Beyond Leak Alerts: Leveraging AMI to Engage Families in Unexpected, Creative, and Fruitful Ways

Nate Conroy, STEM Hero

Beyond Leak Alerts: Leveraging AMI to Engage Families in Unexpected, Creative, and Fruitful Ways

METER HERO

But not just engage…

"How AMI Can Let You Drive Conservation, Program Adoption, and Good Will, Without Losing Your Marbles"

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Lessons Learned:

1) Follow teachers' lead
2) Keep it real
3) But make sure everyone can participate
4) And don't forget about those utility benefits

METER HERO

But wait!

"Why is some guy from rainy Oregon telling us about Texas water conservation?!"

METER HERO


Advancing a More Sustainable Water Future
AWWA
WATERSMART
INNOVATIONS
Founded by Southern Nevada Water Authority
Advanced Metering Infrastructure
(AMI) for Conservation Progra

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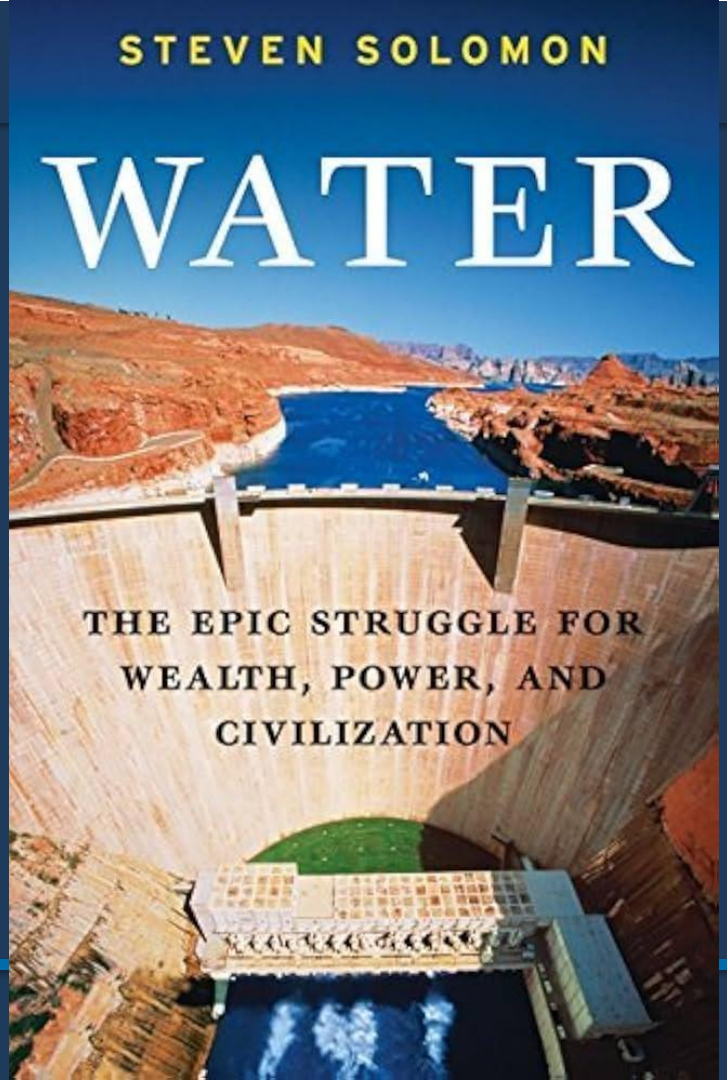
OREGON
Bend
Eugene
Springfield
Cottage Grove
Oakridge
NEWBERRY NM
High Desert
Burns
Crooked
CRATER LAKE
Chiloquin
Klamath Falls
Dorris
Yreka
LAVA BEDS NM
Mt. Shasta
14,162 ft.
(4,317 m)
Weed
Dunsmuir
Herald and News
April 6, 2001— No. 19,739
Klamath Falls, Oregon
50 Cents
No water for most farmers
Thousands of acres will go dry for benefit of fish
By JOHN BRAGG


What a good
Where
WISCONSIN


STEVEN SOLOMON
WATER
THE EPIC STRUGGLE FOR WEALTH, POWER, AND CIVILIZATION

METER HERO

THE WATER COUNCIL

SERVING THE WORLD WATER HUB

THE WALL STREET JOURNAL.

METER HERO

But, yikes!

"Almost no one is logging in!"

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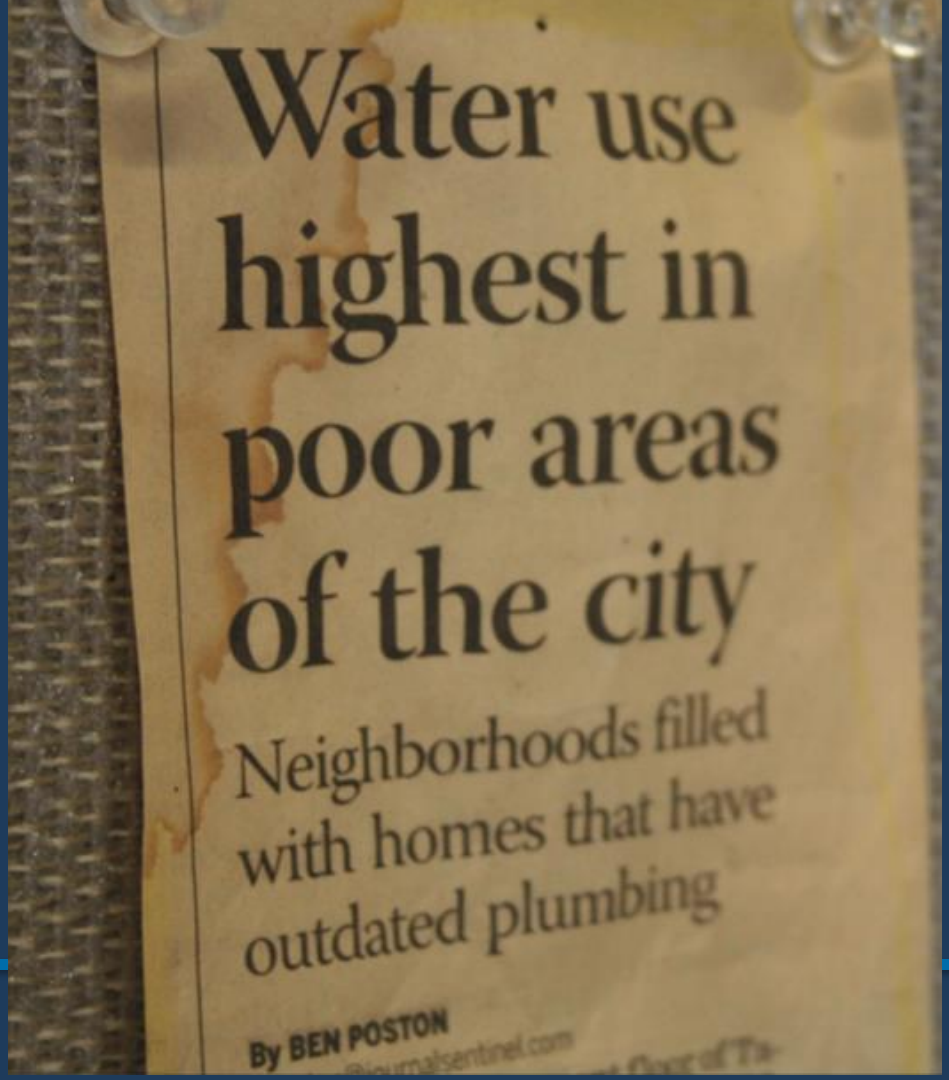
Rochelle, Teacher,
Bradley Tech High School:

"My students are awesome at filling out worksheets, and I hate it"

METER HERO



Water use highest in poor areas of the city

Neighborhoods filled with homes that have outdated plumbing

By BEN POSTON

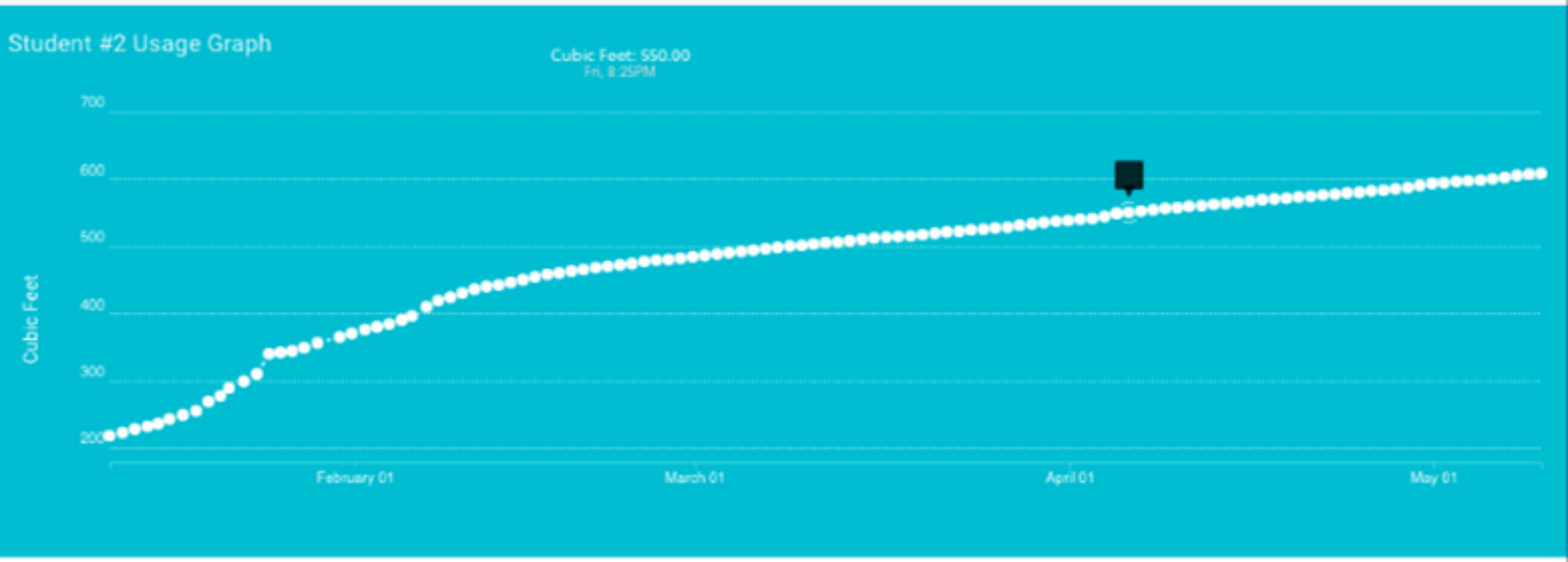
“***But, honestly***
your website kind of stinks!”

METER HERO

Would students even care about meter data?

BOYS & GIRLS CLUBS
OF GREATER MILWAUKEE

"My students
have developed an ***addiction***
to placing their results in your system"



Shoot! Turns out
students are not perfect
meter readers!

Where's my meter?

Negative water use!

Crazy HUGE consumption!


SST-600in
10:24 OFF
RUN DAYS
TIMES PER DAY
SUN
MON
TUE
WED
THU
FRI
SAT
ZONE OFF
1ST TIME
2ND TIME
3RD TIME
4TH TIME
EVEN / ODD DAYS
CYCLIC WATERING
ZONES
RESET
SEE INSTRUCTIONS INSIDE WIRE COVER
1 2 3 4 5 6


A.S.M.E. STANDARD
100 120 160 200 220
WATER TEMPERATURE
60
260
110
115
50

METER HERO

Solution!

Just simulate the results

METER HERO

"Nate! We already have too many canned activities in math and science. Students need us to empower them with messy authentic inquiry! That means making and fixing mistakes."

¿Dónde Están Mis Medidores?

Medidor de Agua

En climas más fríos, medidores de agua normalmente están localizados en el sótano, sobre el piso al lado de la pared más cercana a la calle. En climas más calientes, medidores de agua normalmente están ubicados al lado de la calle directamente enfrente de la casa a dentro de una caja.

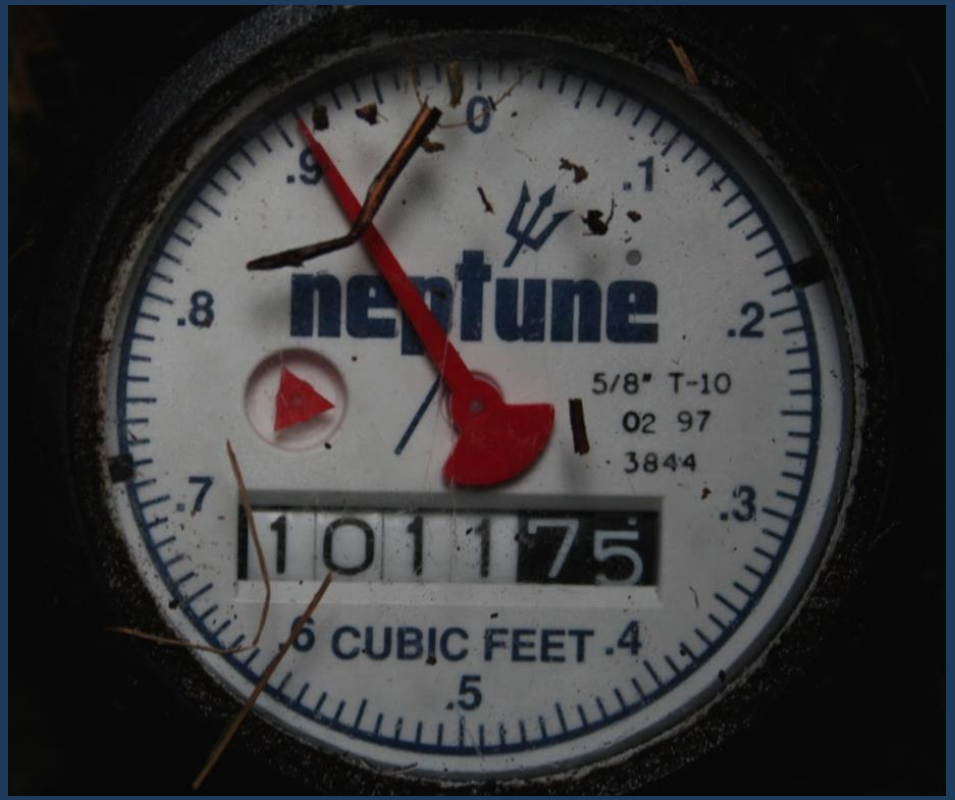
Deslice con cuidado, sin levantar, la tapa del medidor.

