MathAmigos: A Community Math Initiative

JMM 2020, Denver

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Math Circles Collaborative of New Mexico

MathAmigos

In spring of 2017 a small group of math education-enthusiastic Santa Feans started meeting in order to raise awareness and levels of mathematics understanding in Santa Fe, New Mexico public schools (SFPS).

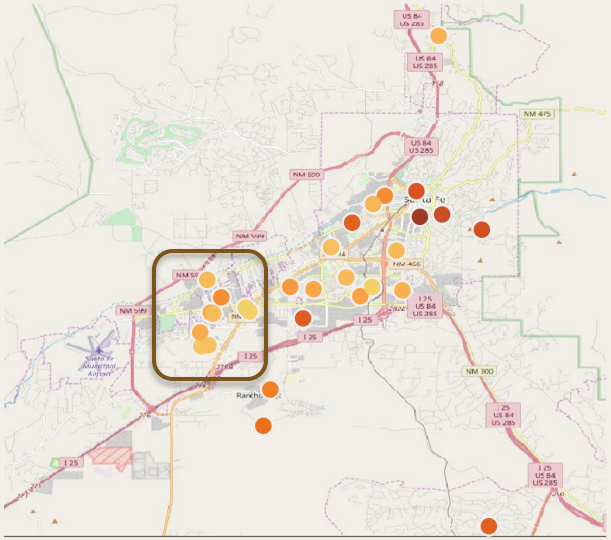
This is their story.

District Geography

Math Proficiency

Use the 'Measurement Selector' on the right to select a statistic to be displayed for each school. All statistics are presented as a percent of the student body. Mouse over schools for additional information. Some school/statistic combinations are omitted as they are n..

SFPS Map of PARCC Math Proficiency Rate



Measure 0.00 61.70 Updated Dec 7, 2017

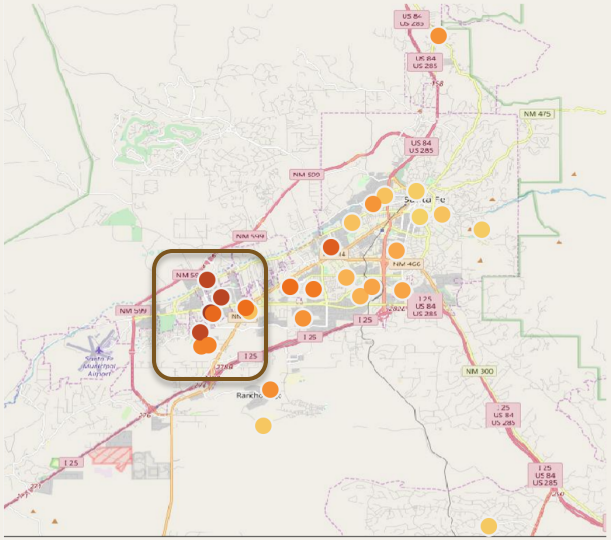
Measurement Selector
PARCC Math Proficiency Rate

Academy at Larrag..	0.0
Acequia Madre	47.7
Amy Biehl	27.2
Aspen	8.5
Atalaya	45.3
ATC Charter	31.9
Capital High	3.5
Carlos Gilbert	43.1
Cesar Chavez	12.0
Chaparral	15.3
Early College Oppo..	0.0
EJ Martinez	7.7
El Camino Real	8.0
El Dorado	38.4
Engage	0.0
Gonzales	22.2
Kearny	13.8
Mandela	37.8
Milagro	10.9
Nava	17.8
Nina Otero	5.9
Nye Becc	
Ortiz	6.9
Pinon	39.1
Ramirez Thomas	22.2
Salazar	6.0
Santa Fe High	7.9
Sweeney	13.0
Tesuque	10.0
Wood Gormley	61.7

English Language Learners (Spanish)

Use the 'Measurement Selector' on the right to select a statistic to be displayed for each school. All statistics are presented as a percent of the student body. Mouse over schools for additional information. Some school/statistic combinations are omitted as they are n..

