Active learning in a remote environment

Dr. Angie Hodge-Zickerman & Dr. Cindy S. York
Northern Arizona University Northern Illinois University
(Other collaborator: Eric Stade)

A little about Angie...

A I B L

About Cindy

- PhD in Instructional Technology from Purdue
- $4^{th}/5^{th}$ grade teacher (1996-1998)
- Past President of the Division of Distance Learning for the Association for Educational Communications and Technology
- Teaching using technology since 1994
- Teaching teachers online since 2004
- Working with a combination of mathematics, active learning, and technology since 2015

AECT ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS & TECHNOLOGY

A short story…

There is a tool in your house you use probably every day. It has had pretty much the same use since its creation. What do you think that tool is?

Now that we know that tool is a toilet, think about how that tool might be a bit different if it had a computer chip in it.

Some previous ideas we've heard are heated seat, knowing what magazine you want to read while sitting, auto cleaning, etc. These are Better, Faster, Easier ideas...but still the tool's use is fundamentally the same – to remove your waste.

How about taking your "sample" analyzing it, sending results to your doctor automatically, and putting a follow up appointment on your calendar for you. This would fundamentally change the role that tool – the toilet – plays. Now – how do we fundamentally change education because we have computers in our lives?

What is active learning?

- Four pillars of active learning
  - Collaboration for sensemaking
  - Engagement with rich “mathematics”
  - Instructor inquiry into student thinking
  - Equitable instructional practice (Laursen & Rasmussen, 2019)

How can we achieve these four pillars of active learning in an online environment (and honestly not put our students to sleep)?

Fundamentally change how we teach online

- Don’t just have boring threaded asynchronous discussions
  - Yes, there is a use for them sometimes
- Increase collaboration
  - Hold synchronous sessions
  - Use breakout rooms
  - Have students use microphones to speak
  - Use tools that allow students to participate at the same time
    - Whiteboards, Google tools, Concept mapping, etc.

Collaboration for sensemaking

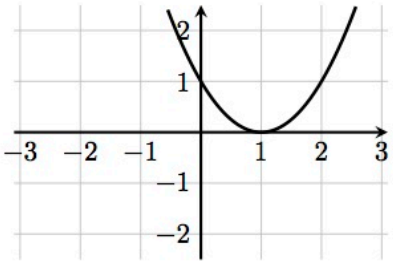
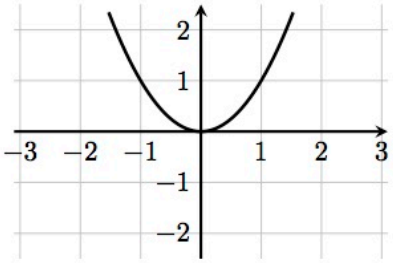
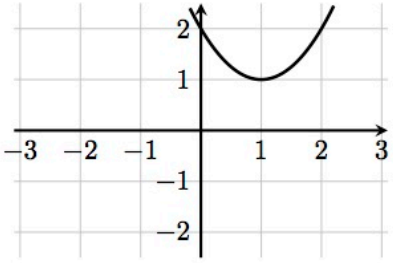
TACTivities are great for this!

Activity → Discussion

(a) Finland	(b) United States	(c) Turkey
Canberra	Paris	Monrovia
(d) Thailand	(e) France	(f) Netherlands
Ankara	Amsterdam	Stockholm

(g) Sweden	(h) Japan	(i) Liberia
Tokyo	Oslo	Ottawa
(j) Canada	(k) Norway	(l) Australia
Helsinski	Bangkok	Washington, D.C.

Tricks or discussion points?

$h(x)$ 11	$x^2 - 2x + 1$ D	 ⇒
$h(x+1)$ 12	x^2 C	 +
$h(x)+1$ 13	$x^2 - 2x + 2$ M	 #

Engagement with rich content

Engaging problems → Discussion

https://www.jrmf.org/activities

Julia Robinson Mathematics Festival

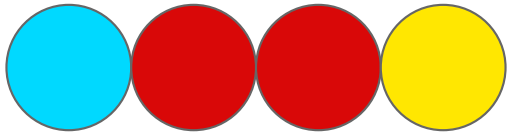
Color Triangles

Objective:

Predict the color of the bottom dot of a Color Triangle given an initial row of dots.