Describe la ubicación de su medidor de agua (de escritura o dibujo):

Encierre en un círculo las unidades de su medidor de agua:
Cubic feet (cF), Gallons (gal), Cubic meters (M3)

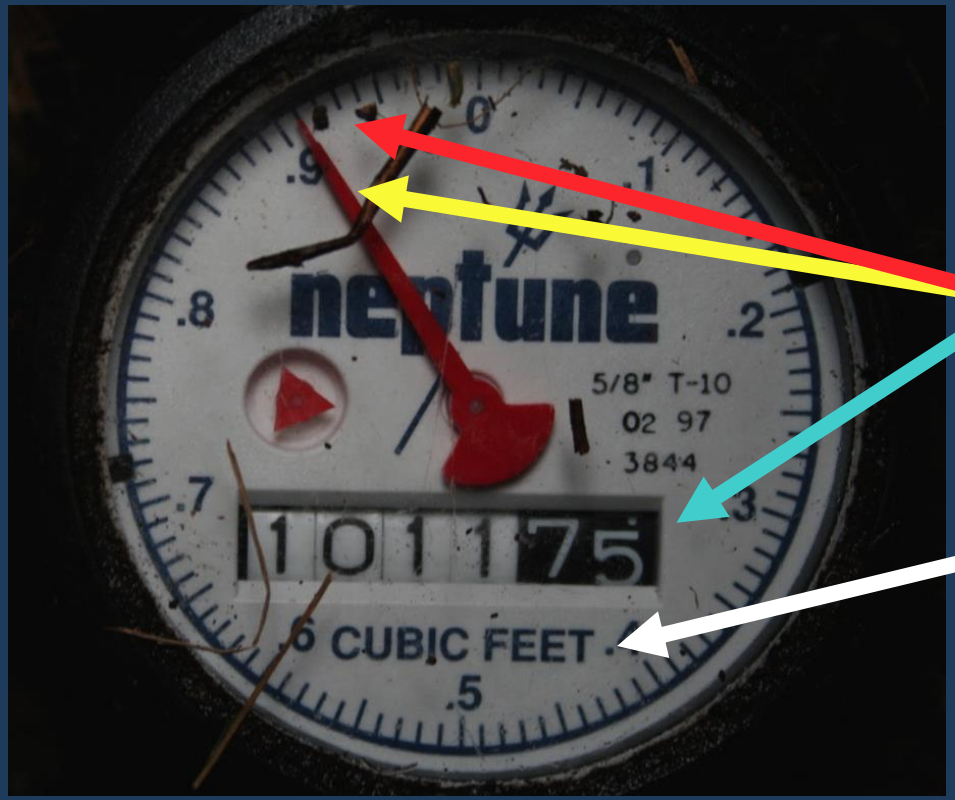
METER HERO

What type of meter am I and what's my reading?



METER HERO

What type of meter am I and what's my reading?

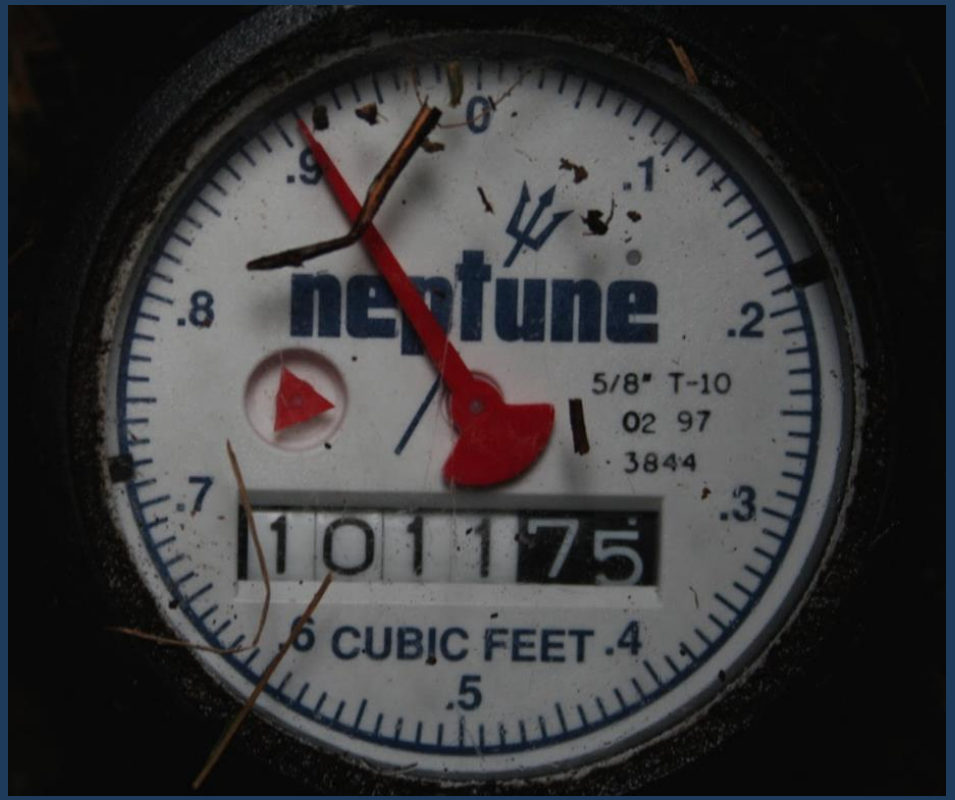


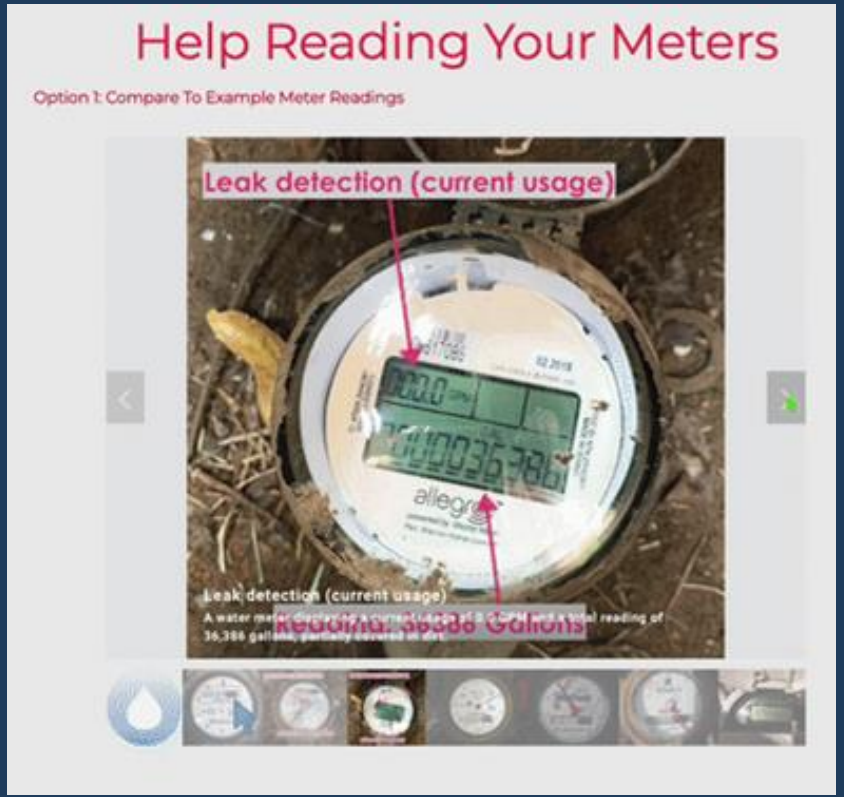
101174.91

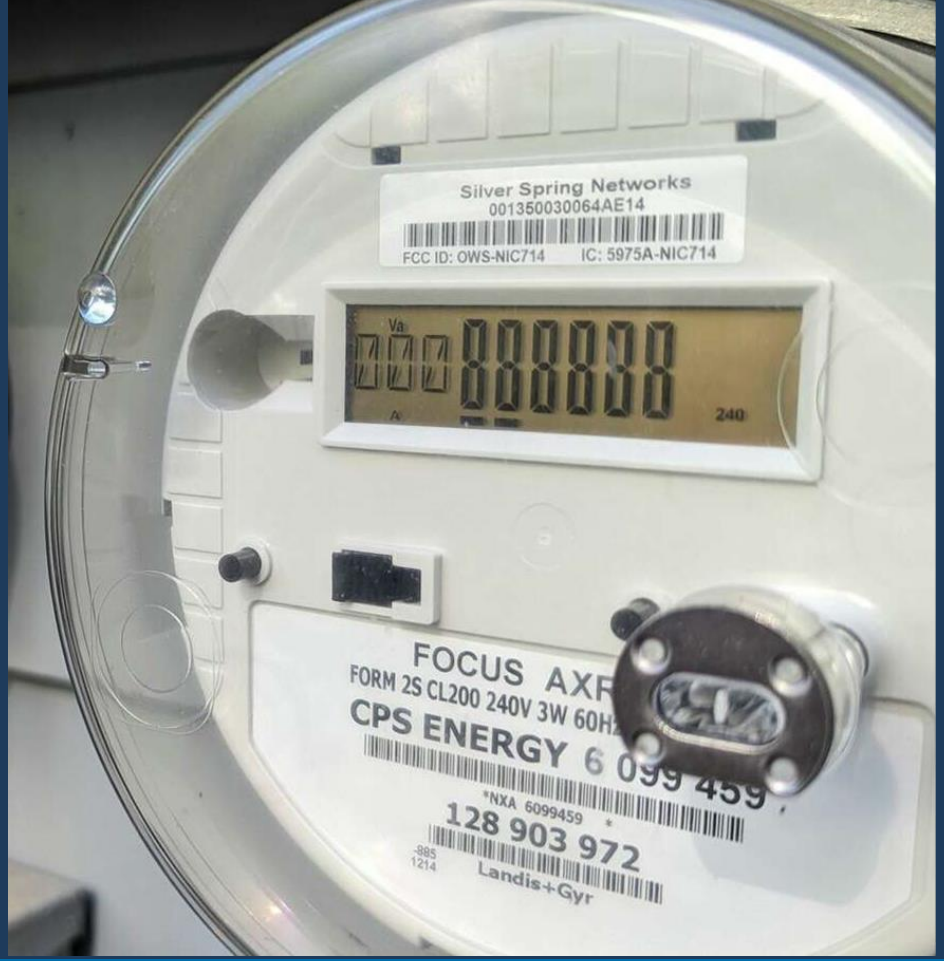
Cubic Feet

METER HERO

What type of meter am I and what's my reading?






Silver Spring Networks
001350030064AE14
FCC ID: OWS-NIC714
IC: 5975A-NIC714
Va
240
FOCUS AXR
FORM 2S CL200 240V 3W 60H
CPS ENERGY 6 099 459
NXA 6099459
128 903 972
-885
1214
Landis+Gyr

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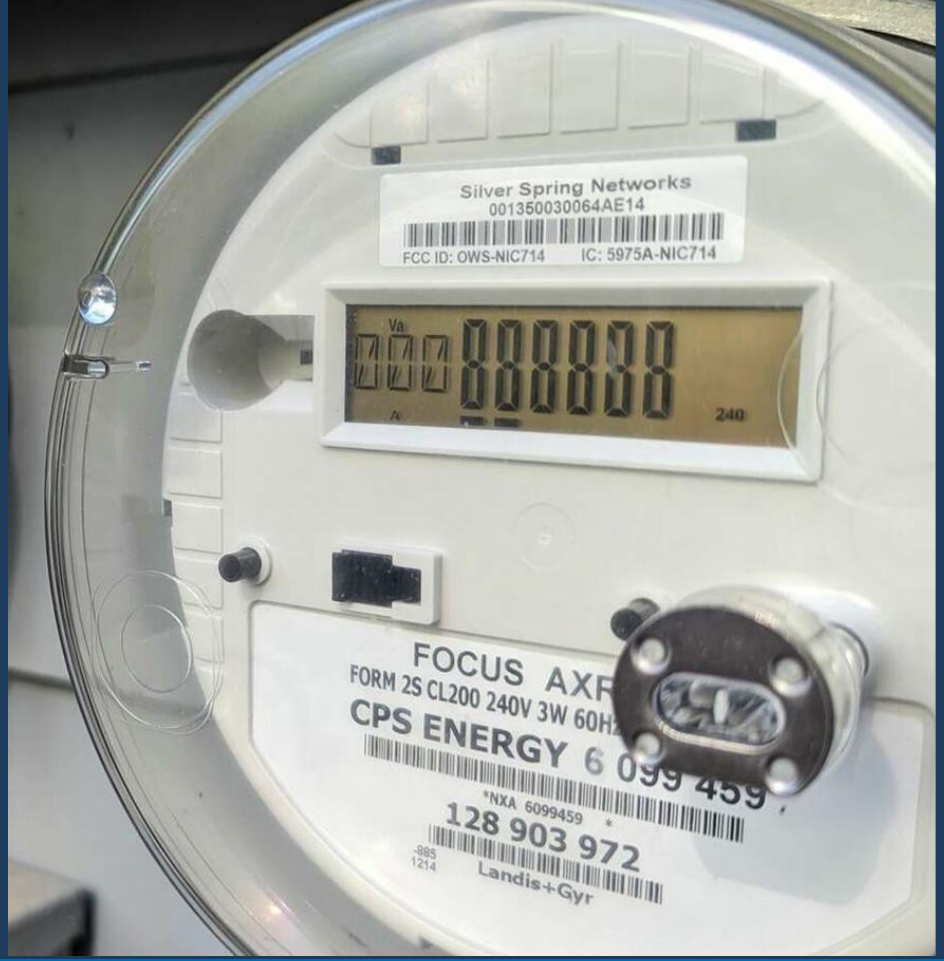
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CPS ENERGY 6 099 459
NXA 6099459
128 903 972
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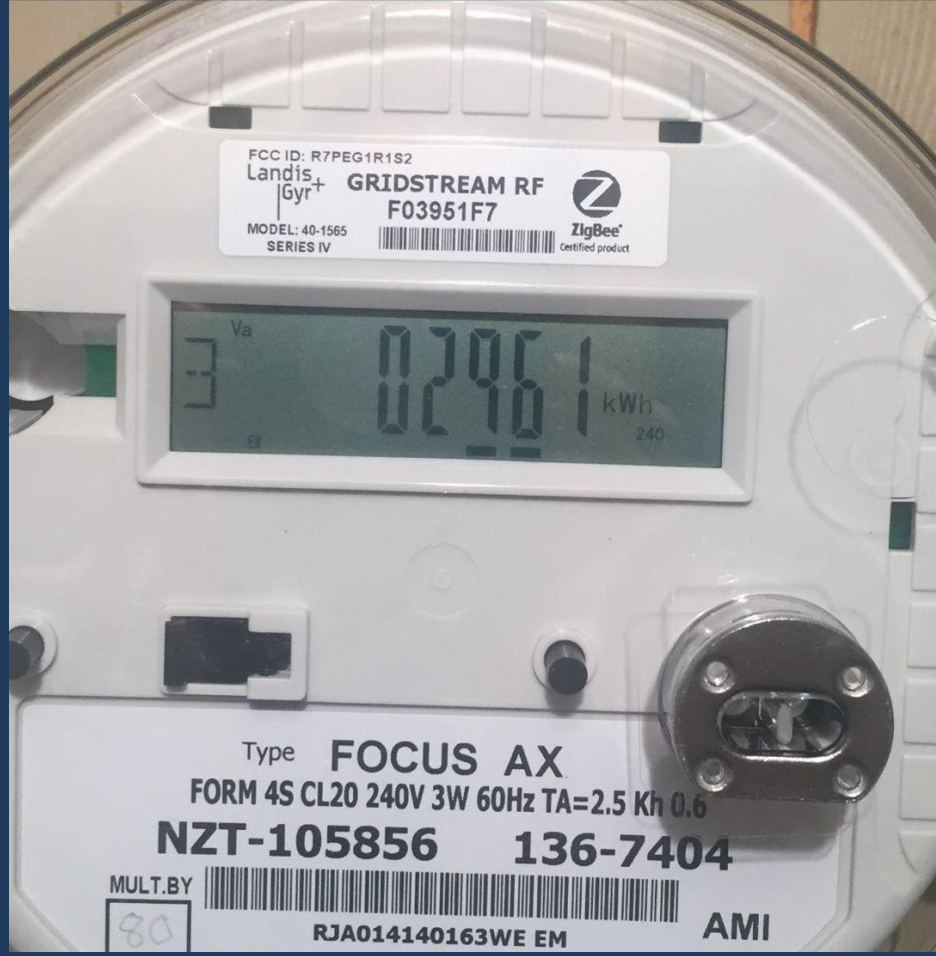
1214
Landis+Gyr

