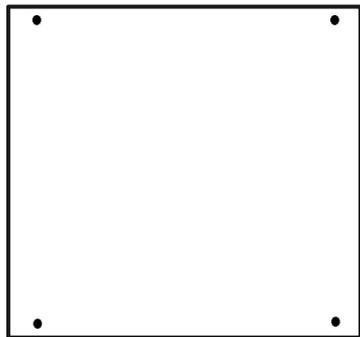


# Welcome - please grab a partner and try this game

## (1) Setup:

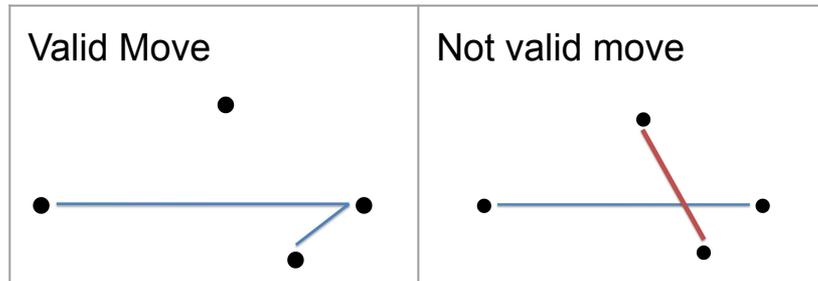
Make a box with four outside dots.

Add up to seven more dots in the middle.

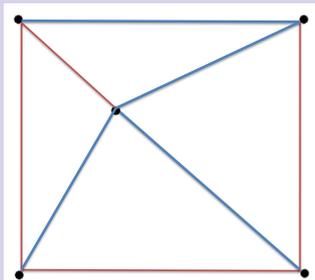


(2) Play game by alternating connecting the dots with lines that don't intersect at non-dots.

Player with the last valid line wins.



Example Game:



What do you notice as you play?  
Do you want to go first or second?

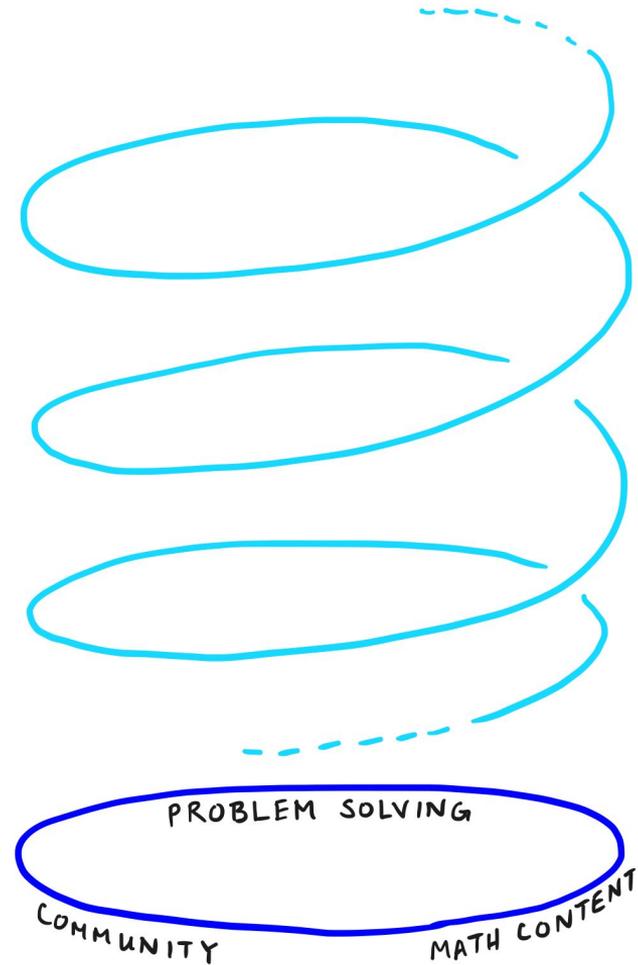
# Creating Community Responsive Math Circles

