a classroom report,** what would you do to support your class?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November 11th, 2025
“The Art of Data Visualizations”
Sign up here

Questions and Answers

To access recordings and slides please visit the Montana OPI Math Page

https://shorturl.at/Awnp2

Contact us at OPICSI@mt.gov

Feedback and Evaluation

Please complete the feedback form to request a Professional Development Unit Certificate from OPI and to provide feedback for improvement.