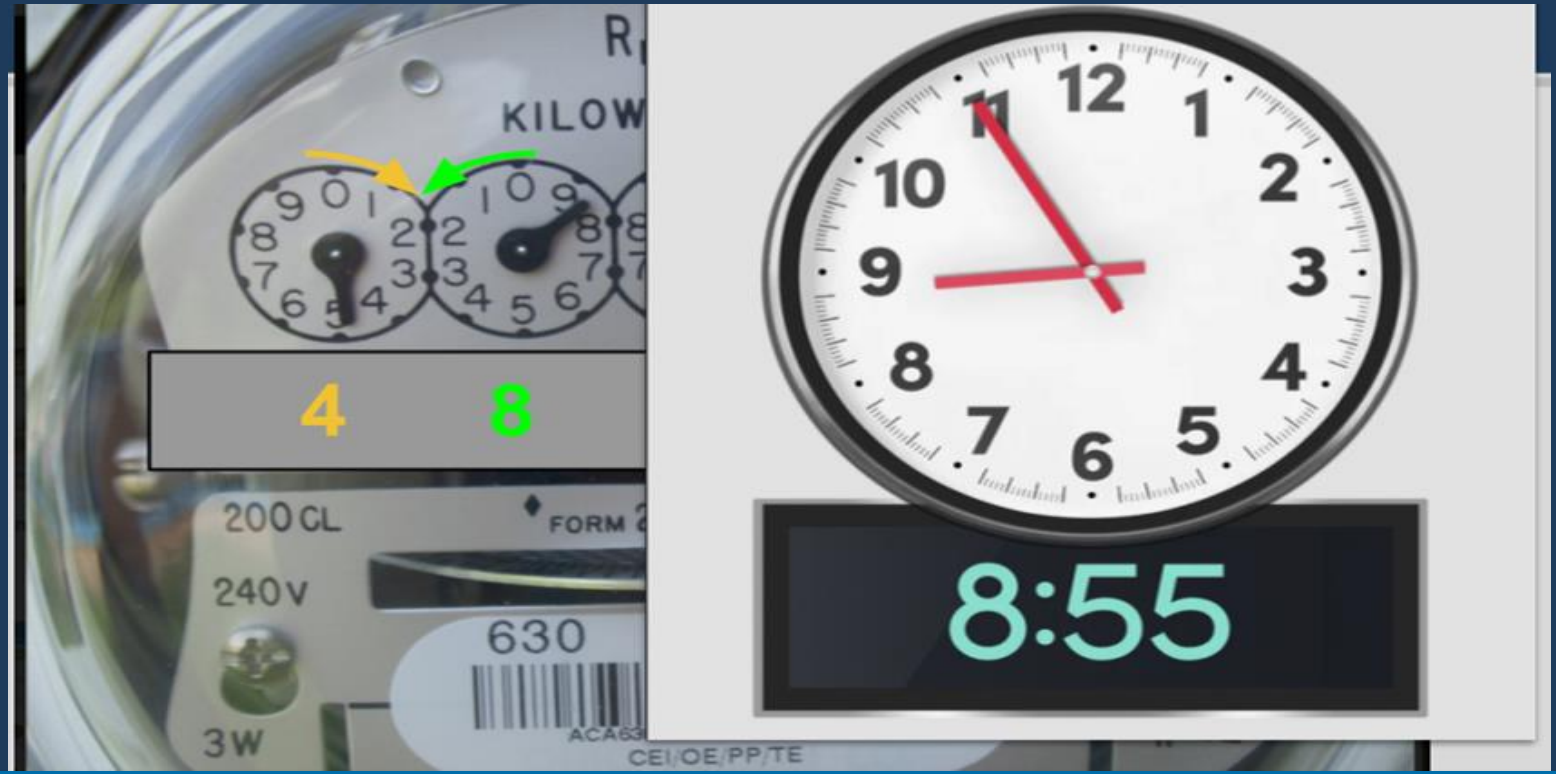

FCC ID: R7PEG1R1S2
Landis+Gyr
GRIDSTREAM RF
F03951F7
MODEL: 40-1565
SERIES IV
ZigBee
Certified product
Va
02961
kWh
240
Type FOCUS AX
FORM 4S CL20 240V 3W 60Hz TA=2.5 Kh 0.6
NZT-105856 136-7404
MULT.BY
80
RJA014140163WE EM
AMI

METER HERO

What type of meter am I and what's my reading?

METER HERO

What type of meter am I and what's my reading?



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"This could help us close the STEM Gap!"

PROJECT LEAD THE WAY
PLTW

U.S. GREEN BUILDING COUNCIL
USGBC
EDUCATION
PARTNER

MARQUETTE UNIVERSITY
BE THE DIFFERENCE.

LOYOLA UNIVERSITY CHICAGO

DEVELOPING CITIZEN-SCIENTISTS

Effects of an Inquiry-Based Science Curriculum on STEM and Civic Engagement

THE ELEMENTARY SCHOOL JOURNAL
Volume 119, Number 2. Published online October 19, 2018

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Center for Research on Lifelong STEM Learning

STEM Interest Trajectories of Under-served Youth (2014)

Recent research shows that interest in STEM and attitudes towards STEM careers achieved primarily during out-of-school time in early adolescence appear to be the single most important factor in determining children's future career choices (and success) in STEM; particularly among underserved populations.

THIS CHECK HAS VARIOUS FEATURES INCLUDING SECURITY PAPER, MICROPRINTING & PRINTED WATERMARK - HOLD AT ANGLE TO VIEW

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100 WEST 10TH STREET
CHICAGO HEIGHTS, IL 60411

2-28
710
BMO HARRIS BANK N.A.
CHICAGO, ILLINOIS
VOID IN 90 DAYS

No. 206018475

EXPENSE
1147

DATE
11/10/2014

CHECK AMOUNT
$199.00

PAY ***One Hundred Ninety Nine and 00/100*** Dollars

TO THE ORDER OF
STEMHERO, LLC.
2580 N. OAKLAND AVE, STE. 105
MILWAUKEE, WI 53211

⑈206018475⑈ ⑆071000288⑆ 18⑈4??⑈1⑈

BLOOM TOWNSHIP HIGH SCHOOL DIST 206 CHICAGO HEIGHTS, IL 60411

Vendor	Vendor Name	Voucher	Date	Account Number	Check Number
22990	STEMHERO, LLC.	1147	11/10/2014		206018475

PO Number	Invoice	Amount
150453	5	199.00

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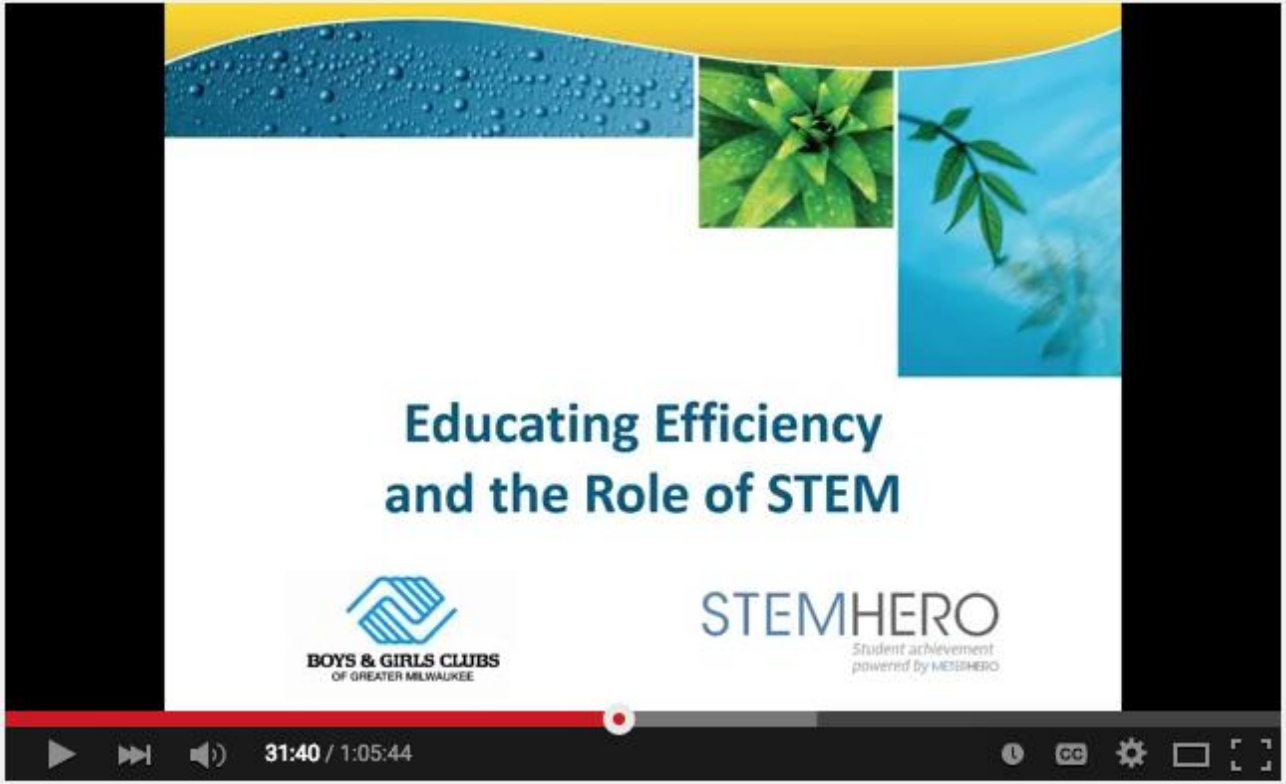


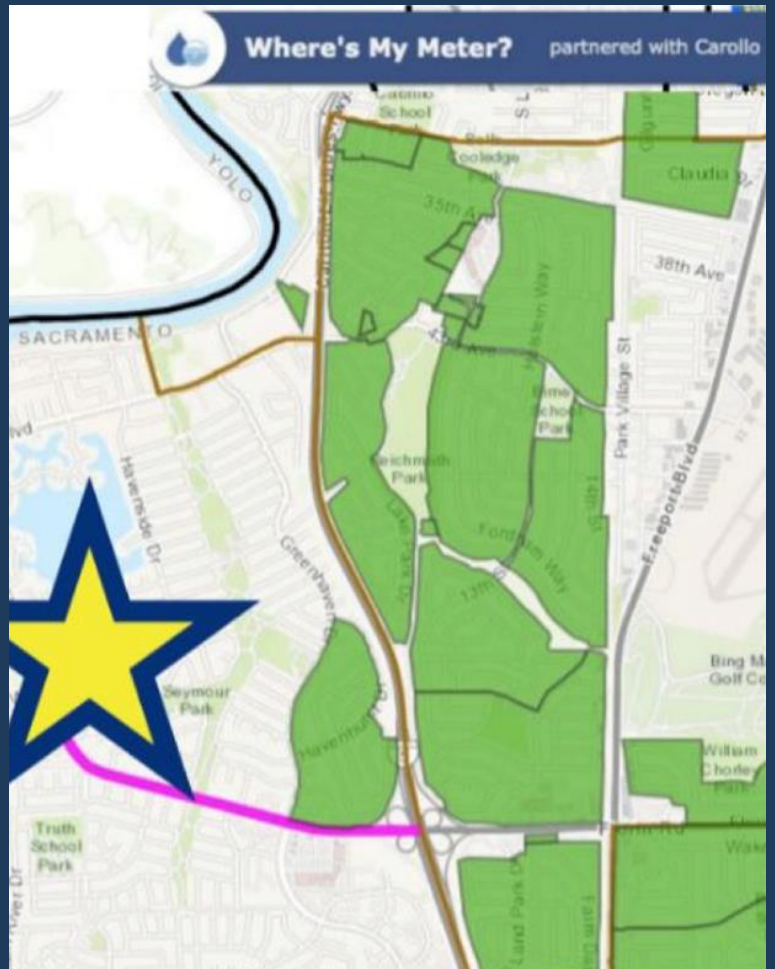
AWE Webinar - Merging Technology and Science to Instill a Water Ethic