Dr. Brandy Wieggers  
College of Idaho  
[@drbrandymath](#)



## Math Circles...

- Exploring worthwhile mathematical tasks,
- Fostering problem-solving habits of mind
- Building communities of mathematical thinkers and problem solvers



# Human Side of Math



*“A Math Circle is a place where people motivate each other to learn mathematics by sharing their love and enjoyment of the subject.”*



<http://mathcircles.org>

# I am a lifetime Girl Scout

(I got organizational skills)





Jane Long, Alessandra Pantano, Diana White, and Brandy Wieggers. Math Circles Embrace Underserved Students. *MAA Focus*. (2017, October).

Brandy S. Wieggers, Yvonne Lai, and Diana White. Exploring the effects of four years of math circle on middle school and high school students' mathematical task value. *School Science and Mathematics Association Convention Proceedings*. (2016, in publication).

Matthias Beck and Brandy S. Wieggers. Creating Momentum Through Communicating Mathematics. *AMS Blog*. (October 17, 2016).

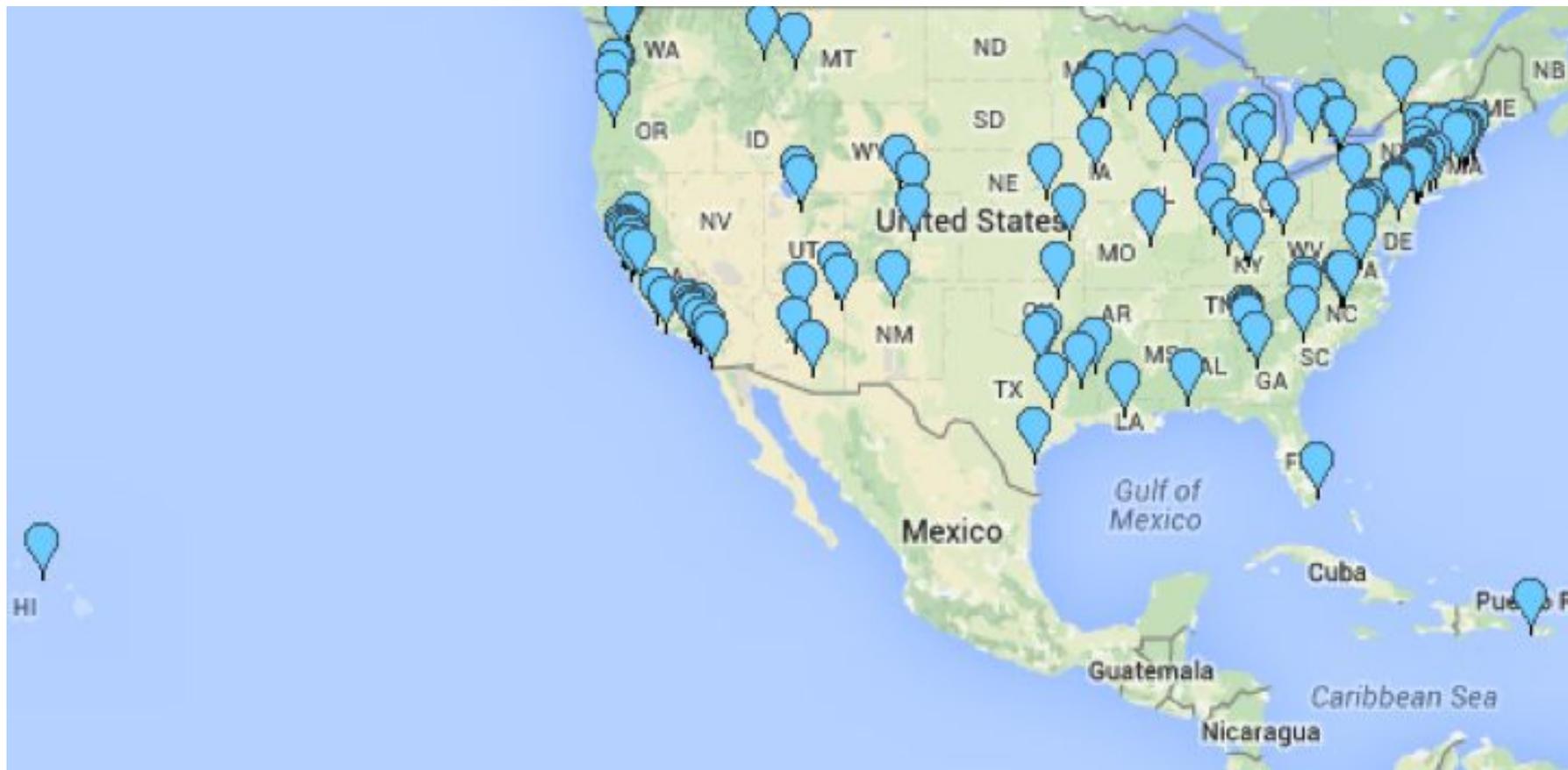
Brandy S. Wieggers and Diana White. The establishment and growth of Math Circles in America. *Research in History and Philosophy of Mathematics, Proceedings of the Canadian Society for History and Philosophy of Mathematics*. M. Zack, E. Landry (eds.) (2016).