SFPS Map of English Learner %



Measure 1.20 58.40 Updated Dec 7, 2017

Measurement Selector
English Learner %

Academy at Larrag..	6.2
Acequia Madre	5.9
Amy Biehl	21.4
Aspen	19.5
Atalaya	3.1
ATC Charter	4.3
Capital High	24.5
Carlos Gilbert	2.9
Cesar Chavez	48.9
Chaparral	10.7
Early College Oppo..	14.7
EJ Martinez	13.6
El Camino Real	49.7
El Dorado	3.8
Engage	30.8
Gonzales	5.9
Kearny	27.6
Mandela	6.1
Milagro	14.8
Nava	30.9
Nina Otero	25.2
Nye Becc	0.0
Ortiz	32.9
Pinon	20.3
Ramirez Thomas	50.5
Salazar	37.5
Santa Fe High	10.6
Sweeney	58.4
Tesuque	20.2
Wood Gormley	1.2

Our 5 cohort schools (boxed) are at 100% free lunches or very close to it.

School District Numbers

- Total SFPS students: 13,087 in 29 schools
  - District math proficiency average: 17%
  - The district's best schools are in the 30%-45% range, with one at 61%, nearly all being small schools in affluent neighborhoods.
- Our five cohort schools' math stats (K-6 or K-8):
  - 6%, 8%, 12%, 13%, and 22% (2018)
  - These are feeder schools to Capital High School, which has 3% math proficiency

Philosophy

A fundamental theme of our work is that of treating teachers as awakening mathematical thinkers and doers. We feel that this is not often a principle in mathematical professional development, and this is reflected in the practice of "training" teachers to deliver methods rather than to grow as *mathematician-teachers*. Often, such trainings offer little follow-up and support. We address this by offering an introduction to the productive struggle of the mathematician via math circles combined with a **professional partnership with our coaches**.

MathAmigos

- A community mathematics initiative in Santa Fe, NM
- Led by retired and active teachers, mathematicians, a former medical school dean, district teachers, administrators, VISTA support, retired college professors
- Not a formal legal entity such as a 501(c)(3)
- Primarily for teacher professional development (PD), though workshops and teacher coaching
- Initial cohort grades 3-4, some 1-2, 4-5. K-12 now.
- Began teaching Exploding Dots and Math Circles, with Cuisenaire Rods for early grades
- Runs JRMF-style family math nights

Origins

- A small group of Interfaith Coalition for Public Education (icpesantafe.org) members, who had been working tutoring in our schools decided that tutoring wasn't enough.
- They met with others outside their group and recruited other Santa Feans interested in math education.
- And began meeting to figure out what to do, knowing that the school district had not been welcoming to outside groups in the past.

(Some of) our MathAmigos Team

- Former Medical School Dean. Experience with curriculum reform and with navigating complex educational organizations
- Retired IBM applied mathematician
- Retired 7-12 grade computer science and math teacher
- Executive Director and Assist. Director of Curriculum & Instruction, SFPS
- District Mathematics Coordinator
- VISTA volunteers given us by the SF Community Foundation
- 5th grade teacher and recent NM Presidential Award winner for math and science teaching—our Exploding Dots expert
- Retired math and business professor
- 5 retired master teachers (our coaches), mostly K-6

Before the 2019-20 School Year

- Journal of Math Circles article details this*
  - The MathAmigos program
  - The team
  - Origins
  - Timeline of program and activities
  - Program elements and rationale
  - Workshop curriculum and operation
  - Classroom implementation
  - Measurement (surveys at end of each workshop) & feedback
  - Funding
  - Community response

* https://digitalcommons.cwu.edu/mathcirclesjournal/vol1/iss1/

2019-20 School Year

- What did not appear in the JMC article
  - Problems (not of the mathematical sort)…
    - (Previous) school system reluctance to work with external groups, low student math levels, teacher prep and morale, community distrust, capacity (availability of mathematician instructors and mentors), difficulties getting data, etc.
  - Fall 2019 growth of program and reach
  - New programs introduced
    - Student math circles, support staff workshops, etc.
    - New courses (Spanish/bilingual/SpEd, Stories, Language)
  - Increased interest from school district administration
  - New funding sources (mostly teacher stipends)
  - Access to anonymized school/class data for analysis