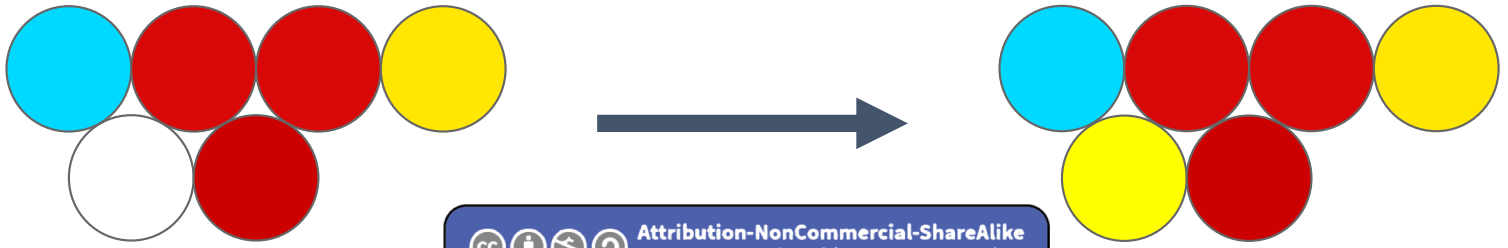
Rules:

1. Start with a row of colored dots. Below is an example with 4 dots.



1. If two dots next to each other are the same color, place a dot of the same color below them.

1. If two dots next to each other are different colors, place a dot of the third different color below them.

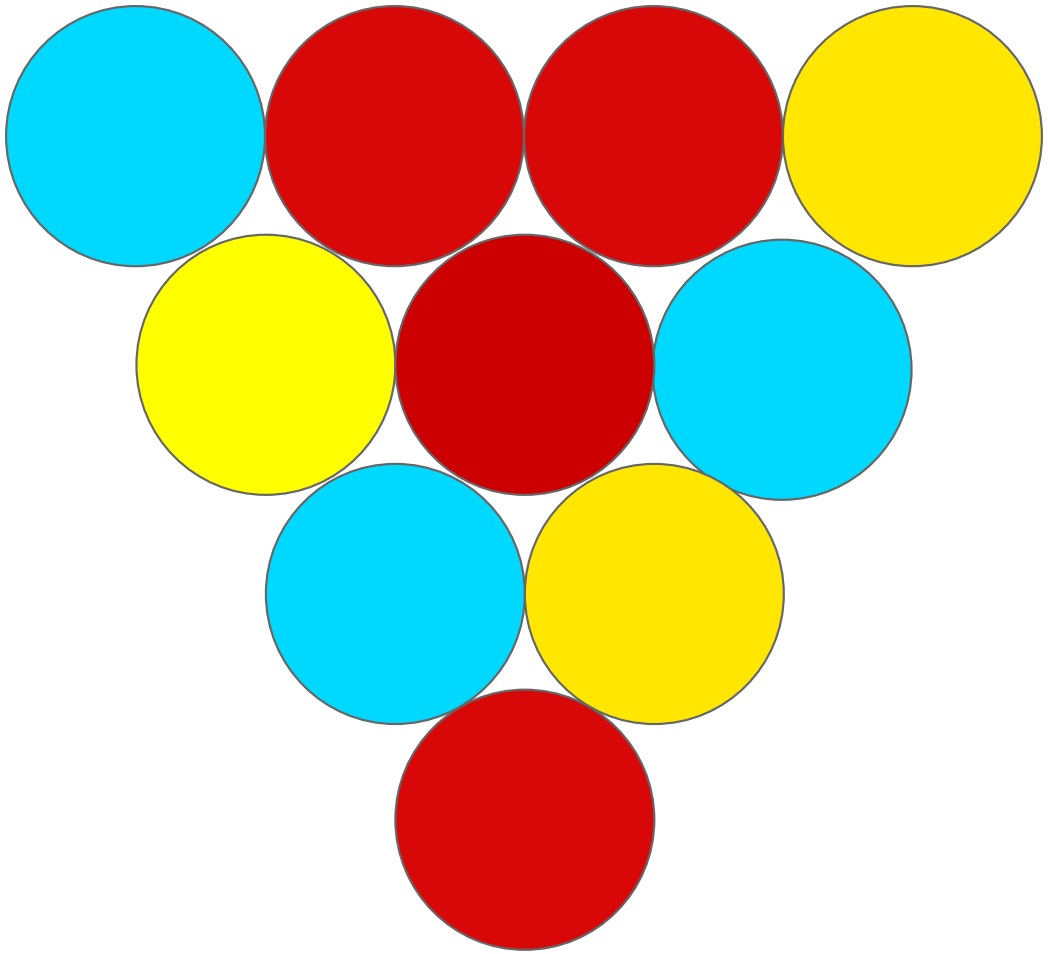


Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)

Revised on 2020.05.03

Color Triangles

Endgame: Keep going until you end up with a triangle like the one below.



