
In their own words:

Teachers Reflect on their MTC experiences



Michelle Manes
University of Hawai`i at Mānoa
mmanes@math.hawaii.edu
Math Teachers' Circle Hawaii (MaTCH)



MaTCH Facts and Figures

- Started Summer, 2011
 - 8 meetings per year, Saturday mornings
 - 2014-2015 numbers:
 - 70 teachers, average of 44 teachers per session
 - 23 elementary
 - 25 middle
 - 18 high school
 - 12 special education
 - 4 administrators
 - Small number of teachers from neighbor islands participate via Google Hangout.
-



Typical Session

- Start at 8:30am, paperwork and snacks
 - Mathematical activity
 - pre-write:
“What are your thoughts about the mathematics topic for today’s activity?”
 - 9am–11am activity
 - post-write:
“What new insights do you have about the mathematics topic for today?”
“What mathematical questions do you have as a result of today’s session?”
 - Pedagogical discussion
 - End at 12:30pm
-



2014–2015 topics

- Optimization
 - Curvature
 - Mathematics in unexpected places
 - Using statistics to improve design
 - Pick's theorem
 - Topology
 - The relationship (if any) between area and perimeter
 - Expected value
-

Area & Perimeter pre-write:

- I am excited about perimeter & area because I am a huge fan of geometry!
 - I want to know how to make a lesson on perimeter & area that is effective and keeps students engaged.
 - Area = length \times width, Perimeter = sum of all sides.
 - Area = total amount inside, Perimeter = total amount around.
 - As the perimeter increases at a constant rate, the area increases at an exponential rate.
 - This is one of the many topics that my students seem to interchange often.
-

Perimeter and Area

The session started with watching this video:
<http://www.101qs.com/2859-circlesquare>

Area & Perimeter activity

- Describe what's going on in the video. Do you have any questions?
 - What mathematical questions can you ask about this situation?
 - Some that we investigated:
 - Where are the two areas equal?
 - Where is the total area the greatest?
 - Where is the total area the smallest?
-

Area & Perimeter post-write:

- I want to explore the isoperimetric theorem more to work out some of the noodling going on in my mind.
 - How can I make an animation of my own?
 - The idea that there is a max and min for the total area, that is a quadratic that gives a parabola.
 - Why did our ancestors use quadrilateral taro patches when circular would have been better for area?
 - How can we relate this to volume?
 - I learned a new word called epsilon, a very tiny number.
 - I liked the part where Michelle asked for wrong answers.
 - I still do not understand why the minimum combined area is not simply a square.
-

Portfolio #1

Elementary specialist working on Moloka'i

Math for me from primary to secondary and on to college level was simply the memorization of a variety of formulas, sequences of operations / manipulations. I did well in this structure; just show me some examples and I could follow suit. Understanding of what I was doing, the meaning of the actions or the application of those actions on a real-world situation was limited. Further, number and operations and algebraic representation were emphasized over geometry and spatial sense.

Where is the area of the two shapes identical?

$$\pi r^2 = \left[\frac{(40 - 2\pi r)}{4} \right]^2$$

$$\pi r^2 = (10 - \frac{1}{2}\pi r)^2 = 100 - 10\pi r + \frac{1}{4}\pi^2 r^2$$

$$\left(\frac{1}{4}\pi^2 + \pi \right) r^2 - 10\pi r + 100 = 0$$

$$r = \frac{10\pi \pm \sqrt{100\pi^2 - 100\pi^2 - 400\pi}}{\frac{1}{2}\pi^2 + 2\pi}$$

This is where I got stuck and I couldn't find a real solution. John kept trying to tell me that the numerator in this radical expression should be positive, but when I distributed the -4 across a I came up with both terms being negative.

Side length	P	A	Radius	C	A	Difference
5.00	20.00	25.00	3.18	20.00	31.85	-6.85
5.10	20.40	26.01	3.12	19.60	30.59	-4.58
5.20	20.80	27.04	3.06	19.20	29.35	-2.31
5.30	21.20	28.09	2.99	18.80	28.14	-0.05
5.40	21.60	29.16	2.93	18.40	26.96	2.20
5.50	22.00	30.25	2.87	18.00	25.80	4.45
5.60	22.40	31.36	2.80	17.60	24.66	6.70
5.70	22.80	32.49	2.74	17.20	23.55	8.94
5.80	23.20	33.64	2.68	16.80	22.47	11.17
5.90	23.60	34.81	2.61	16.40	21.41	13.40
6.00	24.00	36.00	2.55	16.00	20.38	15.62
5.25	21.00	27.56	3.03	19.00	28.74	-1.18
5.26	21.04	27.67	3.02	18.96	28.62	-0.95
5.27	21.08	27.77	3.01	18.92	28.50	-0.73

Lesson Plans

Title: Building Fraction Understanding via Student Observation, Discussion, & Reflection

I had designed the lesson to focus in on the skill of observation. We had a discussion about the rudimentary skills required for students to extend a pattern, draw an inference, or examine a counter-argument in a previous MaTCH session. When we talked about what these skills might look like at an elementary level, I was struck by the foundational skills of comparing and contrasting. Underlying this skill was the ability to observe, to discern the features of an object, to notice. This is what I focused on in this lesson.