Contributor- Sam Vandervelde. *MSRI Mathematical Circles Library: Circle in a Box*. AMS (2009).

Brandy S. Wieggers, Angela Y. Cheer, and Wendy K. Silk. Modeling the Hydraulics of Root Growth in Three Dimensions with Phloem Water Source. *Plant Physiology*. 150. 2092-2103 (2009).

Zhiming Liao, Shihua Wang, Brandy S. Wieggers, and Steven K. Clinton. Energy Balance Alters Dunning R3327-H Prostate Tumor Architecture, Androgen Receptor Expression and Nuclear Morphometry in Rats. *The Prostate*. 66:9. 945-953 (2006).

# Math Circles across US



**enriched**

**accelerated  
advanced**

**under-served  
un-enriched**

**remedial**

—

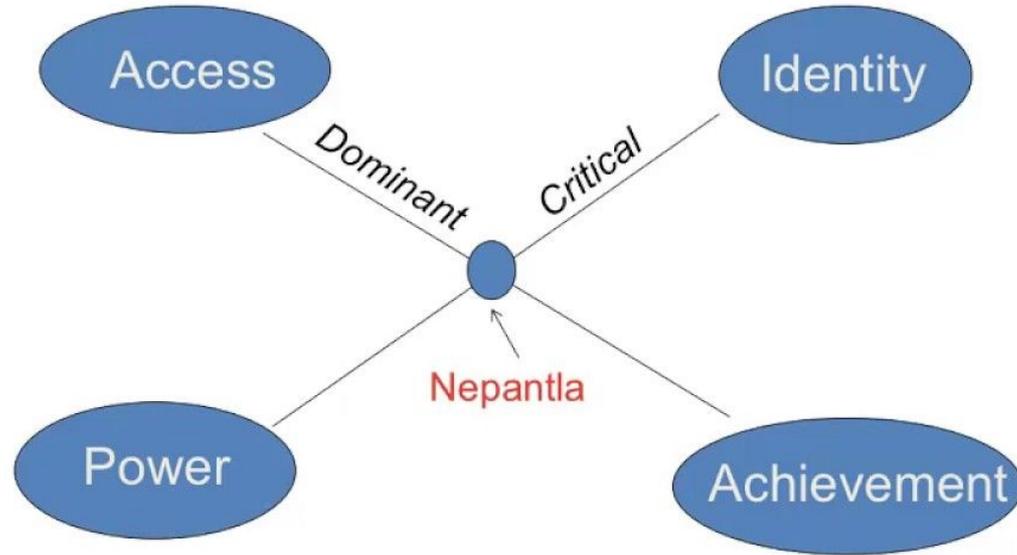
Does mathematical ability trump the need to provide a safe space for marginalized people?

