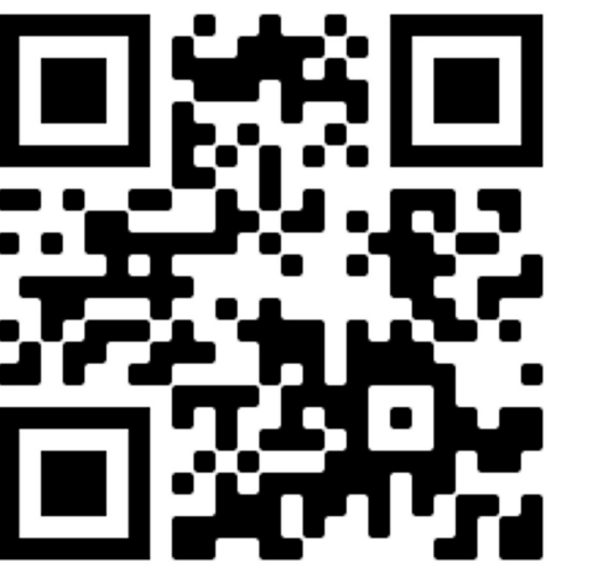




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Context

- Originated from work in contrasting cases in algebra (Rittle-Johnson & Star, 2007; Star, Pollack, et al., 2015; Star et al., 2016)
- Goal of materials is to increase students' procedural knowledge, flexibility, and conceptual understanding (Lynch & Star, 2014; Star, Newton, et al., 2015; Star, Pollack, et al., 2015)
- Each Worked Example Pair (WEP) consists of 5 pages: Student #1, Student #2, Side-by-Side, Discussion Questions, Thought Bubble
- Design considerations: animations, color, comparison type, geometric thinking, diversity

Randomized Control Study

- Treatment (n=29) - exposed to comparison page, discussion questions asked students to compare
- Control (n=29) - exposed to solution methods one at a time

Participants

- Rural, Title I middle school
- 10th lowest performing school in the state
- 18% of students scoring proficient previous school year

Data Collection

- Pre, unit, and post assessments
- Discussion questions
 - Fair, computation, and conceptual subscores

T.3: Rotation
Find the coordinates after the triangle is rotated 90° clockwise about the origin.

Jaxon's "Ferris Wheel" Method

When I think about a rotation, I see a Ferris wheel, so I connect the figure to the origin.

Now I can rotate the figure 90° clockwise about the origin.

I label the coordinates of my rotated figure.

Maxine's "Turn the Paper" Method

When I rotate the triangle 90° clockwise about the origin, the triangle will be in the first quadrant when I rotate it.

I put my pencil at the origin to hold my paper, then I rotate my paper 90° clockwise.

I relabel the coordinates as if they were in the first quadrant.

NC STATE Animated Contrasting Cases in Geometry

Results

Are there significant differences in student achievement between the pre-assessment and the unit and post assessments within the control and treatment groups?

	Mean (Standard Deviation)					
	Control			Treatment		
	PreTest	Unit Post	PostTest	PreTest	Unit Post	PostTest
Overall	26.84 (9.10)		39.42** (17.85)	24.98 (9.40)		40.35*** (16.62)
Angles	28.97 (17.20)	47.32*** (20.35)	43.56* (25.64)	24.52 (17.91)	45.27** (22.63)	45.78*** (25.72)
Transformations	28.42 (16.04)	31.41 (18.57)	36.17 (21.30)	21.70 (13.66)	29.65 (19.34)	35.33* (26.71)
Pythagorean Theorem	23.81 (16.62)	40.12** (25.43)	42.00** (18.08)	27.01 (18.05)	45.51*** (23.36)	40.67** (21.02)
Volume	25.19 (10.34)	36.11* (20.29)	33.89* (22.41)	26.92 (17.63)	38.46 (22.23)	36.89 (22.36)

Are there significant differences in the discussion question fair, computation, and conceptual subscores between the students in the control and treatment groups?

	Mean (Standard Deviation)		
	DQ Fair Subscore	DQ Computation Subscore	DQ Conceptual Subscore
Control Group	42.08 (11.64)	52.95 (14.85)	39.83 (10.56)
Treatment Group	60.17*** (10.84)	70.78*** (14.54)	59.61*** (10.55)

* p-value < 0.05, ** p-value < 0.01, and *** p-value < 0.001

- Treatment students scored significantly higher on discussion questions
- Treatment and control students showed significant gains from web-based animations
- Utilizing web-based contrasting cases shows promise as a viable method for teaching and learning geometric concepts