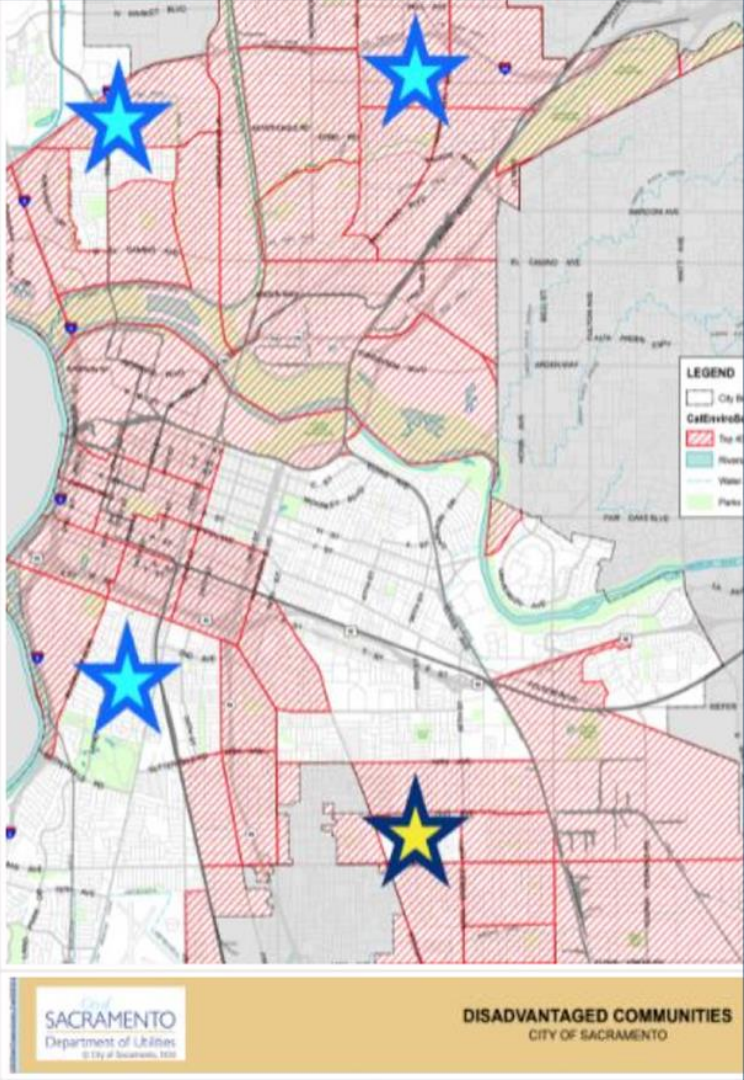
A4WE

Subscribe 220

51 views

Focus on priority neighborhoods





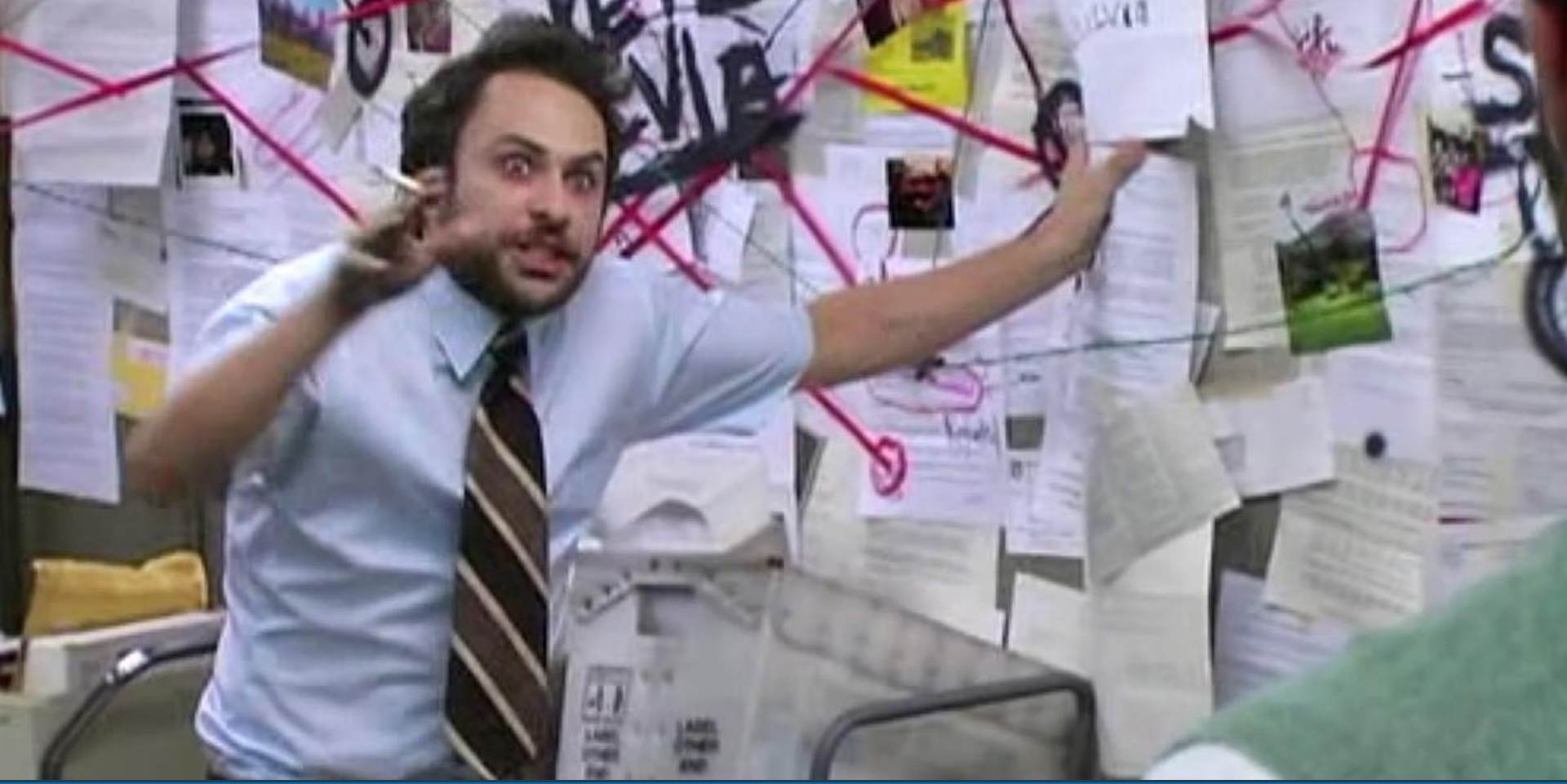
METER HERO


METER HERO
Filter by #:
Lakewood High School 0 readings
Electric meter Stage: 1
Lakewood High School 0 readings
Gas meter Stage: 1
Lakewood High School 0 readings
Water meter Stage: 1
Bond 0 readings
City of SACRAMENTO
IT'S NOT ME. IT'S YOU.
SAVE WATER
#BREAKUPWITHYOURLAWN
CAREERS
PROGRAMS
SOCIAL
UTILITY PORTAL
VIRTUAL TOUR
City of SACRAMENTO
SERVICES
Free Leak Repair
Made possible by:
Using less water.
WATER-WISE FLOWER:
CALIFORNIA GLORY
SacCityUtilities

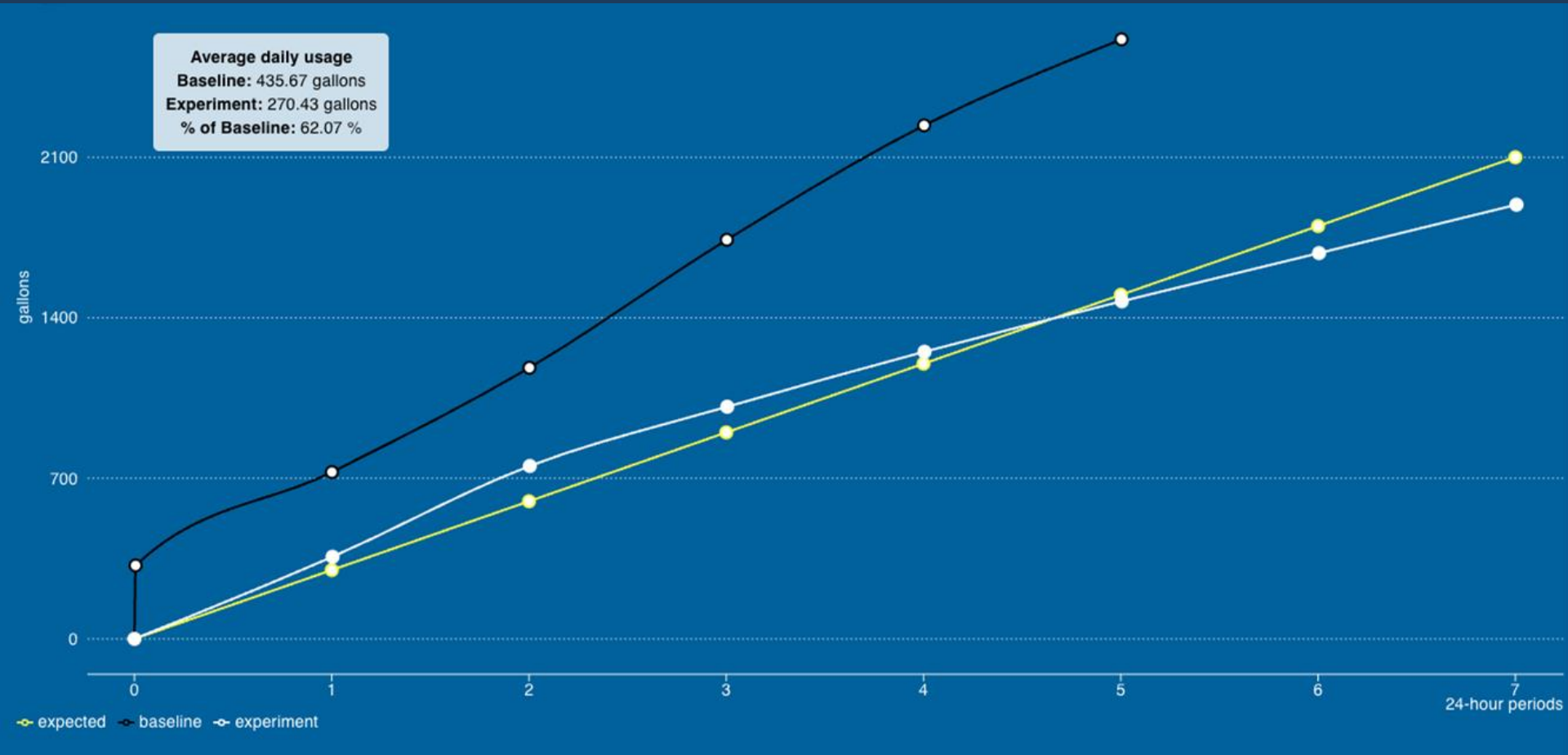
"But don't add to my workload!

I'm already starting to lose my marbles!"

METER HERO



"We want real-world, data-driven inquiry"



SIX STEPS TO DIMENSIONAL ANALYSIS

with students' *real data**

METER HERO by STEMHERO©

(Step 1) Predict usage, (Step 2) Choose an efficiency strategy, (Step 3) Identify data source

(Step 4) Collect 7 daily baseline/control readings, 3 minimum

(Step 5) Implement efficiency strategy and collect 7 daily experimental readings, 3 minimum

(Step 6) Analyze your data and communicate your findings

*start any day you like, steps do not require class time to complete

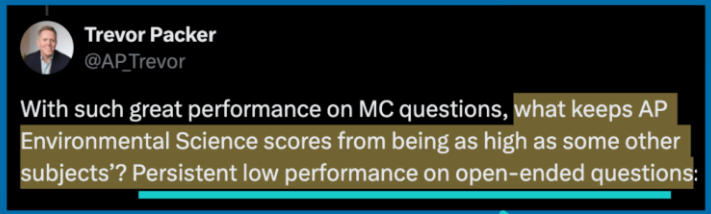
AP® Environmental Science

"Can I just say 'thank you' for aligning this so well to the APES curriculum and our science practices?!"
-- Amy (AP Environmental Science Teacher)

Give students valuable FRQ practice with **real and relevant data inquiry**.