-Dr. Omayra Ortega  
Assistant Professor, Sonoma State University

<https://www.mathvalues.org/masterblog/who-needs-a-diversity-statement-anyway>

# Nepantla - From Dr. Rochelle Gutierrez

(GUTIERREZ, 2007; 2008B; 2009)



# Hard conversations - Dr. Aris Winger

## What I think I need to consider before I Reach out

- Continue to acknowledge that I have an idealized version of what a mathematician looks like and that person still looks white and male.
- Engage with colleagues who are honestly working to improve themselves in this area.
- Be as honest and truthful about my actions as possible.
- Forgive myself
- Be clear about my purpose in reaching out.
- Stay aware of my positionality in this world and its relationship to the groups I seek to recruit.
- Read papers, books, and articles about these issues to broaden my perspective.

**enriched**

**accelerated  
advanced**

**under-served  
un-enriched**

**remedial**

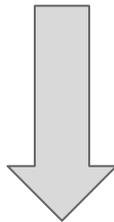
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**Let's move from**

**Thinking of programs through a  
binary/ deficit lens**

**Let's move from**

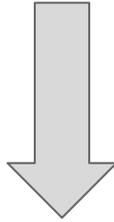
**Thinking of programs through a  
binary/ deficit lens**



**Thinking about how programs are  
Community-Responsive.**

**Let's move from**

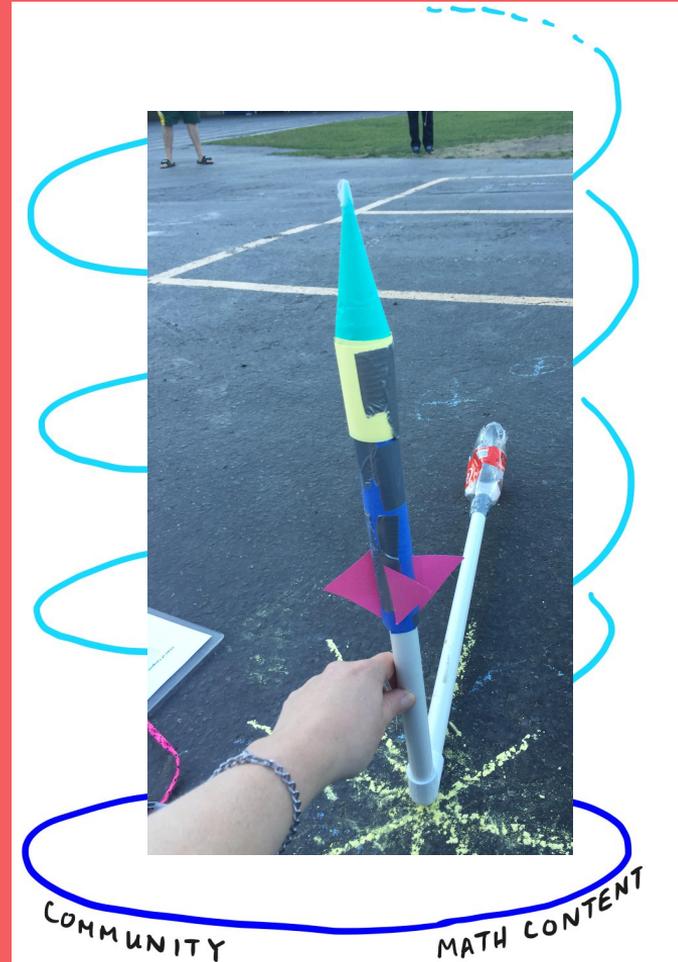
**What I think my community needs**



**Finding out what my community  
needs.**

# Community Responsive Math Circles...

- Exploring worthwhile mathematical tasks,
- Fostering problem-solving habits of mind
- **Building communities of mathematical thinkers and problem solvers**