Program Elements

- Saturday teacher PD workshops, stipends for teachers, with followup surveys. Handouts include Common Core Alignment. $150 stipends & meals.
- Key Element: **Followup in-class coaching**, one retired master teacher per school. Guarantees implementation!
- Family math nights, modeled after JRMFs
- End-of-year, multi-day teacher PD workshops
- Weekly MathAmigo meetings to plan, assess, budget, design curriculum, provide feedback to school district

Family Math Nights, K-6

- JRMF-style, table leaders drawn from faculty and administrators of district schools
- ~250 students/night
- We feed the families
- These teachers collected activity sheets from other tables to take back to their own classrooms

Timeline

Stage	Year	Period	Event
Origins: Formation	2017	Spring	Santa Fe Public Schools (SFPS) math tutors meeting.
		Spring-Fall	Formation of Collaborative Working Group on Math, Santa Fe Community Foundation. Grant application.
		Fall	Founding of MathAmigos and development of programming design. Planning for spring 2018 workshops.
Origins: Pilot workshops & festivals under foundation funding	2018	Jan & Feb	First two grades 4-6 workshops. Test of curriculum concepts.
		May	Family math night.
		May	Application for City of Santa Fe funding.
		June	Notification of City funding award.
Year 1: Formal MathAmigos program with 5 cohort schools, grades 3 and 4 with some grades 1, 2, and 5.		June-Sept	Planning for 2018-19 sessions. Recruiting coaches.
		Oct	1st Saturday workshop.
		Nov	2nd Saturday workshop.
	2019	Jan	3rd Saturday workshop.
		Feb	Family Math Night Festivals 1 & 2.
		May	MathAmigos integration (29 of 44 sessions) within 3-Day end-of-year SFPS district math professional development workshop.
Year 2: Formal MathAmigos program with 5 cohort schools, grades 3 and 4 with some grades 1, 2, and 5.		Sept-May	First formal student math circle, grades 5-7, at large SFPS K-8 school within 21st Century Program. Additional teacher funded by grant through MathAmigos.
		Oct	1st Saturday workshop.
		Nov	2nd Saturday workshop.
	2020	Jan	3rd Saturday workshop.
		Spring	Family Math Night Festival 1 & 2.

Exploding Dots

- Hugely popular with teachers, entire cohort using
- Easiest element to implement in the classroom
- Sometimes requires coaching
- Even 1st and 2nd grade teachers found it useful
- Most widely implemented part of our program

Exploding Dots: Coach's Report

- Initial teacher questions:
  - "When do I teach or introduce it?"
  - "How do I find time to incorporate one more thing into my already tight schedule?" "How does this fit into my curriculum?"
  - "Why should I teach Exploding Dots?"
  - "How do I explain what I'm doing if my administrator walks in?"
  - "How does [a teacher] grade activities like Exploding Dots?"
  - "What if parents are concerned about why students would be taught an alternative method of how to solve addition or subtraction by going left-to-right as well as right-to-left?"

Math Circles

- A short and long term strategy for teacher-mathematicians
- More difficult than Exploding Dots for most teachers to feel comfortable introducing
- Teachers appreciate being treated as professionals and as mathematician-teachers
- A substantial departure from typical PD, where teachers are being *trained* to deliver content or techniques rather than encouraged to be mathematical thinkers and investigators

Math Circles

- Our coaches have observed teachers not only using the math circles we've taught in workshops, but also adapting their math teaching style to the "be less helpful" strategy favored in math circles.
- Teachers have indicated that their views of themselves as math teachers are changing
- Teachers are trying out circles independently in after-school programs

Math Circles into Math Competition

- One of our MathAmigos coaches works with the gifted and talented program at a cohort school
- The GATE teacher at this school had these (grades 4-5) students so enthralled with math circle problems that they lobbied coach and teacher to have the entire class prepare for and enter a district math competition.
- That school not only won the competition, but three of these students placed 1st, 2nd, and 3rd.

