Puget Sound Council of Teachers of Mathematics

March 11, 2022





Puget Soundings



Making and Breaking Rules: Art and Math as Embodied Practices – Timea Tihanyi, UW Interdisciplinary Visual Arts Professor

March 11, 2022

Happy Pi Day!

Editor: Joyce Frost (frostjoycee@gmail.com)

PSCTM Zoom Spring Dinner 5:30 pm Monday, May 9, 2022 **Timea Tihanyi**

Making and Breaking Rules: Art and Math as Embodied **Practices**

Timea Tihanyi is a Teaching Professor in Interdisciplinary Visual Arts at the University of Washington, and the founder and director of Slip Rabbit, a technoceramics research and mentoring space in Seattle. Tihanyi serves on the Advisory Board of the Seattle Universal Math Museum, and has been exhibiting, speaking, and teaching master courses around the world. Her exhibition, Object Permanence, is on view until May 29th, 2022 at the Bellevue Arts Museum.

Happy Spring PSCTM members!

Welcome fellow math friends,

We are excited to share another collection of mathematical lessons, games, jokes, history, and ideas with you in this spring edition of Puget Soundings. Ana Monnar said, "Sharing will enrich everyone with new knowledge."

With that quote in mind, we welcome your ideas for our newsletter, too. If you are interested in contributing to the newsletter, please contact Joyce Frost. Joyce has served as our newsletter editor for a few years now, and she is eager to elevate teacher and student voices in our publication. Editions of Puget Soundings are released quarterly. We know that there is so much to celebrate in each of our classrooms.

We hope that the ideas shared in this edition will energize you to spring forward as we move toward the end of another school year. Have a wonderful Pi Day on Monday, March 14th!

Thank you again for your continued support of Puget Sound Council Teachers of Mathematics.

Best wishes, Traci Cotton, PSCTM President

Renew your PSCTM membership online

Jane Bissonnette - Past President, Secretary, Joyce Frost – Program, Newsletter, Jane Hunter - Newsletter, Art Mabbott – Treasurer, NCTM Rep, Joe Frost - Web Page, Laura Beckett, Maryke Haynes - Equity, Angela Ensminger – Membership/Social Media,



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PSCTM Newsletter: Puget Soundings





Timea Tihanyi: Object Permanence

Professor Timea Tihanyi

PSTCM Dinner Monday, May 9, 2022 Zoom Presentation featuring UW Interdisciplinary Visual Arts Teaching Professor, *Timea Tihanyi* 5:30 pm, Monday, May 9, 2022, on Zoom

Making and Breaking Rules: Art and Math as Embodied Practices

Being a neuroscientist turned artist, I often contemplate on how we get to know things, especially when it comes to dealing with forms of abstraction. I will introduce three ideas, *iteration*, *glitch*, and embodiment, through three projects: a collaboration with a mathematician on ceramic 3D printing using elementary cellular automata algorithms, a recent body of artwork entitled Object Permanence, and a new art & math course developed with the help of a Mellon Foundation grant at the University of Washington. In dialogue with the attendees, I will discuss how these ideas intersect in a research practice and form a bridge between art and mathematics.

Timea Tihanyi is a Hungarian born interdisciplinary visual artist and ceramist living and working in Seattle, Washington. Tihanyi holds a Doctor of Medicine degree from Semmelweis University, Budapest, Hungary; a BFA in Ceramics from the Massachusetts College of Art in Boston; and an MFA in ceramics from the University of Washington.

"The current era of climate emergency combined with the ongoing pandemic has forced many of us to radically rethink our relationship to objects and Nature, rewriting our own roles as makers and consumers. How we exist without and within boundaries. including the space between virtual and physical, inside and outside, living and dead, and what it means to be with, to cope, adapt, survive, and thrive needs to be reconsidered with urgency. Surrounded by scarcity during an authoritarian political regime, I grew up making things. Do-It-Yourself was a way to gain independence and exercise my rebellion and self-definition. The material world that surrounded us in the Eastern Block was cobbled together from hand-me-downs, which became tokens of history and memory, and took on a new life as the narratives that circulated through them. The labor of making by hand, the tenderness with which the soil is tended. bodies are touched, and textiles are mended are both in my family and my ethnic heritage." - - - Timea Tihanvi

Math Fun - Multipingo by Jane Bissonnette

I learned about this game at a math conference. The object of the game is to observe and study the outcomes of multiplying the rolls from two 10-sided dice. It's a fun way for students to explore probability.

