

# Forum of International Projects and Collaborations

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# Development and Research in Early Math Education (DREME)

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*DREME seeks to advance the field of early mathematics research and improve young children's opportunities to develop math skills.*

*Site for researchers, practitioners, and future teachers.*

## Example from teaching Channel

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Kathy's video asks children to record their *Counting Collections* work on paper. Watch the different ways children begin to create a written representation of their already counted objects, and listen as Kathy describes how this representation becomes a productive communication piece between teachers and families (3:18 - 4:41).



## Part of DREME research & practice: Cognitively Guided Instruction (CGI)

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The principles of CGI (pioneered by Thomas Carpenter and Elizabeth Fennema): (a) everyone has knowledge to contribute (children, teachers, graduate students, researchers); (b) we continue to learn if we ask questions, listen to others, and justify our thinking; (c) details matter; (d) mathematics, as well as teaching, is about problem solving and connections.

# The History of Math Circles

from <http://mathcircle.stanford.edu/about/history>

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“A math circle is a social structure where participants engage in the depths and intricacies of mathematical thinking, propagate the culture of doing mathematics, and create knowledge. To reach these goals, participants partake in problem-solving, mathematical modeling, the practice of art, and philosophical discourse. Some circles involve competition, others do not; all promote camaraderie.”

—National Association of Math Circles Wiki

## **From Eastern Europe to Stanford University**

The Math Circle movement migrated from Eastern Europe to the United States in the 1990s. Today, more than 180 Math Circle programs operate across the country. Math Circles vary greatly in their style and the students they serve, but they share common goals of bringing mathematicians together with students to expose them to mathematical reasoning and problem solving beyond that normally encountered in traditional school classes.



# Cognitively Guided Instruction in Math Circle Fresno, grade 3-5 students

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“Number talk”: 25 times 45

Video from 2016-2017 Math Circle

The session is facilitated by an undergraduate student (prospective teacher)

What was Misa’s way of thinking?

How are the principles of CGI manifested in this video segment?

# The Joy of Mathematics through Hands-on Activities

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## Experience Workshop

- Zometool, tiling
- GeoGebra
- STEAM
- Team work

## Summer Academy in Fresno

- Manipulatives
- GeoGebra
- Computer simulations
- Building bridges (team challenge this Summer)



# Inquiry Based Learning (IBL)

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- Deep engagement in rich mathematics
- Opportunities to collaborate
- Instructor: inquiry into student thinking
- Instructor: focus on equity



# IBL and work in Fresno

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IBL website: <http://www.inquirybasedlearning.org/>

- Videos
- Resources
- Workshops
- Events
- Blogs
- Community

Work in Fresno:

- Calculus class/workshop for prospective secondary teachers
- Math classes for elementary teachers
- Graduate and Undergraduate Student Seminar (GAUSS)
- Problem Solving Playground
- Community of Learners



# Community of Learners: Sonia Kovalevsky Day

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# SK Day Volunteers





# Travel to a conference

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# Department of Mathematics Day (1)

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# Department of Mathematics Day (2)

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# Department of Mathematics Day (3)

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# Calculus class/workshop for prospective secondary teachers

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# Preparation for group presentations

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# Math classes for elementary teachers (1)





# Math classes for Elementary teachers (2)





# Math classes for elementary teachers (3)

Project #3 Part #2

### TREE

$V = \frac{1}{3} (3.14 \times 9^2) (600) = 59036.8 \text{ in}^3$

### TRIANGLE

### FLOWER POT

Outside Radius = 14.75  
Inside Radius = 12.75  
Height = 24.0 in

$2\pi(14.75)^2 + 2\pi(14.75)(24.0) = 3589.6 \text{ in}^2$  for outside  
 $2\pi(12.75)^2 + 2\pi(12.75)(24.0) = 2942.8 \text{ in}^2$  for inside  
 Total = 646.8 in<sup>2</sup>

For the tree we measured the bottom of the tree which is 64 inches. The height of the tree is 600 inches. To find the volume we used the formula  $\frac{1}{3}$  base times height.

For the triangle we measured one of the triangles and multiplied the answer by six to figure out the entire structure. We measured it in all areas (the outside and inside) to find the correct measurements.

For the flower pot we measured the inside of the pot and the outside of the pot. When we figured out the calculations we subtracted the inside of the pot from the outside of the pot to get our answer.



# Math classes for elementary teachers (4)

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# Plans for more intensive collaboration

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Establishing a “Polya Institute” with advisory board members from each of the three projects to promote mathematics educational research and practice at all levels in the Fresno region in the spirit of George Polya and Zoltan Paul Dienes to provide on-going, locally accessible support, that allow teachers to collaborate with experts as well as with peers, in implementing engaging and effective mathematics instruction. Revised grant application to be submitted in November, 2019.



# Advisory Board of Polya Institute

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- Dr. Andrew Benedek
- Dr. Kristof Fenyvesi
- Dr. Erhan Selcuk Haciomeroglu
- Dr. Zsolt Lavicza
- Dr. Deborah Stipek
- Dr. Peter Tannenbaum
- Dr. Terry Winant
- Dr. Stan Yoshinobu



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Partners are welcome!  
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Thanks for your attention!