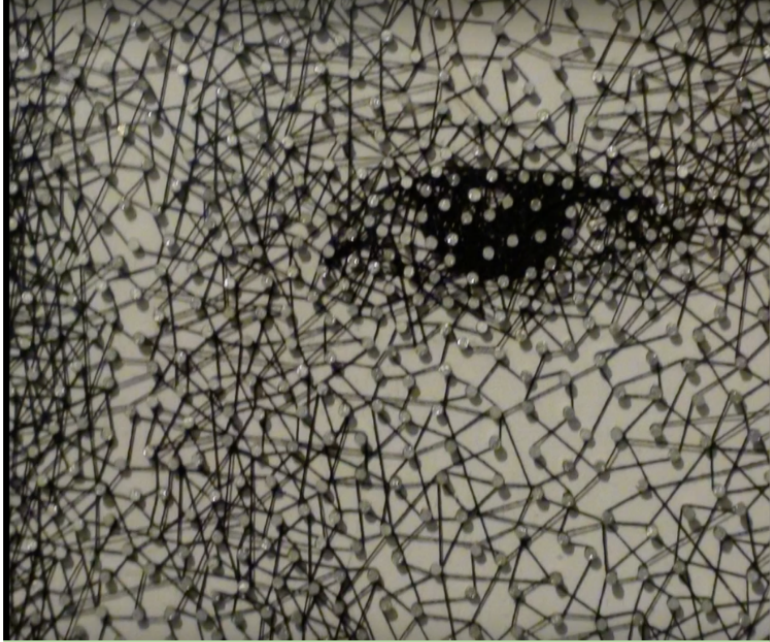
Portfolio #1 – Reflections

Being able to participate in these tasks, to experience what it is like to be a learner in the classroom, and then to reflect upon my learning– my own discovery, provides both fodder and impetus for my own pedagogical transformation.

Obviously, MaTCH is impacting my work at our school both in the classroom and with teachers. I am finding the experience both rejuvenating and challenging.

MaTCH @ the Museum





Kumi Yamashita
Constellation – Mana



Portfolio #2

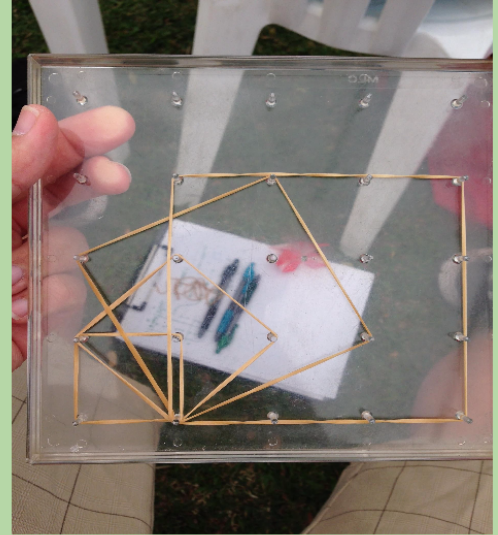
Secondary teacher in Hawaiian immersion school

Math came to me very easily and I enjoyed knowing my multiplication facts; I looked forward to the next chapter in our math book because with every new math concept learned, I was becoming “smarter”.

It was not until I took differential equations when I started to dislike engineering and mathematics because I could not follow lectures and I could not find good support systems. So I dropped out of engineering and continued to pursue my Hawaiian language degree.

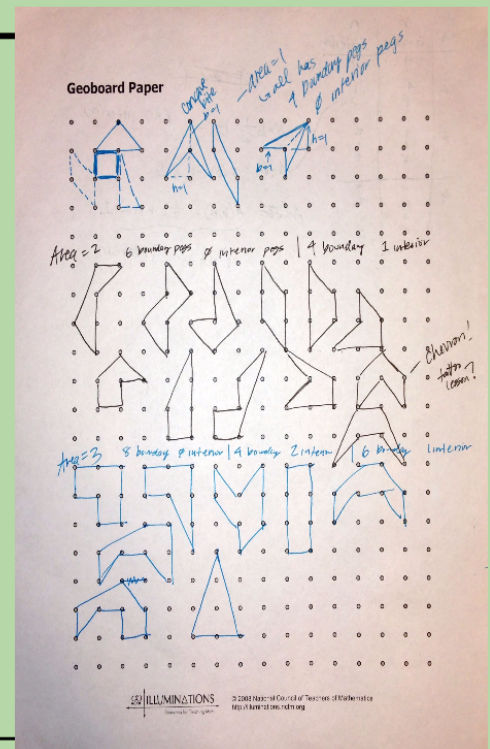
Pick's Theorem

The geoboards were interesting tools to use. I never learned to use one, but was excited to see how easy they were to manipulate.