Funding

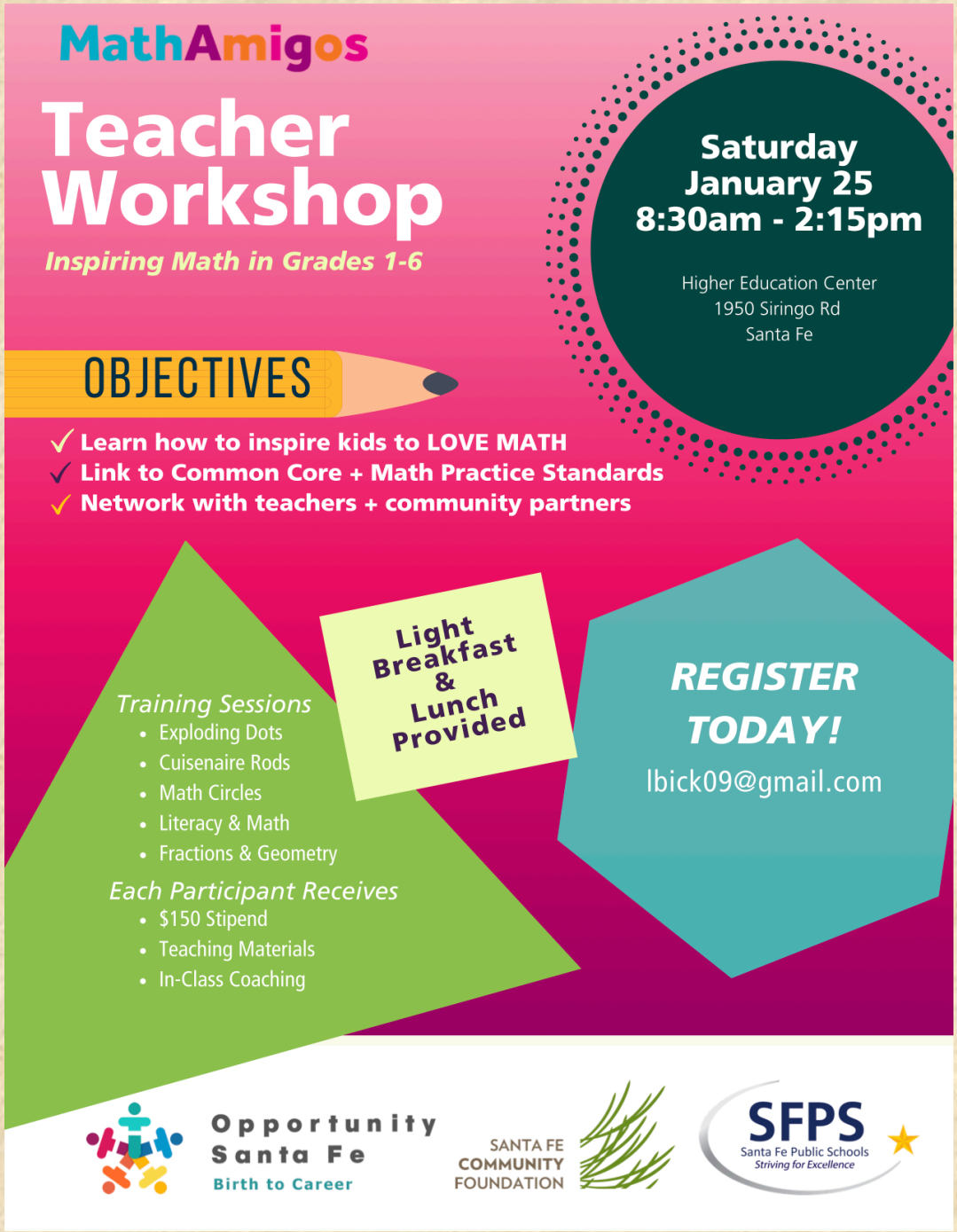
- Initial funding sources:
  - Santa Fe Community Foundation
  - City and County of Santa Fe
  - Private donors
- New funding sources:
  - Santa Fe Public Schools
  - New private donors
  - 21st Century Federal Afterschool Program (partnership)