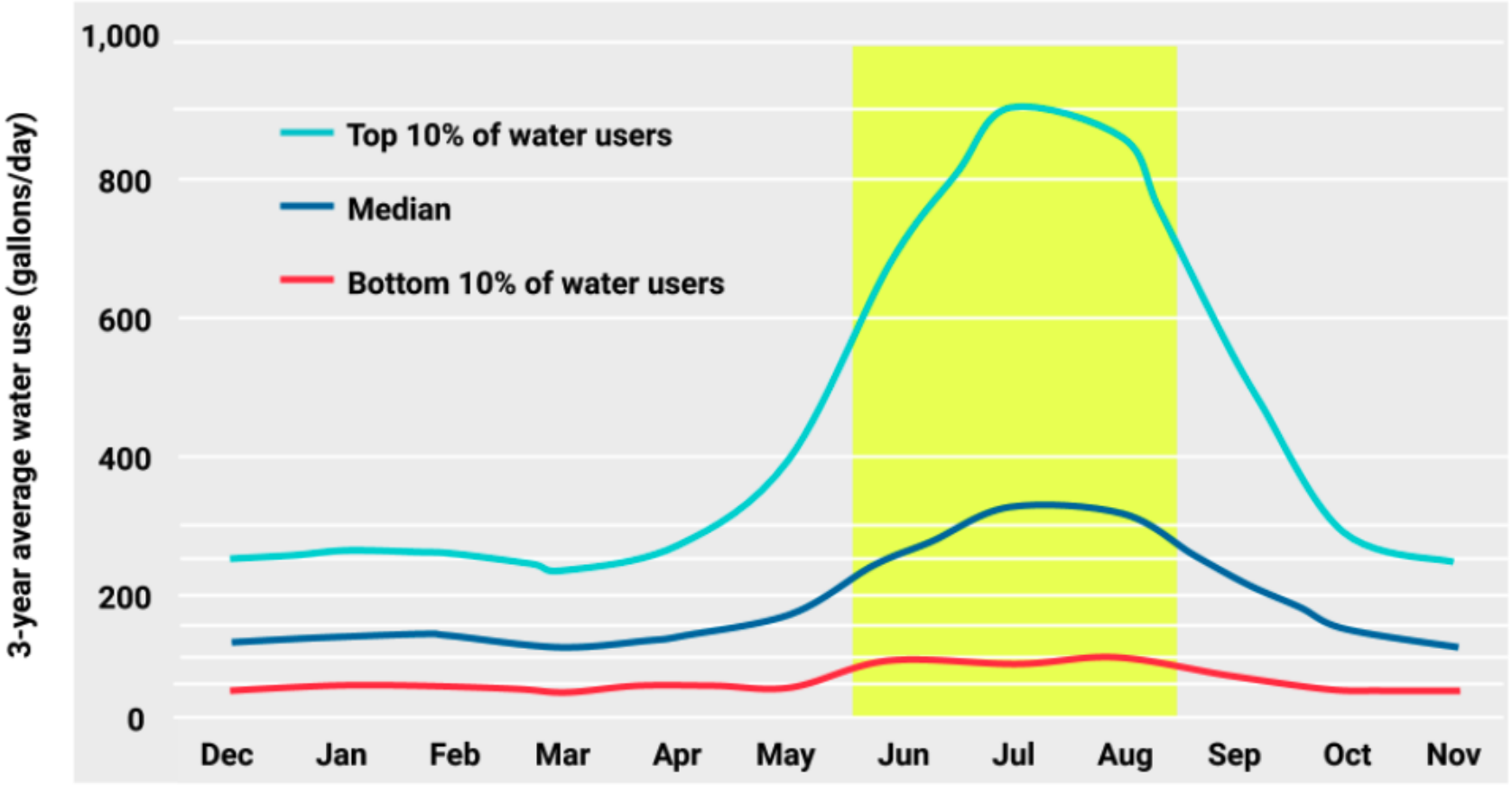
Barely half of students scored a 3 or higher on the 2024 APES Exam*

*Source: The College Board

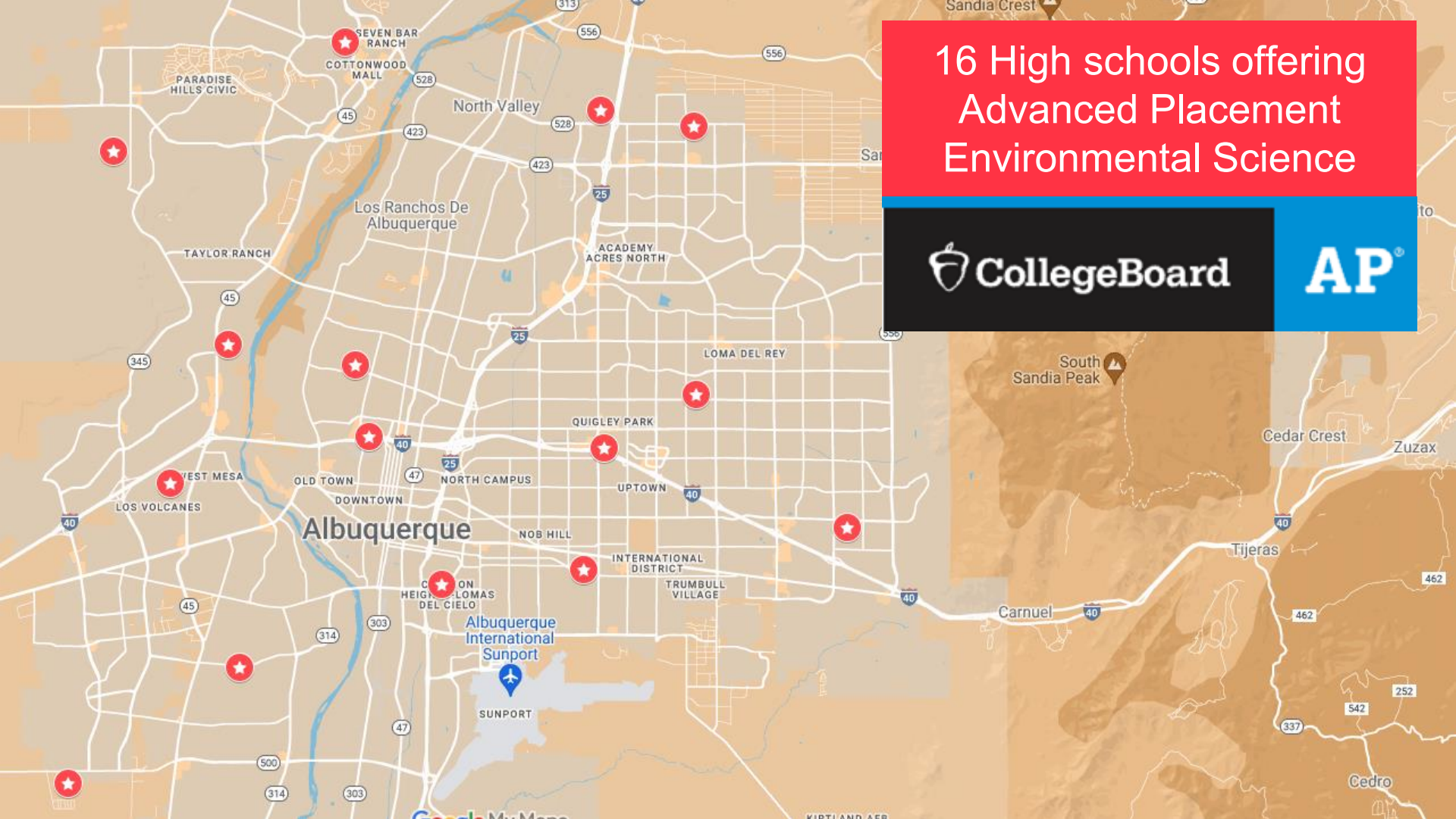


Let's change this!

METER HERO



Source: 2,613 single-family homes (not apartment buildings) with the same year-round occupants in Lynden, Washington. Hurst, Eric (2017). Improving Water-Use Efficiency: Focus on the Outliers. https://whatcomwatch.org/index.php/article/improve-water-use-efficiency-focus-on-the-outliers/


16 High schools offering
Advanced Placement
Environmental Science
CollegeBoard
AP
SEVEN BAR RANCH
COTTONWOOD MALL
PARADISE HILLS CIVIC
North Valley
Los Ranchos De Albuquerque
TAYLOR RANCH
ACADEMY ACRES NORTH
LOMA DEL REY
South Sandia Peak
QUIGLEY PARK
Cedar Crest
Zuzax
WEST MESA
LOS VOLCANES
OLD TOWN
DOWNTOWN
NORTH CAMPUS
UPTOWN
Albuquerque
NOB HILL
INTERNATIONAL DISTRICT
TRUMBULL VILLAGE
Tijeras
Carnuel
Albuquerque International Sunport
SUNPORT
Cedro

"But, what about equity?!

Some students don't have access to data at home!"

METER HERO

Solution!
Fake meters

METER HERO

Virtual Home Water Meter

1

(Reading) (Units)

3/21, 8:13PM
(Date/Time)

2

(Reading) (Units)

3/24, 9:35AM
(Date/Time)

3

4

"Nate! The magic is that it is students' own real data! Let's be creative and find meaningful ways that all students can participate no matter their home situation."

How could students without home meter data participate? **Your ideas:**

METER HERO

Communicate with the family: Purpose and privacy

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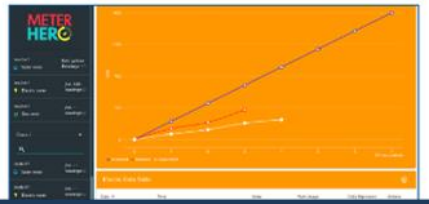
Participación Familiar Durante de MeterHero

Estimado padre(s)/tutores(es),

Como parte de su curso de Advanced Placement, los estudiantes usarán los medidores de electricidad, gas y / o agua de su hogar para practicar las habilidades de recopilar e interpretar información. Este programa, conocido como MeterHero, es posible gracias a una asociación con la ciudad. Los estudiantes leerán contadores algunas veces a la semana y analizarán el consumo de su propia casa.

El programa de MeterHero tiene cuatro objetivos específicos:

1. Los estudiantes explorarán ejemplos de la vida real relacionados a la ciencia, las matemáticas y la ingeniería en su hogar;
2. Los estudiantes medirán y modelaron su huella personal del agua, electricidad y/o gas natural;
3. Los estudiantes desarrollarán y utilizarán las mismas habilidades de experimentación y medición que científicos e ingenieros utilizan a diario;
4. Los estudiantes evaluarán la eficacia de tecnologías y comportamientos que podrían ayudar a su propia casa a reducir su consumo de servicios públicos.



"I am having a blast taking pics of my meters to show to the kids and updating my info on the site too!"

- **Alisa, Teacher**

METER HERO


STEM
HERO

MILWAUKEE·WISCONSIN
JOURNAL SENTINEL

Business

Meter Hero lets area residents track use and save energy

Gary Porter

Jelsyn Nunez-Castillo reads a water meter at Ginger Tapas Bar and enters the information into an iPhone app. Nunez-Castillo, a Riverside High School senior, monitors water, gas and electric meters as part of his Meter Hero internship.

METER HERO

Part 1: School Audit of Potential Strategies to Save Water

Complete the sections below. Consult with your teacher and a school facilities person for assistance. Through this audit you'll gather data to support your recommendations for how your school could potentially save water. Click here for a version of this document in Google Sheets.

Water Efficiency Strategy 1 - Reduce Water Use Indoors

How: Identify water fixtures at your school that could accomplish the same task while using less water.

- Identify water fixtures (showerheads, toilets, faucets, urinals, dishwashers, etc..) that could be upgraded to a more efficient model.
- Use a stopwatch and flow bag to measure actual water consumption.

Why: Designers and engineers have figured out how to maintain or increase performance of water fixtures while at the same time reducing how much water they require. If they can't be replaced, a fixture might be retrofitted with items like aerators, motion sensors, and automatic shut-off valves to reduce their water use.

Complete the data table on the following page with information about the water using devices throughout the school building. Add rows if necessary to collect information on all of the indoor devices in your school.

Tip: Find the Gallons Per Minute and Gallons Per Flush value by locating "GPM" or "GPF" usually written on the side of the fixture

Example motion sensor

Use a flow bag to calculate actual gallons per minute flow

METER HERO

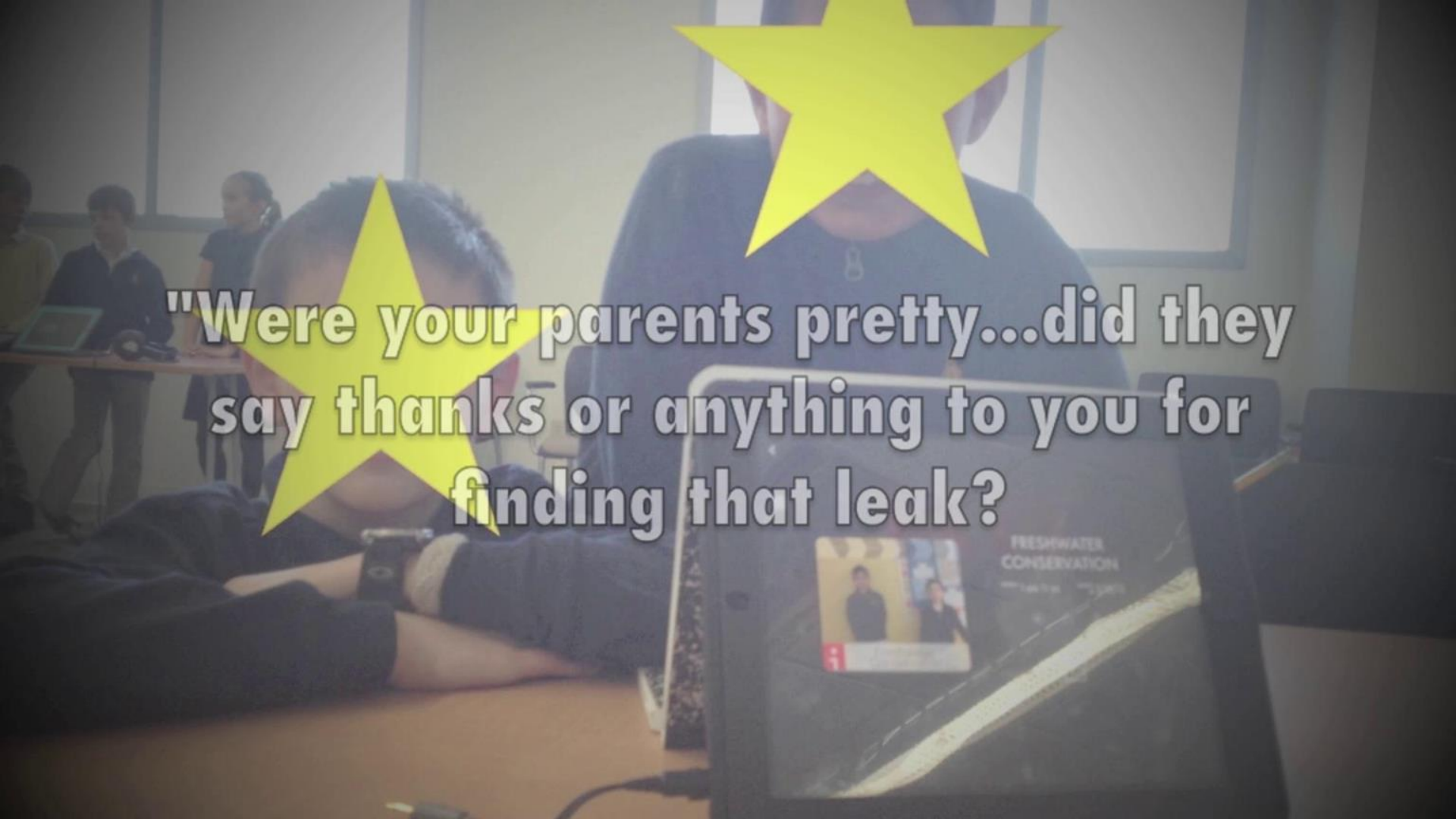
CII Conservation too!