# How to make a community responsive program.

1. Complete an assessment of strengths and areas of needs so you can use resources wisely.
2. Have hard conversations
3. Find community partners
4. Cycle through this until you CAN DO IT RIGHT
5. Run the program
6. KEEP ASKING YOUR COMMUNITY HOW IT CAN GET BETTER

# Where is Kittitas County?

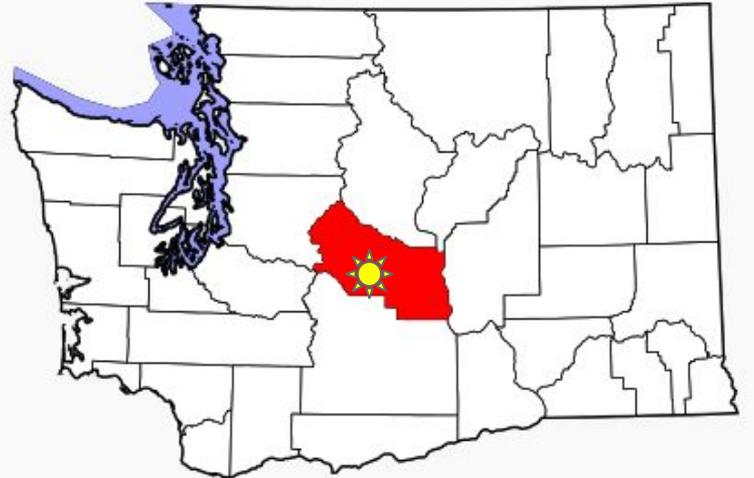
**Population:** 42,670 (estimated in 2015).

7,484 children under 18 (18% in 2010)

**Total Area:** 2,315 square miles



Washington's location in the U.S.



Location in the state of Washington

Image from [https://en.wikipedia.org/wiki/Kittitas\\_County,\\_Washington](https://en.wikipedia.org/wiki/Kittitas_County,_Washington)

Data from: <https://www.co.kittitas.wa.us/about/default.aspx>



4 Year public university

Enrollment: 10,650 students

- ~9800 undergraduates
- ~500 graduate students
- 166 declared majors
- 50+/- graduates a year

Math degrees offered

- Pure
- Actuarial
- Teaching (secondary, middle)
- Applied

# Creating KVMC- Using Resources Wisely

## Small Rural Town (19,786)

- Sports
- Bible Study
- Other outreach projects
- Driving distance

## Comprehensive (non-R1) University

- Undergraduate Mentors
- Quarters (10 weeks)
- Supportive STEM outreach



Dr. Dominic Klyve

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## Elementary Math Circle:

