



The Global Math Circle

# Scaffolding vs. Ownership

The Balancing Act of Online Tool Use

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# Our program

- Nonprofit
- Online math circles for ages 5-14
- 10-week courses
- Groups of 5-7 kids
- Scholarships available to anyone who asks
- An experience of math as mathematicians do it





# Bob and Ellen's vision



Engage all kids in math circles in order to share the creative, collaborative nature of mathematics, our lost native language.





# Factors to consider with manipulatives

- Accessibility
- Supporting thinking
- Limits on imagination
- Ownership vs. scaffolding





# Ownership vs. Scaffolding

- **Bespoke tool / Highly-scaffolded**

- Get “big results” more quickly
- Thinking starts at a more abstract level
- “The teacher’s thing”
- Can gloss over “clarifying the problem” process
- Specific questions have right answers

- **Simple tool / Low-scaffolding**

- Fuller ownership by the kids
- Open play is engaging
- Can risk feeling “too loose;” still have a mystery
- May take longer to reach deeper levels of abstraction





# Three virtual manipulatives

- Polyhedra in Polypad
- Geometry in Geogebra
- [Triangle Manipulator](#) from Fractal Kitty







# Takeaways: Polypad Polyhedra

- Accessibility
  - Visualization still hard (vs. physical toys)
  - “Sage on the stage” helpful (tool challenging)
  - Using on their own: distracting or helpful?
- Built-in “Spoilers”
- Limiting imagination about 3D shapes
- Lots of room for open play
- How specific of a question do you ask?





# Takeaways: Geogebra Geometry

- Pros
  - Move triangle points around, easily see things
  - Easy to use, easy to see what's going on
- Cons
  - Assume things that need proof; intellectual “crutch”
  - Little motivation for angle bisector or other provided tools





# Takeaways: Polygon Symmetry Tool

- Tool credit: Sophia Wood (Fractal Kitty)
- Super helpful for visualizing!
- Motivation for these moves?
- Scaffolding the process of clarifying thinking? (Colors, letters)
- Seeding the idea of other polygons
- Maybe bring the tool in later, after physical triangles?





# Any questions?

- Online math circles for anybody ages 5-14
- Math circle guide trainings
- Other ways to connect!

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**Thank you!**