"Nate recently led a PD for our high school science teachers and did an outstanding job. Teachers left energized and ready to implement MeterHero. Feedback included that students will be "using real data and taking ownership of learning," the lessons are "ready to use with real-life data," and the program "can be implemented ASAP — and it's free!" **Several teachers are already planning a campus competition to reduce water use with MeterHero. "**

Gina Austin
High School Science Coordinator
Northside Independent School District

"Thank you, Megan!
I'm so glad we kept it real."

April 20, 2024	10:08 AM	80725.72
April 19, 2024	03:48 PM	80716.87


"Were your parents pretty...did they say thanks or anything to you for finding that leak?
FRESHWATER CONSERVATION

"Now they can actually monitor [water use]; it becomes their responsibility to see how water fluctuates and then they can associate what activities happened at home, that in turn caused that change in the amount of water use...they could see the trends, ***and then we could ask questions, like "why do we see a dip here? what is that indicating to us?"*** *That kind of critical thinking, reading what the graph is telling us...was really good, and appropriate for the age level"*

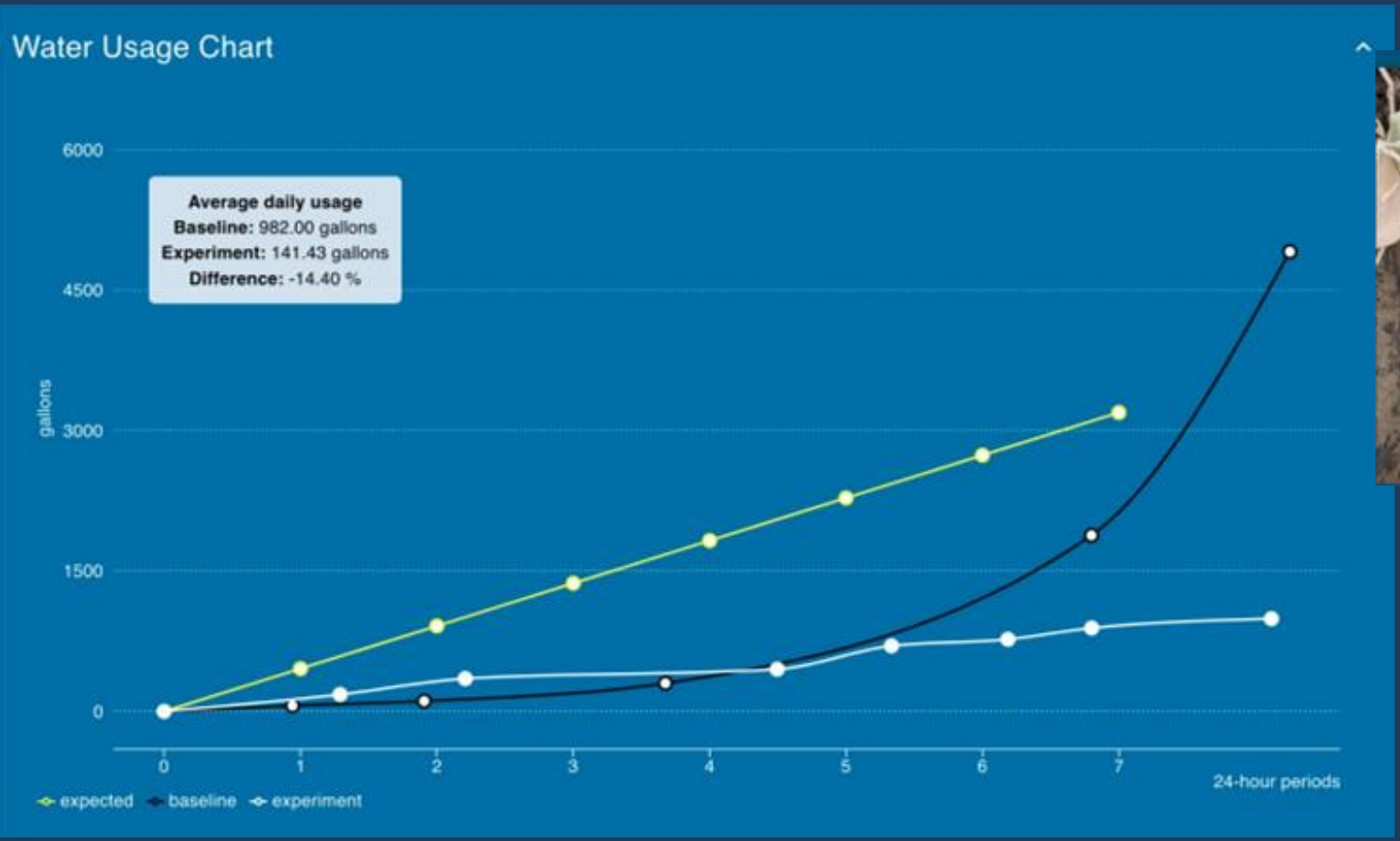
METER HERO

“This is awesome!!... I’ll send you a video my kids are making about leaky sinks in the science wing. They want to present it to the principal and the plant manager :) …. This project makes my end of the year bearable :) and wraps up so many APES concepts into something very real for them.”

Senna Vasquez, Science Teacher
John F. Kennedy High School, Sacramento, CA

METER HERO

Water Usage Chart



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METER HERO by STEMHERO

ham5432 — Water meter — Unit: gallons — Readings: 14

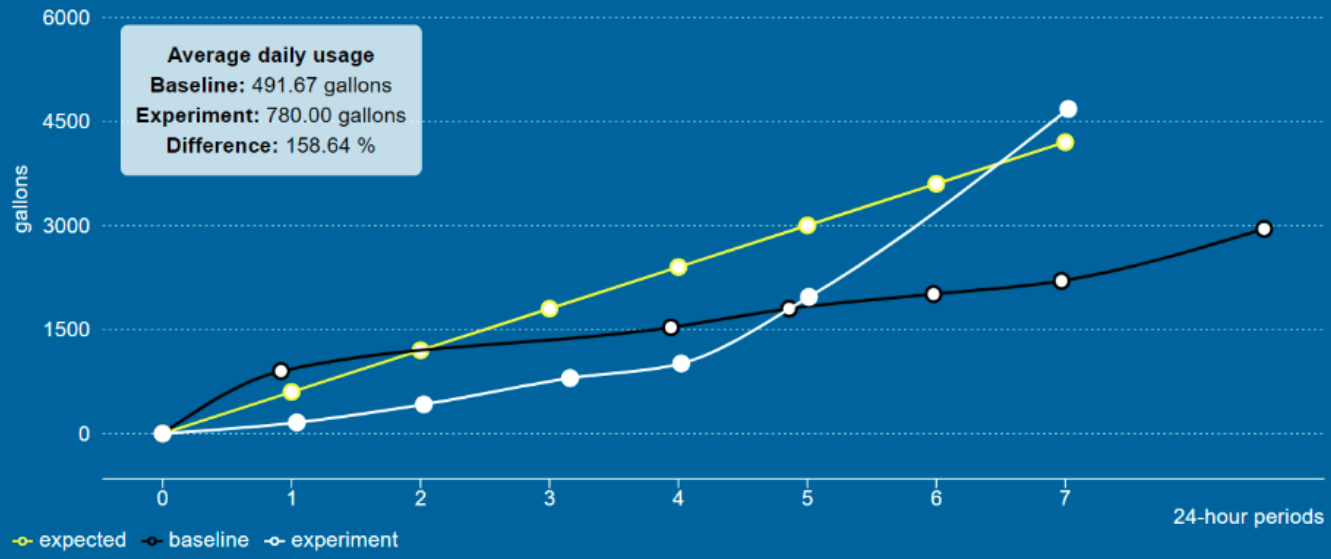
ham5432 — Electric meter — Unit: - - — Readings: 0

ham5432 — Gas meter — Unit: - - — Readings: 0

Classmates' meters

Classmate — Unit: gallons

Water Usage Chart

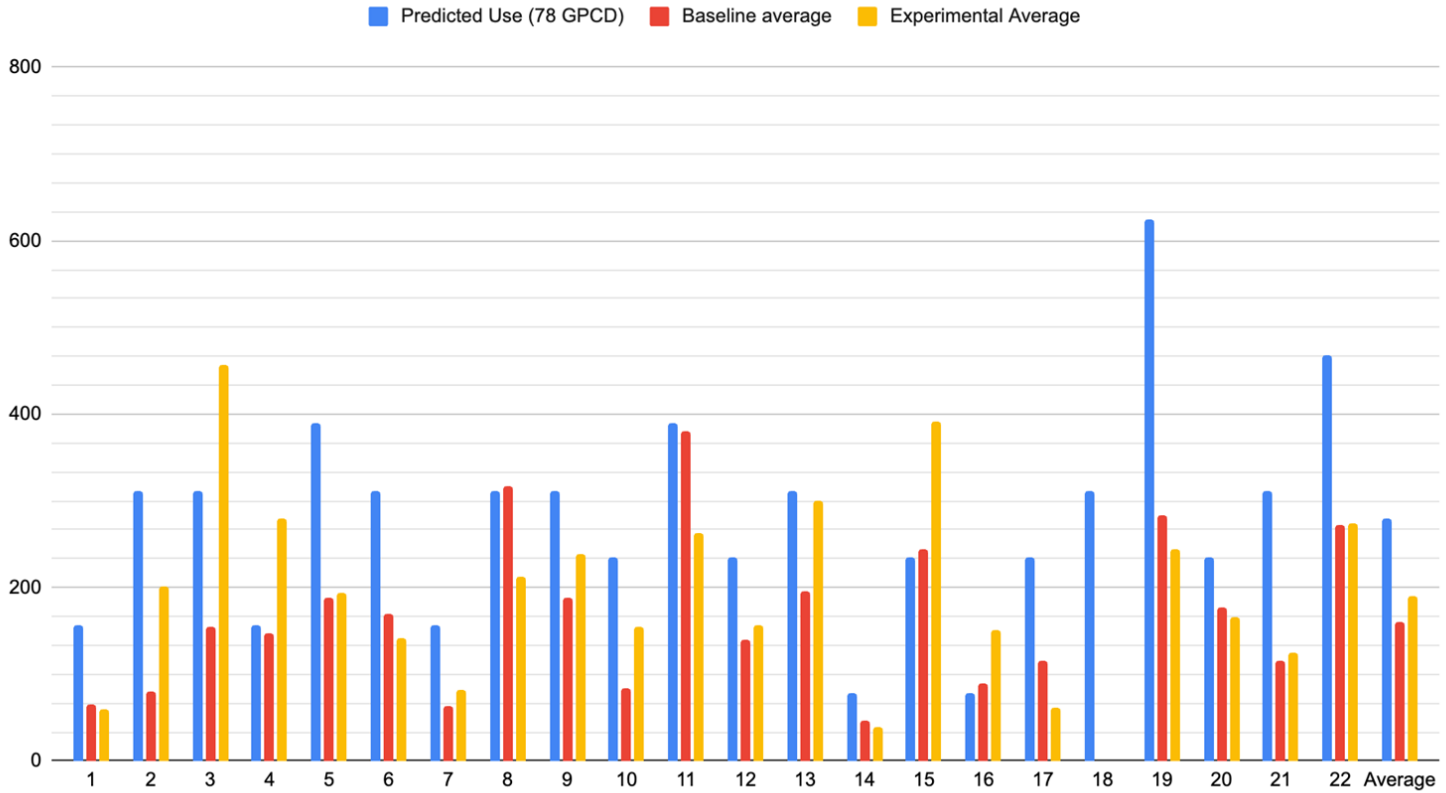


METER HERO

Conclusion

Through this experiment it is apparent that just cutting down shower time will not reduce the water uasage a lot. I was the only one participating in shortening my showers but in addition to that I was also concious about turning off the water when I was brushing my teeth and I washed my face in the shower and not the sink. Just doing these practices reduce the water use a little but not as much as I would have liked and we still used a lot of water. These results led me to think what do we do that uses that much water. While going through this experiment and collecting data we had a sprinkler burst and that made my graph shoot up exponentially and that led me to think the sprinkler system and hose uses a lot more water that what we may realize

How Did Storm Fern Affect Water Use? It went up!



Daily Water Use Class Averages:

- Predicted: 280.1 gal.
- Baseline - before storm (1/17-19): 159.8 gal.
- Experimental - during storm (1/24-26): 190.5 gal (119.2% of Baseline)

Texas Academy of Biomedical Sciences

"MeterHero gives students practice with experimental design, something I've noticed is a difficult and abstract set of skills, even for AP students. Using their real-time data, it helps them learn to communicate ideas and connect science practices in the classroom to skills they can use no matter what career path they choose."

- *Lauren, IM Terrell Academy, Fort Worth, TX*

METER HERO

"But, why not other classes?!

Many students are not in AP Enviro. Science?!"

METER HERO

Noriega, Leticia A <lnorie@neisd.net> Wed, Feb 25, 11:48 AM (1 day ago)

to nate@lc.meterhero.com, greg.wukasch@saws.org, angelica.zuniga@saws.org, success@stemhero.com

Good afternoon,
Thank you for sharing your time and the MeterHero program with me. I shared a bit of the information with my specialist team and we are ready to dig a little deeper.

We feel that the program is a perfect fit for our 7th graders who need a little extra TLC-thier not the new 6th graders nor are they the "veteran" 8th graders. MeterHero could provide them with an experience that they can own and be proud of. And for that, we are truly excited!

We'll be in touch. I'd also like to extend a big "Thank You!" to SAWS for sponsoring this partnership. What a wonderful and wise investment in the education of our students!