In the first round, tell the students they will be playing a bingo-like game with two 10-sided dice. Have the students fill in their own five by five grid with the numbers 1-100. Numbers can be used more than once. After all the grids are complete, the students take turns rolling two 10-sided dice, multiplying the result together and announcing the result to the class. If the number appears on a student's grid, the student places a marker on the number. If the number appears more than once, the student can choose which ONE to cover. The winner is the first student to complete a row, column, or diagonal.



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For attending one or more PSCTM events: Fall 2021, Winter or Spring 2022, you can receive 1 ¹/₂ clock hours per presentation. Email art@mabbott.org after the event. **PSCTM's Clock Hour process:**

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- Request clock hours for any one of the events
- Art will send you an evaluation form .
- Complete evaluation form and email to Art
- Art will send you the clock hour form for the event •
- Complete clock hour form and keep for your • records. (Email Art if you have questions)

Follow PSCTM on social media! Share *your lesson ideas, news with us, too!* @PSCTM



PSCTM Zoom Virtual Winter Dinner, Monday, February 7, 2022 Solving Problems: OSPI initiatives to improve student access to high-quality mathematics instruction across our state. Arlene Crum, Director of Mathematics, OSPI: Arlene.Crum@k12.wa.us

Arlene shared information about the new Modern Algebra II course in development (Available for pilot in 2022-23) as well as the Instructional Materials Review Project that will publish a list of the curricular materials aligned with Washington Educational Priorities. Here is a summary in picture form of the presentation!







Check out this blog by Dan Finkel of "Math for Love"

"A play-based approach mimics what mathematicians and scientists actually do in their work. And when you take a play-based approach in the classroom, you get students learning more and having a better time."

4 Reasons Play and Math Go Together

Here is a short excerpt from this blog post:

"Everyone deserves a chance to experience what makes people fall in love in mathematics. We founded Math for Love on that principle, and we've been looking, relentlessly, for the best ways to share the beauty, joy, meaning, and power of mathematics.

Increasingly, the invitation to play with math feels like the secret sauce to transforming how math gets taught and learned."

- 1. Play helps students like math more, and care more about learning it.
- 2. Play helps the test scores go up.
- 3. A playful approach helps teachers better understand where their students are, and what they need.
- 4. A playful approach helps teachers grow in their practice.

Be sure to read the whole blog post for inspiration and great ideas!

Biographical history, as taught in our public schools, is still largely a history of boneheads: ridiculous kings and queens, paranoid political leaders, compulsive voyagers, ignorant generals – the flotsam and jetsam of historical currents. The men who radically altered history, the great scientists and mathematicians, are seldom mentioned, if at all." - - Martin Gardner

What is imagination?...It is God-like, a noble faculty. It renders earth tolerable; it teaches us to live, in the tone of the eternal. - - - *Ada Lovelace*

Women's History Month: Women Scientists Were Written Out of History. It's Margaret Rossiter's Lifelong Mission to Fix That

"In 1969, Margaret Rossiter, then 24 years old, was one of the few women enrolled in a graduate program at Yale devoted to the history of science. Every Friday, Rossiter made a point of attending a regular informal gathering of her department's professors and fellow students...

During a lull in the conversation at one of those sessions, Rossiter threw out a question to the gathered professors. "Were there ever women scientists?" she asked. The answer she received was absolute: No. Never. None. "It was delivered quite authoritatively," said Rossiter, now a professor emerita at Cornell University... the history of women in science would become Rossiter's lifework, a topic she almost single-handedly made relevant. Her study, Women Scientists in America, which reflected more than a decade of toil in the archives and thousands of miles of dogged travel, broke new ground and brought hundreds of buried and forgotten contributions to light...

Rossiter's historical research has spotlighted hundreds of women scientists in America. here are a few of the most notable who persevered to expand our understanding of the universe, from black Read stories about these amazing trailblazing women! holes to genes to computers."



Margaret Rossiter- Historian.



Virologist/Molecular



Cosmologist "dark matter"

Barbara McClintock (1902-1992)



Cytogeneticist



Pharmacologist/physician Cell biologist/Cancer researcher



Astronomer



First African American **Chemistry PhD**



Experimental physicist



Nobel Prize in Physiology/Medicine Klara Dan von Neumann (1911-1963)



Mathematician



Mathematician, computer scientist, rear admiral





Elizabeth Blackburn (born 1948)

6



The Homemade Air Purifier That's Been Saving Lives During the Covid-19 Pandemic

Made from everyday items found in hardware stores, the Corsi-Rosenthal box is a testament to the power of grassroots innovation.