2nd- 6th grade students

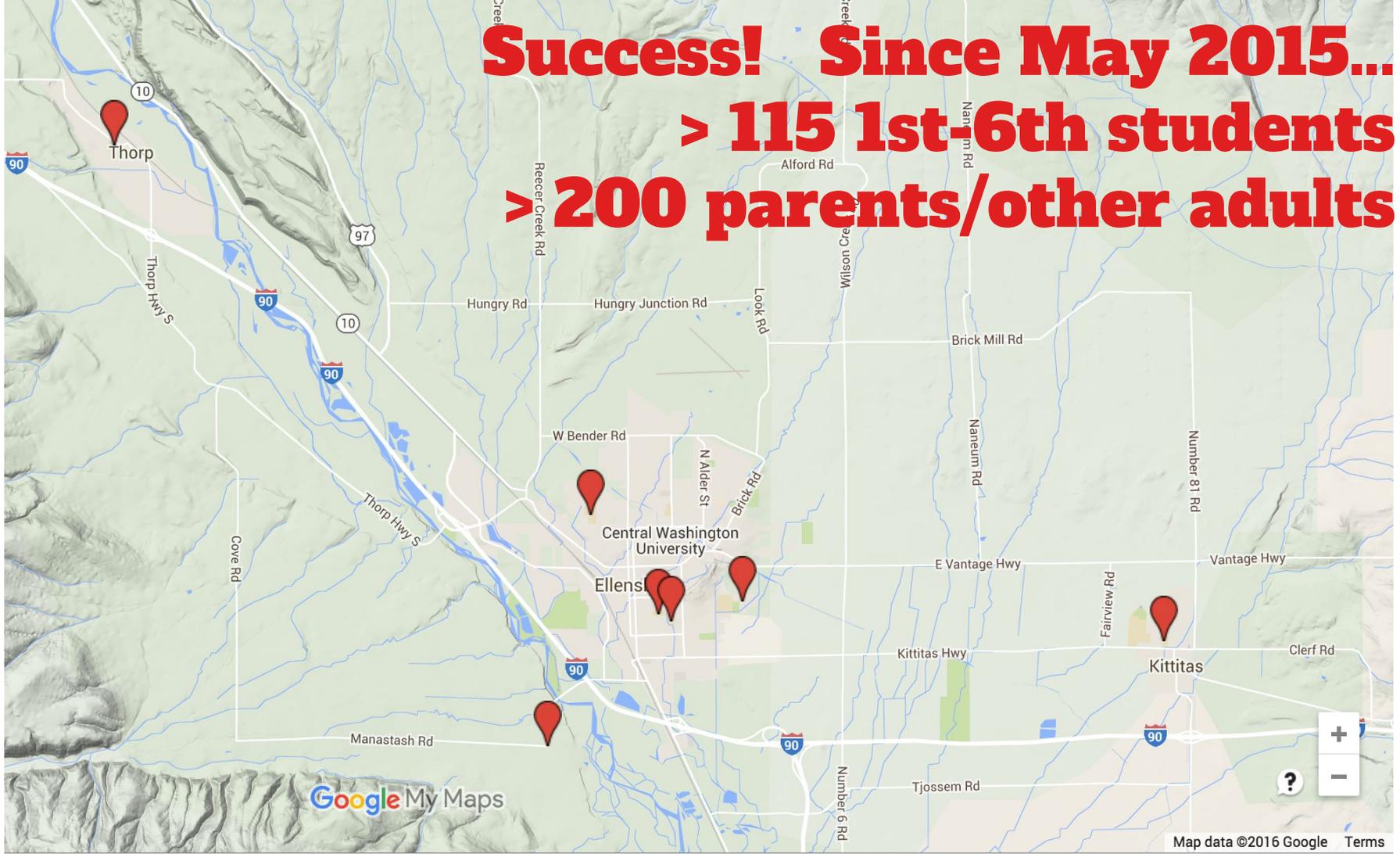
## Topic blocks

(5 weeks, one topic per quarter)

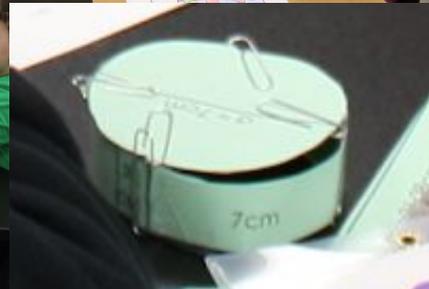
## Parents/ guardians are

invited to attend a specific adult session for the 1st two weeks of each topic block.

**Success! Since May 2015...**  
**> 115 1st-6th students**  
**> 200 parents/other adults**



# Learning about $\pi$



# How to make a community responsive program.

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Table 3. Student Program Data for 2015-2016 Ellensburg Middle School

Gender		
Male	362	51.0%
Female	348	49.0%
Race and Ethnicity		
Hispanic/Latino of any race(s)	131	18.5%
American Indian/Alaskan Native	5	0.7%
Asian	12	1.7%
Black/African American	10	1.4%
Native Hawaiian/Other Pacific Islander	1	0.1%
White	538	75.8%
Two or More Races	13	1.8%
Ellensburg School District Special Programs		
Free or Reduced-Price Meals (May 2016)	263	37.1%
Special Education (May 2016)	95	13.4%
Section 504 <sup>a</sup> (May 2016)	16	2.3%
Transitional Bilingual (May 2016)	46	6.5%
Migrant (May 2016)	10	1.4%