With appreciation,

Leti Noriega

NEISD Assistant Director of Science K-12
North East ISD
8961 Tesoro Drive
San Antonio, Texas 78217

NORTH EAST
INDEPENDENT SCHOOL DISTRICT
CURRICULUM & INSTRUCTION

North East Independent School District | Division for Instruction & Campus Administration Curriculum and Instruction

NEISD Environmental Systems Year at a Glance

Spring Semester							
Unit Title	**Unit 3: Humans & the Environment**		**Unit 4: Earth's Resources**			**Unit 5: Toward a Sustainable Future**	
	Natural Changes	Human Impact	Land Resources	Water Resources	The Atmosphere	Energy Conservation	Waste Management
Time	1-2 weeks	3-4 weeks	3-4 weeks	3-4 weeks	3-4 weeks	2-3 weeks	1-2 weeks
Understandings	Earth's environments have been undergoing natural changes since its formation.	Humans impact environmental systems through emissions and pollutants.	Economic and ecological consequences influence the choices made to manage land resources.	Economic and ecological consequences influence the choices made to manage water resources.	Economic and ecological consequences influence the choices made to manage resources that impact our atmosphere.	Human activities can positively and negatively affect the environment and resource availability.	Human activities can positively and negatively affect the environment and resource availability.
TEKS	E.9ABC	E.10ABCDE	E.6ACDE	E.6BCDE	E.6CDE; 9DE	E.11ABC	E.6F

"But, what about results? We can't afford just a feel good thing!"

METER HERO

Engagement Over Weeks

+Total Student and Teacher Actions

*Only counts engagements online with the MeterHero Dashboard

106,309

Percent Conservation

Reduction in Water Consumption

23.33%

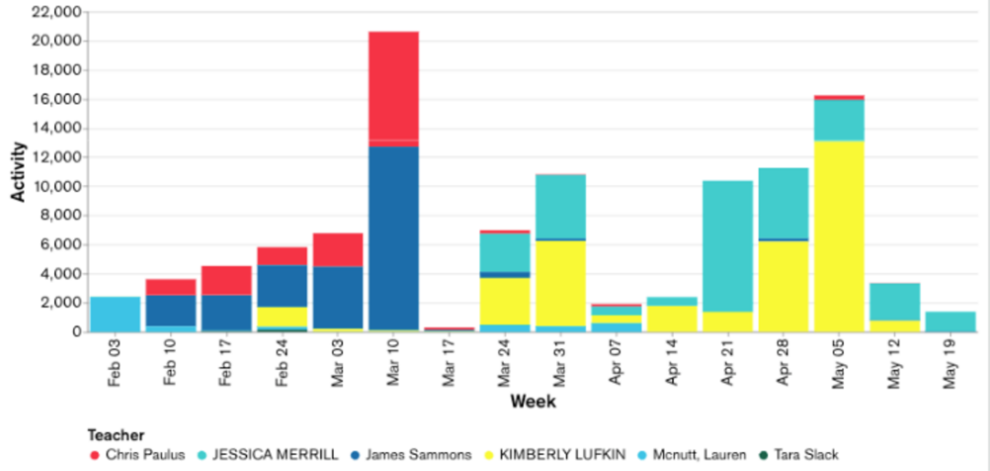
Gallons Saved

90 Day Projection

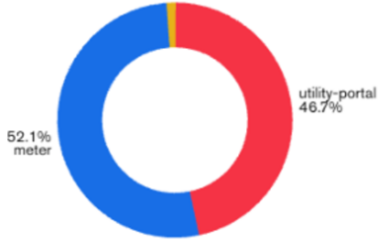
2,218,784

>Student Engagement By Week

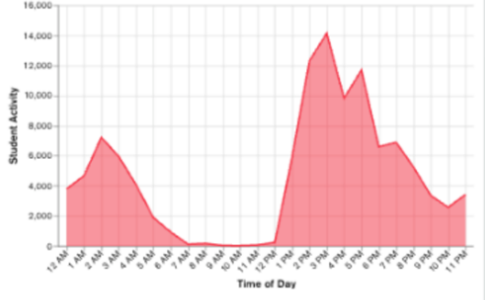
Students Updating Information on the MeterHero Dashboard



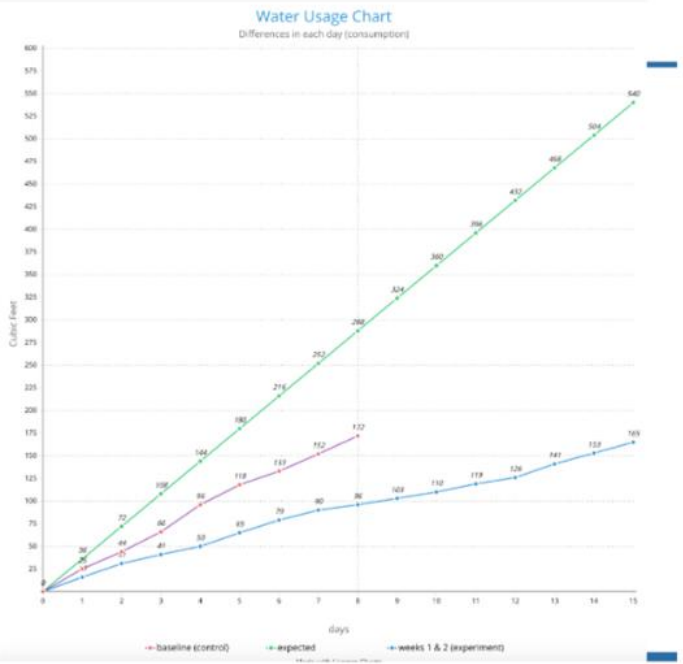
***Primary Sources of Utility Data Used By Students**



Student Activity by Time of Day



“I would like to thank my family, especially my brothers, who usually aren’t willing to help out with this kind of thing.” - Student



METER HERO

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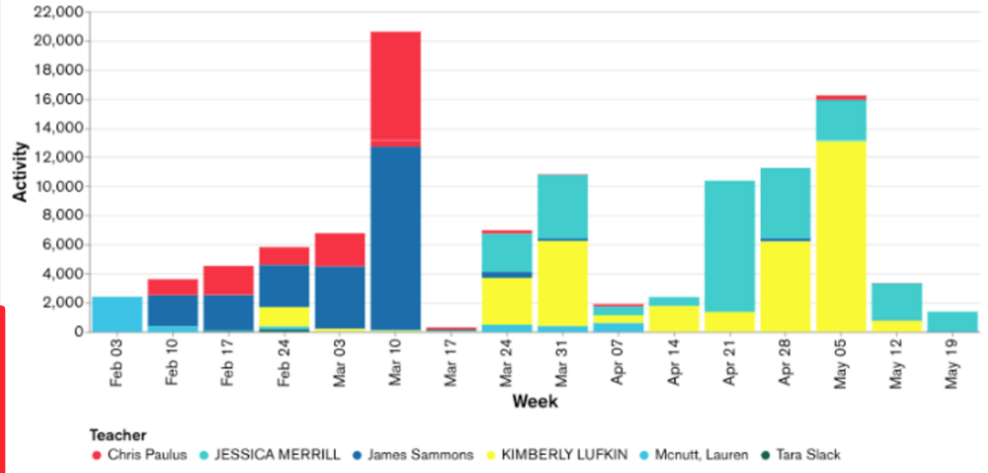

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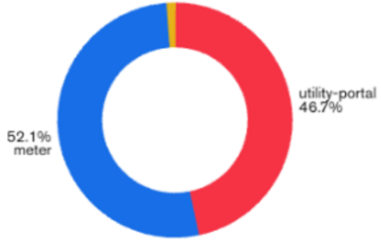

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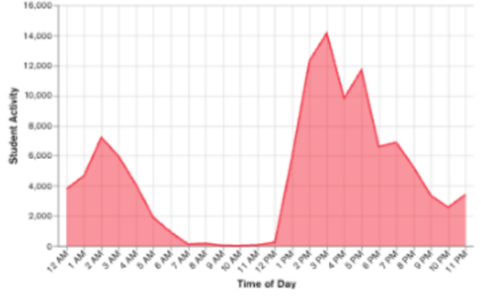
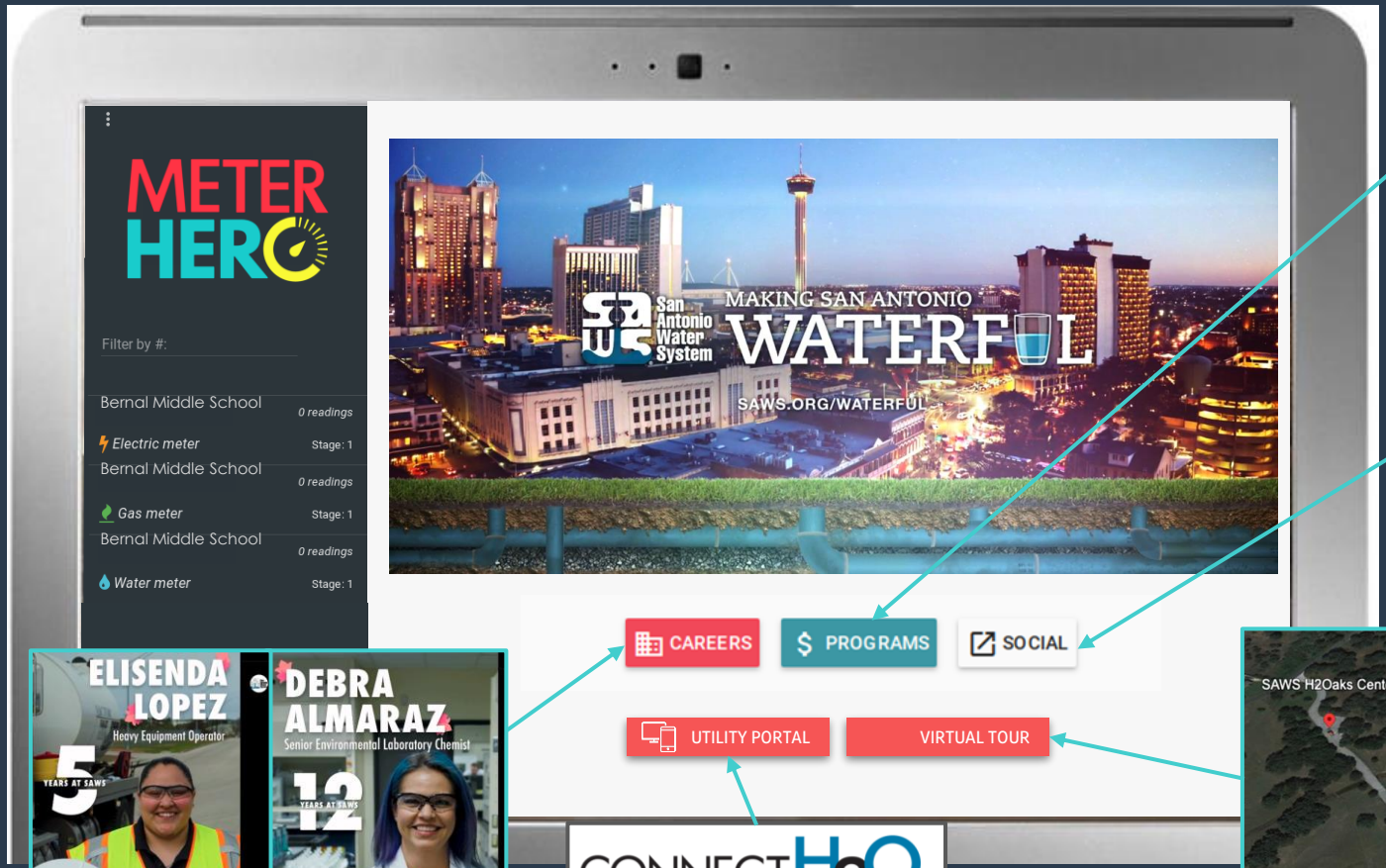


“Carrying out this experiment forced me to confront just how much of our households’ water disappears into the lawn without anyone noticing… My family will continue with our new 3 day schedule and has implemented other changes to our watering system.”

- Student

METER HERO

Drive AMI adoption, programs, and good will



AMI Portal Adoption

+Total Student and Teacher Actions

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>Student Engagement By Week

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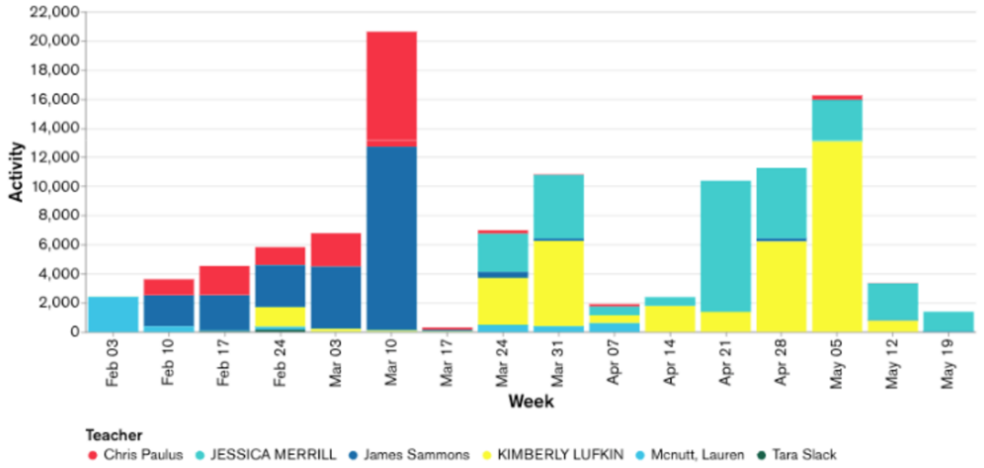

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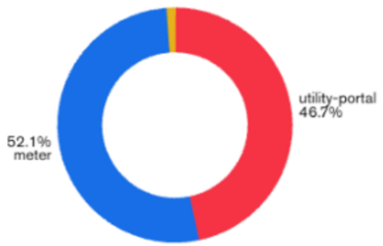

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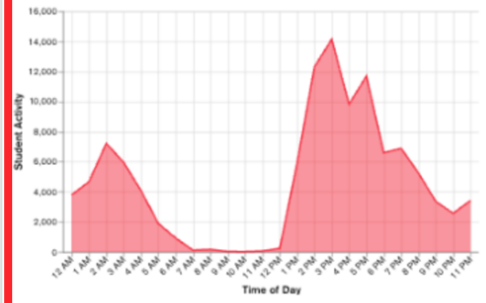

Prior to this experiment I had no idea that we were using so much water from sprinklers. It wasn't until after I created an EyeOnWater account to track my water usage that I noticed that I was using around 10,000 gallons of water per week! After realizing this fact, I decided to base my experiment around the idea of reducing the average water usage from my sprinklers.