"The Corsi-Rosenthal box is <u>a cube consisting of</u> four to five off-the-shelf furnace filters topped by a standard box fan blowing outward. Once sealed together with tape, it can sit on a floor, shelf, or table. The fan draws air through the sides of the cube and out the top. The units are simple, durable and easy to make, and are <u>more effective</u> than simply placing a single filter in front of a box fan. It usually takes 40 minutes, minimal technical expertise and \$60 to \$90 in materials that are available from any home supply store. Despite this simplicity, though, these homemade units are extremely effective. When used in a shared space like a <u>classroom</u> or <u>hospital ward</u>, they can supplement existing ventilation and remove airborne contaminants, including smoke and virus-laden particles. A raft of recent peer-reviewed research has found portable



air purifiers can dramatically reduce aerosol transmission. Other preprint and under-review studies have found <u>Corsi-Rosenthal boxes perform as well as professional units</u> at <u>a fraction of the cost</u>."

Enjoy this Smithsonian Magazine story of collective innovation which began August 2020!

⊗ youcubed°	Mathematical Mindset Practices Rubric	
Mathematical Mindset Practices	Self Assessment Is this a practice that you already do a lot, or would like to improve in? Please give examples.	
Beliefs: I believe in myself, I know I can learn anything, as I have unlimited potential.		
l know that my brain is flexible, and it is developing, strengthening and/or connecting pathways all the time.		
Struggle: When I find work difficult and I struggle, I keep going, knowing that I am developing my brain.	င်းထွာ	
and get it wrong.		
Strategies: If I try a method or approach that does not work, I try a different approach, and think about the problem in new ways.	¢ ^{\$} }	
I like to investigate ideas, search for patterns, and think in different ways – visually, verbally and physically, as well as numerically.		
Connections: I am curious about other people's ideas, and their different ways of thinking. I ask questions about what I am learning to		
Reflection:	0	
I think reflection is a valuable learning practice.	<i>A</i>	
When I get a lot of feedback, even if it looks overwhelming, I know it will be helpful and I use strategies to incorporate it into my own work.		
Copyright © 2022 youcubed. All rights reserved.	1]	

Check out this new downloadable Mindset Rubric from Jo Boaler at <u>youcubed</u>! <u>Mathematical</u> <u>Mindset Practices Rubric</u>

"Hello, youcubians. I have had many conversations with teachers who have asked me what a growth mindset looks like in the classroom, and how it may be measured. So we have developed a new resource to share with you, a mindset rubric. You can use this to help students understand the importance of developing a growth mindset toward mathematics." Jo Boaler

Mary Somerville, "Queen of Sciences" - - - Joe Frost

Mary Somerville, 1780 – 1872, was the first person to be described in print as a scientist. Born Mary Fairfax, daughter of a poorly paid Scottish naval officer, she was largely self-educated. Her parents sent her to school for one year to learn reading, writing, and French. She hated the school but learned reading well enough to begin studying in her uncle's library when not hiking on the beach or collecting seashells.

At 13, she was sent to a writing school to improve her writing and to learn the rudiments of arithmetic. She was upset that the boys in the village school were taught Latin, "but it was thought sufficient for the girls to be able to read the Bible; very few even learnt writing."

Home again, she taught herself Latin. One aunt told her parents that her studies should be stopped, as they were unladylike. Her uncle encouraged her, telling her that there had been many women scholars in ancient times. While spending the summer with another aunt and uncle, she learned to play the piano and to read Greek. She spent that winter at a women's academy, where an instructor advised a fellow student to read Euclid's *Elements*. Mary convinced her younger brother's tutor to buy her a copy of Euclid's *Elements* and *Algebra* by John Bonnycastle and embarked on a deep study of mathematics.

She married her first husband at age 24 and had two children. Her husband discouraged her studies of anything but French. When he died three years later, she returned to Scotland with a comfortable inheritance and resumed her mathematical studies. She corresponded with the mathematician William Wallace and others and began solving problems posed in the mathematics journal of the Military College at Marlow. At Wallace's suggestion, she studied the works of Pierre-Simon Laplace and branched out into astronomy, chemistry, geography, microscopy, electricity, and magnetism.

Her second husband, Dr. William Somerville, was supportive of her scholarship. When he was posted to London, Mary became tutor and lifelong friend to a neighbor's daughter, Ada Lovelace. She spent four years translating and expanding Laplace's five-volume treatise on celestial mechanics. Her 1831 version of the first two volumes was used as a required text in Cambridge until the 1880s. In 1834, she was heralded as the "Queen of Science" for her book *On the Connection of Physical Sciences*, a bestseller that popularized recent advances in the physical sciences. Her updates in 1835, 1836, and 1837 were effectively an annual review of advances in science.