Amounts:
$80,000+ 2019-2020
$55,000 2018-2019
$20,000 2017-2018

Teacher Workshop Attendance

Attendees	Year	Date
30	2018	January
32		February
29		October
33		November
29	2019	January
125		May, end-of-year, district-wide
41		October
53		November
57		January 2020 11-CC, 11-ECRA, 5-NO, 12-RT, 9-Sw, 9-Other 34 Latinx surname

Workshop Flyer



A Workshop Schedule

Time Block	Room 157	Room 135	Room 147	Room 159
9:00 am *to* **10:20 am**	**EXPLODING DOTS: INTRODUCTION AND REVIEW** **Grades 1-3** And how to use in your classroom! *Instructor: Barbara Bianchi*	**CUISENAIRE RODS MORE ON FRACTIONS** **Grades 3-6** Models to develop and support students' mathematical thinking *Instructor: Libby Kuehl*	**MY FIRST (OR SECOND) MATH CIRCLE** **Grades 1-6** A playful introduction to the low threshold/high ceiling Math Circle model *Instructor: James Taylor*	**MULTIPLICATION AND DIVISION** **Grades 4-6** Games and strategies to vary your teaching *Instructor: Carolyn Stupin*
10:20 - 10:30 AM: 10-MINUTE BREAK				
10:30 am *to* **11:50 am**	**EXPLODING DOTS** **Grades 4-6** More on Multiplication & Division *Instructor: Alan Lucero*	**CUISENAIRE RODS - THE BASICS AND MORE** **Grades 1-3** Explore concrete models to develop and support students' mathematical thinking *Instructor: Libby Kuehl*	**MATH AND MIND-READING** **Grades 3-6** Or as a 6th grade math circle student asked, "Is this mathematics or matheMAGIC?" A good connection to Exploding Dots. *Instructor: James Taylor*	**BASIC MATH FACTS** **Grades 1-3** Ways of learning number facts, and figuring out the facts you've forgotten. *Instructor: Carolyn Stupin*
11:50 AM - 12:30 PM: 40-MINUTE LUNCH BREAK – MAIN LOBBY				
12:30 pm *to* **1:50 pm**	**MORE ON WORKING WITH DATA** **Grades 3-6** Explore resources and strategies for teaching interpretation, analysis, & representation of data *Instructor: Jenifer Hooten*	**EMBEDDING LITERACY IN MATH** **Grades 1-5** Learn to use literacy to teach math *Instructor: Judy Reinhartz*	**¿FÚTBOL, EL AJEDREZ, O EL TÉ? (Soccer, Chess, or Tea?)** **Grades 1-6** An introduction to Math Circles in Spanish! *Instructors: Mitchell Rocha with James Taylor*	**STORIES WITH MATH** **Grades 1-6** Learn to use and write your own exciting Stories with Math *Instructors: Gary Clendenen and Donna Walter*
1:50 - 2:15 PM: COMPLETE EVALUATIONS. MAIN LOBBY - SIGN OUT TO RECEIVE MAILED STIPEND CHECKS				