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# **MAA Tensor SUMMA Grant**

**[https://www.maa.org/programs-and-communities/  
outreach-initiatives/tensor-summa-grants](https://www.maa.org/programs-and-communities/outreach-initiatives/tensor-summa-grants)**

Grants will be awarded up to \$6000 and will be made to the institution of the project director for a one-year project. An institution is expected to supply matching funds or in-kind support as an indication of commitment to the project.

# What did we do next?

- (1) **Develop quality** Spanish Math Circle **materials**
- (2) **Develop undergraduate mentor training** that prepares students to support inquiry-based mathematical exploration in Spanish
- (3) **Utilize community and university resources** to **recruit** and **sustain** middle school students' participation in the program
- (4) **Evaluate** and **share** the work

# It's working! And we're learning



# ¿Qué ayudó más?

## What helped the most?

**!!!Días para recordar!!!**

**Círculo de matemáticas comienzan el 28 de enero.**

**Asegúrese de que se haya registrado en <https://www.cwu.edu/math/KVMC-Espanol>**

# Imanes de recordatorio reminder magnets

## Spot-IT!





Series on Mathematics Education Vol. **16**

Edited by  
**Hector Rosario**

## **MATHEMATICAL OUTREACH**

Explorations in Social Justice Around the Globe

1. The Julia Robinson Mathematics Festival: An American Artifact in an International World
2. Math Unbounded: A Transcultural Experiment
3. The Global Math Project: Uplifting Mathematics for All
4. The International Mathematics Enrichment Project: Enhancing Teacher Preparation Through International Community Engagement
5. Creating Community-Responsive Math Circle Programs
6. The Alliance of Indigenous Math Circles: From Invitations to Partnerships
7. BEAM: Opening Pathways to STEM Excellence for Underserved Students in Urban Settings
8. Mathematics, Computational Thinking, and Coding for Middle and High School African American Girls in the Deep South
9. Math Instructors' Critical Reflections on Teaching in Prison
10. "No Fractions": Math in Prison for the Common Good
11. Advising Undergraduate Research in Prison

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# Let's move to Idaho...



# How to make a community responsive program.

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# THE COLLEGE *of* IDAHO



4 Year private university

Enrollment: 1100 students

Math degrees offered

- Mathematics
- Mathematics-Computer Science
- Mathematics-Physics
- Math for Secondary Educators

In Caldwell, Idaho:

Has 5,627 students in grades PK, K-12 with a student-teacher ratio of 16 to 1.

**Surrounded by rural smaller communities**

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## **MATHEMATICAL OUTREACH**

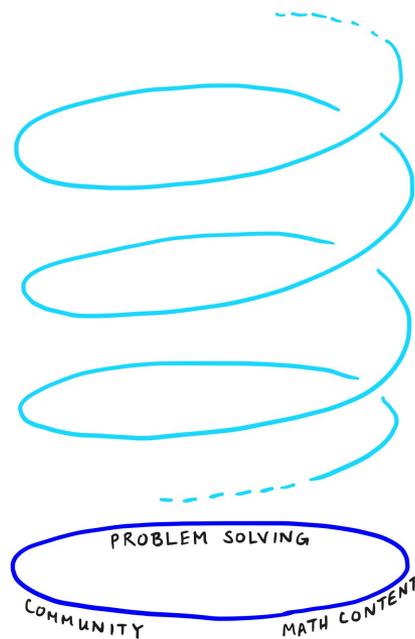
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# REMEMBER the Journal of Math Circles

Brandy Wieggers (@drbrandymath)  
College of Idaho



<https://digitalcommons.cwu.edu/mathcirclesjournal/>