Her subsequent books on science, physical geography, and molecular science all proved hugely successful and were standard texts for decades. She later wrote that she regretted that she spent so much time writing for a living that she couldn't really devote herself to producing something useful in mathematics.

In 1868, four years before her death at age 91, she was the first person to sign John Stuart Mills' petition for women's suffrage. Her face has been featured on the £10 note of the Royal Bank of Scotland since 2017.





Collaboration is the Best! - - - Jane Hunter

I have to be honest; teaching takes a lot out of me and there are days when the creative juices need a bit of a push. When I was younger, we resorted to copy and pasting from peer's assignments or our favorite books to create that perfect assignment we wanted. The internet and Facebook have provided a dizzying array of options. I have found some of the most amazing labs with the Desmos group. Just in time for Pi Day, my recent favorite lab was shared by *Audra Crist*. Click this for the link!



As a teacher of Geometry, this lab is everything I could have hoped for and more. Audra gives us the learning goals, the math standards, and her research is from a wide variety of sources. Even if you are new to using Desmos labs this is fun to do as an entire class or to assign students to do on their own time.

The best of learning opportunities, in my opinion, arise when students are actually seeing the representation as it happens. On the first page of Audra's lab (1), she sends the students to a link to move the circle themselves and see the effects.



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She ends the lab with the best of all... a site where students can find their exact birthdays (day, month, and year) in the number pi. Special thanks to Audra! I am psyched to share this with my class on March 14th!



Discovering Pi with Google Sheets

Create "Pi Poems" with Google Sheets

Graph a Pi-Line Skyline with Google Sheets

Celebrating Pi Day with EquatIO Mathspace

<u>Control Alt Achieve</u> – transforming education with technology – from Eric Curts

Texas Instruments: World of Pi Webinar, In Search of Pi Around the Globe,

from the United States to Latin America to China to Australia to Sweden to Russia.

Teachers around the globe celebrate pi, the magical, mathematical, and infinite constant that is the ratio of a circle's circumference to its diameter.

Listen to the webinar and learn how TI technology can be used to explore pi in different areas of mathematics. Ways to Celebrate Pi Day

go

to

web site

Celebrate Pi Day using these fun math activities. It's as easy as 3.1415...

Pi Digit, Pi Patterns, and Pi Day Anthem

Welcome to this week's Math Munch! It's here—the Pi Day of the Century happens on Saturday: 3-14-15! How will you celebrate? You might check to see if there are any festivities happening in your area. There might be an event at a library, museum, school, or university near you. (Here are some pi day events [...]

posted by j<u>ustin lanier</u>. categories: <u>math munch</u>. tags: <u>applet</u>, <u>arithmetic</u>, <u>art</u>, <u>binary</u>, <u>computers</u>, <u>digits</u>, <u>history</u>, <u>music</u>, <u>numbers</u>, <u>pi</u>, <u>recreational mathematics</u>, <u>software</u>, <u>vi hart</u>, <u>video</u>. <u>8</u> comments

Making Pi, Transcending Pi, and Cookies

Welcome to this week's Math Munch- and happy Pi Day! You probably know some pretty cool things about the number pi. Perhaps you know that pi has quite a lot to do with circles. Maybe you know that the decimal expansion for pi goes on and on, forever and ever, without repeating. Maybe you know [...]

posted by <u>anna weltman</u>. categories: <u>math munch</u>. tags: <u>circles</u>, <u>cookies</u>, <u>esch</u>



Pi Ku Poetry: Writing Pi Day Poems

from Sarah Carter's blog, M + A + T + H = love

"What is a Pi Ku Poem?

Since the first three digits in pi are 3, 1, and 4, pi ku poems have three lines consisting of three, one, and four syllables, respectively.

Usually, all I have to do is display the syllable format for the class to see, and they will immediately begin writing their pi day poems."

Errors using inadequate data are much less than those using no data at all. - - - *Charles Babbage*

Many who have had an opportunity of knowing any more about mathematics confuse it with arithmetic and consider it an arid science. In reality, however, it is a science which requires a great amount of imagination. *Sofia Kovalevskaya*

<u>A Brief History of Pi – Simon Clark</u> (16+ minutes)



meant to signify the first three digits of pi, the ratio of a circle's circumference to its diameter. In a bit of serendipity, March 14 is also Albert Einstein's birthday. It wasn't until 2009, however, that it became an official national holiday when the U.S. House of Representatives passed legislation.