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Abstract

Excessive water usage is an ongoing problem in many households that is often neglected. This is especially because these individuals don't know how to check their water usage, thus they don't know they are contributing to this great problem of unrestrained water depletion. This study sought to discover how much water one can save by simply decreasing the output of water dispensed from a singular source category. For this experiment, in particular, the water source being manipulated was the sprinkler system. Sprinklers that were in close proximity to one another were disabled, as there was no need to utilize all of our sprinklers when using fewer, spaced-out sprinklers was just as effective at ensuring that vegetation on the property was receiving a sufficient supply of water. All sprinklers also had their run times reduced to only 10-15 minutes per use (when they were previously running for 15-20 minutes). The results indicated a massive decrease in overall water consumption, as water exhaustion dropped nearly seven-fold after the experiment was carried out. An average of a little over 1,000 gallons of water were being saved per day after the implementation of this experiment and there were no negative consequences to the local vegetation that stemmed from the execution of the procedures. These results demonstrate how easy and low-maintenance it can be to reduce one's overall water consumption. By increasing awareness of how common of an issue excessive water depletion is, many can contribute in their own ways to save water in simple, yet effective ways, leading to incredibly beneficial impacts on our environment.

Objective

The purpose of this experiment is to determine how much water is being conserved by manipulating water usage of sprinklers on my property.

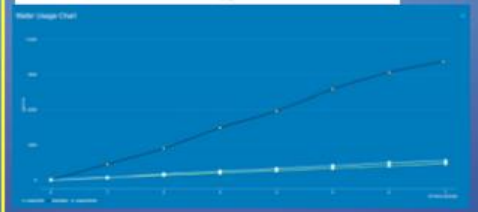
Background/Introduction

Prior to this experiment I had no idea that we were using so much water from sprinklers. It wasn't until after I created an EyeOnWater account to track my water usage that I noticed that I was using around 10,000 gallons of water per week! After realizing this fact, I decided to base my experiment around the idea of reducing the average water usage from my sprinklers.

Methods

For my research project, I decided to reduce the average water usage coming from the sprinklers on my property. My hypothesis prior to the investigation was that if I disable sprinklers that are already in close proximity to one another and decrease the amount of time each sprinkler runs by 5-10 minutes each, then my overall water consumption will decrease because less water is being utilized on a weekly basis. The quantity of water used for other daily tasks remains constant, as it is only the independent variable of the water consumed from the sprinklers that will be impacting the dependent variable of the overall water usage succeeding the first day of testing the experiment.

Results



The data taken from both MeterHero and EyeOnWater clearly depict the vast differences in daily water consumption from both before and after the execution of the experiment. Nearly 7 times as much water was being conserved subsequent to the first day of enforcing the experiment.

The following image is the sprinkler controller that manages the amount of water being expelled from the sprinklers and and for how long those sprinklers ran

Conclusions

This experiment has showed me how much water sprinkles really use up and made me and my family realize that by simply cutting down on the number of sprinklers we utilize and lowering the time by as little as 5-10 minutes can make a huge impact on the amount of water we use (and the price of our water bill).

Recommendations

What I would recommend to anyone who may be interested in performing experiment, I recommend that whatever water source(s) you chose to decrease the usage of, that it is one that the data would remain consistent throughout. For example, with my sprinkler experiment the weekly data remained consistent throughout because my sprinklers were on a set timer, making it so that the same quantity of water would be used per session, increasing the overall accuracy of the results due to this consistency within the data.

Acknowledgements

Special acknowledgements are extended to Mrs Lufkin, EyeOnWater, MeterHero, Tarrant Regional Water District, and City of Southlake Water Department whose various contributions have been instrumental in facilitating the implementation of this experiment.

References

https://meterhero.com/
https://www.eyeonwater.com/signup

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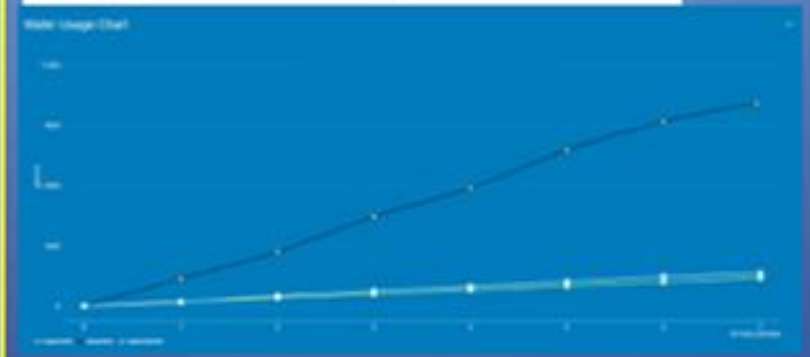

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Recommend

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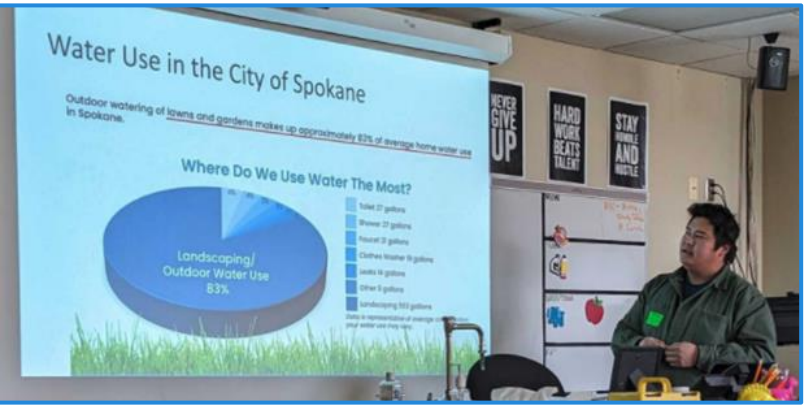
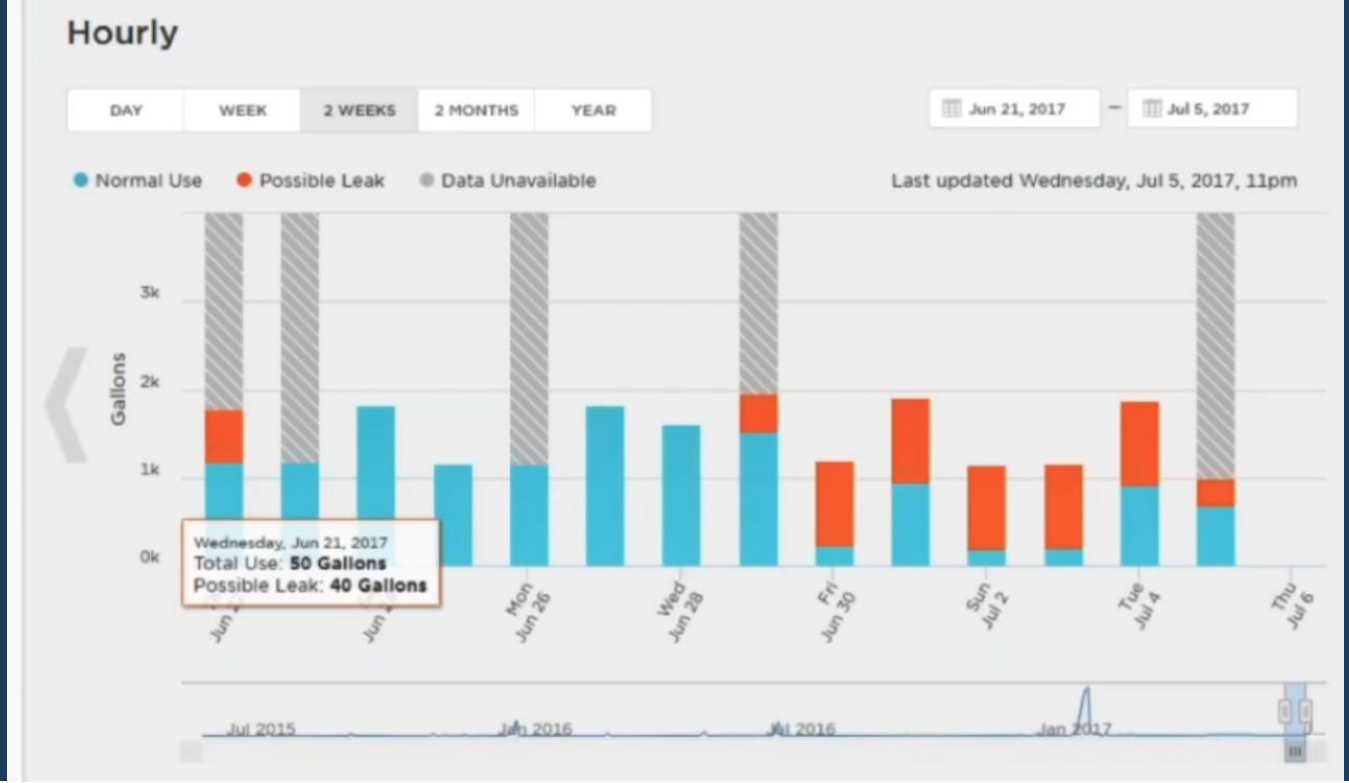
References

https://meterhero.com
https://www.eyeonwa

Without losing your marbles!

“I had lots of fun teaching APES students at Carroll today! Kids were great.” - Betsy, TRWD



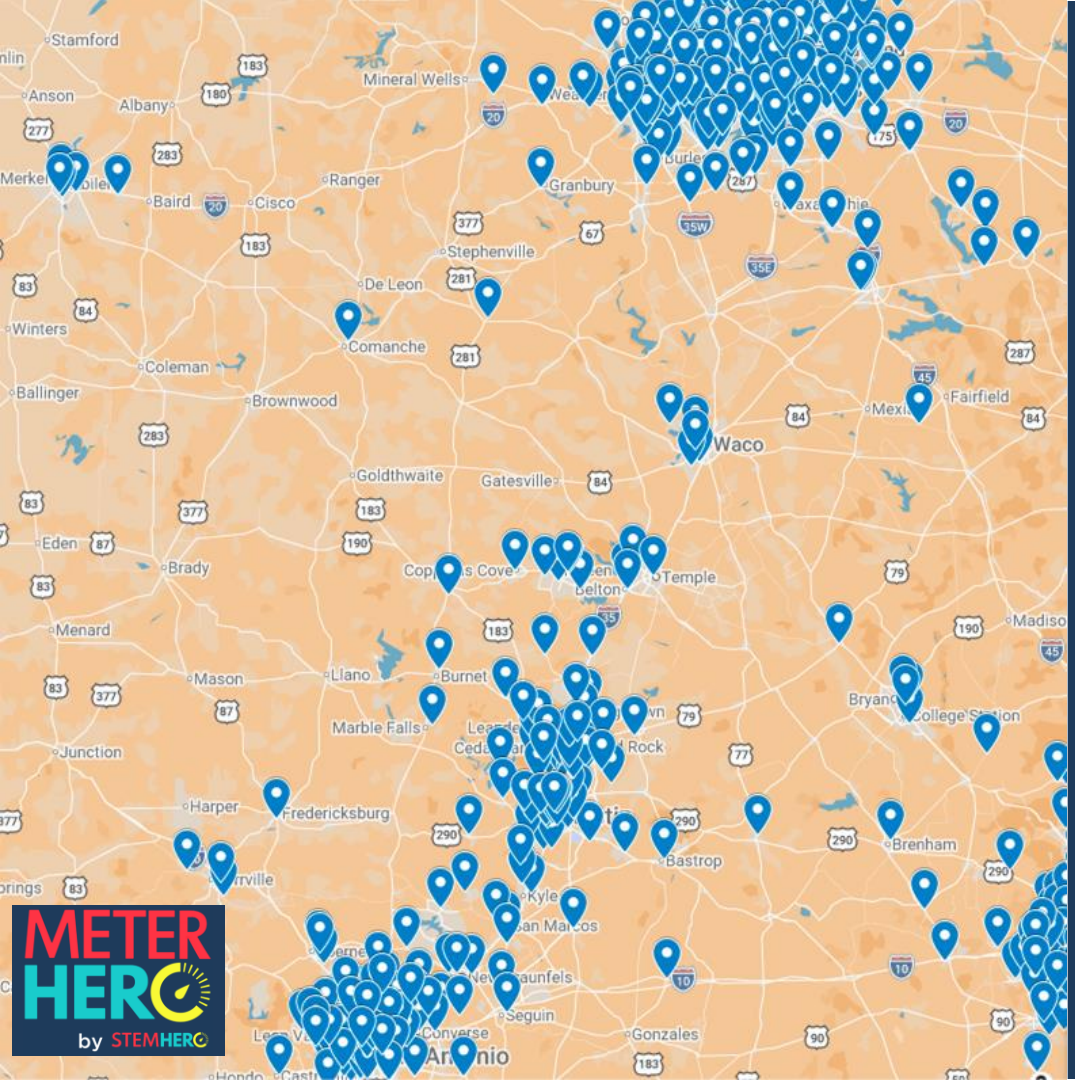


*"**I pulled up my home's MyWater account** with William (Granger) on the video call. In front of all the students he helped me spot a leak! The kids were really into it in the chat and I told them that **this is a service they should all check out with their families**"* -- Senna

Lessons Learned:

1) Follow teachers' lead
2) Keep it real
3) But make sure everyone can participate
4) And don't forget about those utility benefits

METER HERO



Nate Conroy

Utility + School Matchmaker

nate@STEMhero.com

How many of your local schools can participate?

Beyond Leak Alerts: Leveraging AMI to Engage Families in Unexpected, Creative, and Fruitful Ways

Nate Conroy, STEM Hero