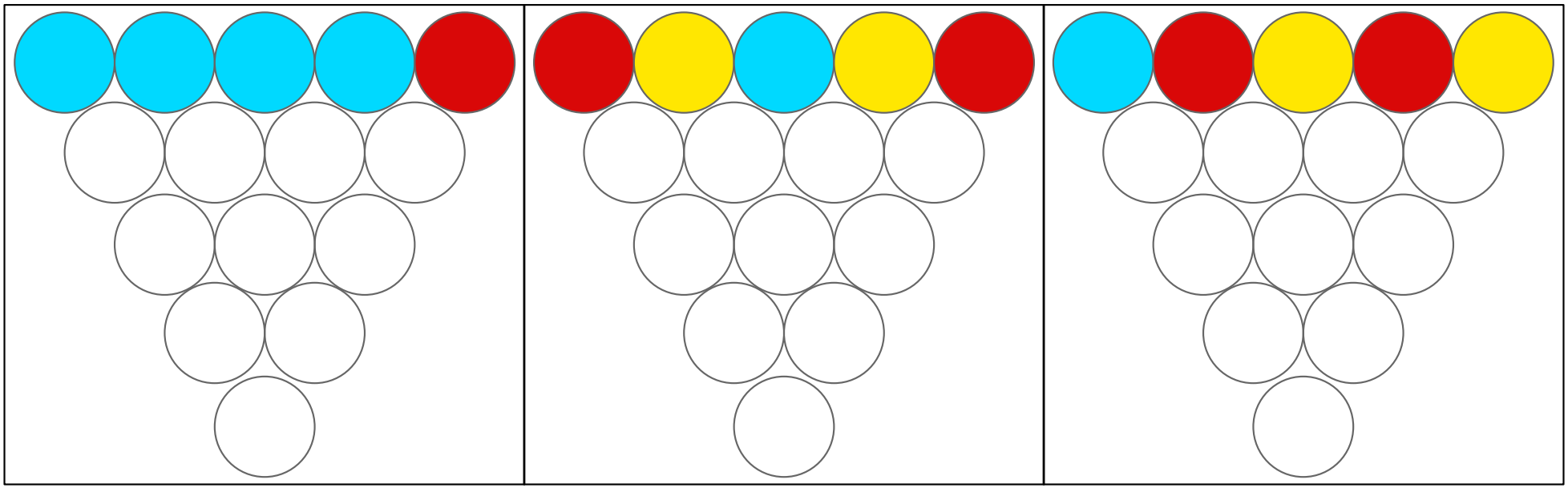
Instructor inquiry into student thinking

Color Triangles: Pattern exploration

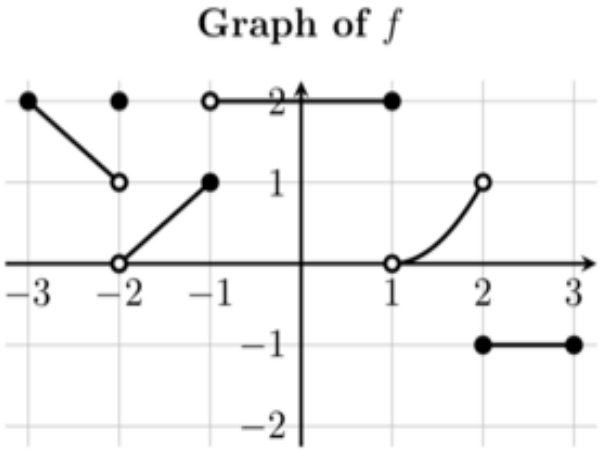
What patterns do you notice?

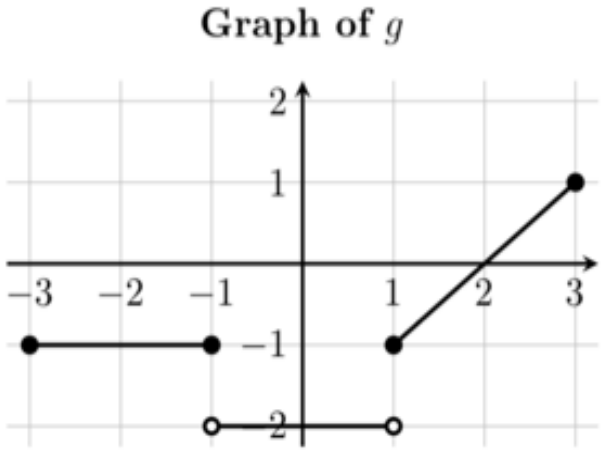
Can you predict the color of the final dot?

Do any of the patterns surprise you?



Why does #8 = -1 and not -2?
What is this teaching students?





7. $\lim_{x \to 1^+} f(g(x))$

8. $\lim_{x \to -2^-} g(f(x))$

Equitable instructional practice

- Online learning is great for equitable teaching.
- ALL are included in a discussion.
- You can require students to post before seeing a thread or see a thread anyway.
- You may want to consider time zones when forming groups or other family factors when having students work together in real time.

Discussion questions

- What challenges exist in engaging students in an online environment?
- What advantages are there to engaging students in an online environment?
- How are each of these challenges/advantages unique to learning STEM topics?

Thank you!

Angie.Hodge@nau.edu
Cindy.York@niu.edu