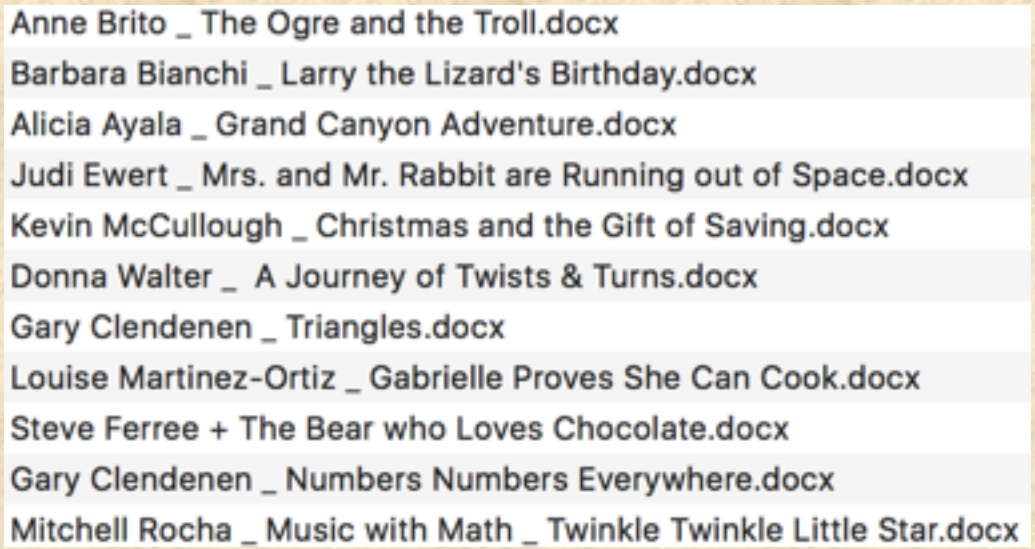
New 2019-20 Workshop Curriculum

- *Stories with Math*
  - Working dinner story writing and critiquing sessions
- Spanish/Bilingual/Special Ed math circles
  - Native speaker/SpEd teacher leads math circles
- Working with Data
  - Helping teachers generate ideas to tie data analysis and representation to other mathematics topics
- Math and Literacy
  - Supporting math learning through math-themed children's literature

Stories with Math

- Inspired by business school case studies
- Take the general idea of cases down to 2nd – 6th grades
- Teach elementary school teachers to write their own Stories
- Simple enough math so no teaching notes necessary
- We include Suggested Grades and Skills with each Story
- Published and distributed to MathAmigos teachers

Examples:



Program Growth 2019-20

- First student math circle at one cohort school
- Many more students at another cohort school participating in district math olympiad
- Increased PD workshop teacher numbers, extending to more schools with district funding
- First appearance of math wrangles in district schools and charter schools

Program Growth 2019-20

- Extending reach to more of district
- Adding PD sessions for district new teacher mentors, instructional coaches, and interventionists*
- Honored by SF Mayor's Give Back Award
- Getting NM Colleges of Education involved

* evaluates students to learn more about the factors affecting behavior and academic performance

Our First Student Math Circle

- At El Camino Real Academy K-8
- 15 grades 6th-7th students, all native Spanish speakers
- Integrated into the school, funded and managed under 21st Century Community Learning Centers
  - **This program does all recruitment, management, record-keeping, feeding, discipline, attendance (rare absences!), and data collection/assessment**
- MathAmigos funds two MathAmigos teachers through a SF County Youth Court grant, Anne Brito (4th grade) and Juana Medina (6th grade & bilingual teacher)
- I lead the math circles and train two teachers to eventually lead circles—which they did a few times, 1st semester

Our Second Student Math Circle

- Also at El Camino Real Academy K-8, for 6^{th}-7^{th} graders
- Starting soon, a second and concurrent circle led by the two teachers I've trained, with preparation and materials I'll provide
- We hope to start in February
- No additional expense to start

Ongoing challenges

- Recruiting/preparing math circle leaders
- Student behavioral issues, these are not self-selected students or parent-selected
- Improving internal communication and support between district administration, school administration, and teachers
- Getting access to district data for our assessments
- Maintaining a good relationship with the district, from teachers to superintendent

Final Thoughts and Questions

Can I or any of our MathAmigos group help you to start such an initiative in your community?

Questions for me?

Resources

Please read our Journal of Math Circles article for far more detail:

https://digitalcommons.cwu.edu/mathcirclesjournal/vol1/iss1/

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