Pick's Theorem

Michelle initially asked us to find as many combinations as possible to have an area that would equal to one unit. I immediately started to mentally splice the square into a triangle and a rhombus as seen in the photos of my worksheet.



Lesson Plans

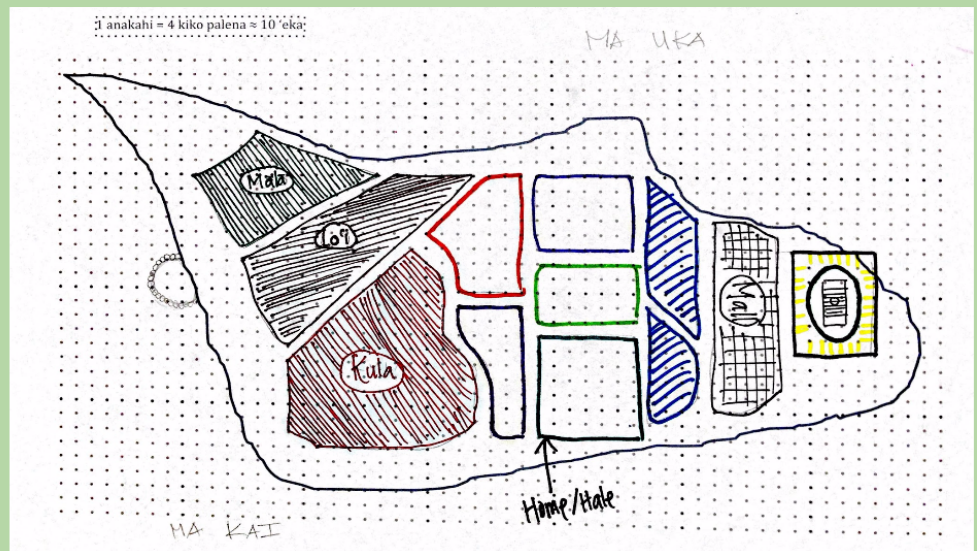
The lesson on geoboards inspired me to create a lesson tying in ethnomathematics. I related Pick's Theorem to land development by overlaying a drawn-geoboard on a map.

Essential Question: What makes land so precious in Hawai'i and what can we do to ensure its beauty? How did ancient Hawaiians divide & maintain land areas and how are we doing it today?

Authentic Performance Task: What if you could purchase the island of Lāna'i back from Larry Ellison because you disagreed with his development project? How would you develop it for the betterment of the constituents of Lāna'i?

Authentic Student Samples:

This student kept the project simple, but also made homes the central point of this community. I really appreciated that the māla (farms), lo'i (taro patches), and kula (school) are on the far right, closest to the ocean; you can also see a fish pond (the small rock formation) on the shoreline. I believe, the blue boxes are business & government buildings and the entertainment district is kept to the far right.



Portfolio #2 – Reflections

This was my first year in the Math Teacher's Circle of Hawai'i and it both met some expectation and exceeded others. This program allowed me to work with higher-order thinking math enthusiasts, further network with colleagues, and find ideas for future classroom lessons. All three are essential for an effective math teaching practice.

The biggest draw for me to be a part of this program was to be able to work with University mathematics graduate students and faculty because these are the people that know math like the back of their hand. I love math and I love solving math problems, but I struggle with the different math topics and how to bring that higher-level thinking down to a secondary education level for my students to grasp and enjoy themselves.

How have you benefited from MaTCH?

- Mathematical dialog that enriches my content knowledge and models effective questioning.
 - I get challenged with math material.
 - I have gained new corrected notions from what I learned as a student.
 - It has increased my desire to engage with mathematics, which was non-existent.
 - I love feeling like a mathematician again. Feeling like a professional helps me inspire my students to become professionals at math.
 - I have learned the importance of accepting right and wrong answers and going through both to finally get the right answer at the end.
-

How has MaTCH affected your teaching?

- I'm more able to ask open-ended questions and let my students explore and discover answers on their own.
 - I encourage students to participate in mathematical conversations.
 - I no longer see math as simple right vs. wrong.
 - It has made me rethink the types of problems and activities that I'm designing.
 - MaTCH has helped me with asking better questions.
-

Has your content knowledge increased?

- Definitely. I am an elementary teacher so much of it was out of my repertoire.
 - I feel like I had a crash course in statistics and calculus this year.
 - Greatly increased. More so in the field of geometry.
 - I have learned a lot about various topics that I had no clue about: curvature, topology, and optimization.
 - I have been exposed to more mathematical ideas, and it has inspired me to explore more on my own.
 - I have realized that there is a vast amount of mathematics that I know nothing about.
-

Final comments?

- I love coming to MaTCH. It keeps me grounded as a teacher and helps me empathize with my students.
 - Challenged my content knowledge and teaching pedagogy.
 - Every session I feel really dumb writing the pre-session freewrite, but after every session I come away having learned so much.
 - I feel my confidence in math increases because of each session I've attended.
-