How many digits in Pi? - - - Joe Frost

A Babylonian cuneiform from about 2000 BCE states that the ratio of the perimeter of a hexagon to the circumference of the circumscribed circle is $57/60 + 36/(60^2)$, leading to a conclusion that $\pi = 3.125$. An Egyptian papyrus from about the same era describes a method of calculating π by inscribing a circle in a square with diameter of 9 units, then dividing the square into three rows and three columns. If you truncate the corners by connecting the diagonals, you have an irregular octagon that is close to the path of the circle. Then the ratio of the area of the square to the area of the octagon is about ($8^2/9^2$); the value of π works out to about 3.1605.

The book of Kings in the Bible was written about 550 BCE, and has the curious mention that Solomon built a metal sea in his house that was ten cubits across and surrounded by a rope 30 cubits long. There may have been a bit of measurement error, or the metalsmith and the ropemaker used different length cubits, or someone shorted the metalwork. We all know π is not that close to 3!

In India, a document from 380 BCE gives a value for π of 3 177/1250, or 3.1416. Petr Beckman, in his book <u>*A History of*</u>, speculates that the Indian mathematicians used the Archimedean method of polygons. Archimedes used a technique of sneaking in on π by calculating the perimeter of a polygon inscribed on a circle and a polygon with the same number of sides circumscribed on the same circle, thus squeezing π between two numbers. His calculation with a polygon of 96 sides yields a value for π that is very nearly 22/7ths.

In China, an author from 130 AD used $10^{1/2}$ as an approximation of π , or 3.1622. Another author, from 384 AD, used a variation of the Archimedean method of inscribed polygons to arrive at an approximation of 3.14159. In the fifth century, an author and his son proved that $3.1415926 < \pi < 3.1415927$, a level of accuracy not achieved in Europe until the 16th century, when Francois Viète of France calculated π to 9 digits by using a polygon of 393,216 sides. That same year, Adriaen van Roomen calculated π to 15 digits.

Newton and Leibniz introduced a completely new way of arriving at approximations of π using infinite series, and in 1705 Abraham Sharp achieved 72 digits of accuracy and in 1706, John Machin arrived at 100 digits. By 1873, the record of 707 decimal places was held by William Shanks, a record that was to stand until 1946, when D. F. Ferguson calculated 808 digits of accuracy, showing that Shanks had been wrong from the 527th decimal place on.

It is unlikely that anyone will surpass Ferguson in the number of digits calculated by hand, because the invention of the computer made such attempts redundant. In 1999, a Japanese team calculated over 200 billion digits, and in 2002 they surpassed 1 trillion digits. As of August 2021, the record is held by a Swiss team of 62,831,853,071,796 digits which is $2\pi \times 10^{13}$ digits! Amazing – over 60 trillion digits. - - Joe Frost



Pi Day Fun for Elementary Students

Celebrating Pi Day looks a little different when you teach elementary school students, but who can pass up the opportunity to celebrate a mathematical holiday?

Our youngest learners explore shapes, and by the time students are midway through elementary school they are exploring perimeter and area.

Here are a few ideas to fold in some fun for your primary and intermediate students.

Videos

For primary grades (TK-2nd)

Pi Day for kids by KSMART

This video provides a brief overview of Pi, connecting it to circles, and why we celebrate this mathematical holiday. (approx. 3 minutes)

For intermediate grades (3rd-5th)

Number Pi by Smile and Learn

This video provides an overview of Pi, how it's calculated, and how the digits are never-ending. (approx. 4 minutes)

<u>Circles, What Pi is</u>. This video is brought to you by MathAntics.

A good fit for grades 2 and up, this video makes a connection between circles and Pi. Pi is introduced at 3 minutes 20 seconds. (approx. 8 minutes)

Story Time

The tales of Sir Cumference are so witty! Most libraries have these books available, but here are two links that have the stories read aloud.

Sir Cumference and The Round Table

r Cumference and the First Round Table

Connections Art, Music, and More

Whether you want to sing a Pi Day song, assemble a Pi Day paper chain, or make an artistic connection these websites will inspire you to try something engaging with your students.

Pi Day in the Elementary SchoolBest Pi	Day Activities	<u>Pi Day Fun!</u>
March 14 isn't just Pi Day, it's also Albert Einst Enjoying a text about this awesome mathematician is anothe Here are a few titles to enjoy: On a Beam of Light by Jennifer Berne Meet Einstein by Jacqueline Tourville Odd Boy Out by Don Brown Who Was Albert Einstein? By Jess Brallier	ein's birthday! er way to celebrate. <i>Hexagons are the</i> <i>bestagons Video</i>	and build only the bestagon, the hexagon.

- - - Traci Cotton



Sir Cumference and The Dragon of Pi

