

Doing Geometry with 21st Century Tools and Needs

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Survey: Why or Why not

- Constructions? [compass & straight edge]
- Proofs/deductive reasoning?
- Exploratory activities to discover geometric properties?

Exploration

In which quadrilaterals, connecting the midpoints of the adjacent sides forms inscribed rectangles?

- Try drawing some quadrilaterals on the graph paper (make them large enough)
- Visually estimate the midpoints and connect them
 - What is your best guess in regards to the inscribed quadrilateral?

What is Dynamic Geometry?

- Allows for construction and manipulation of geometric objects
- Allows for construction of dependencies between objects
- Allows for validity check through “drag test”
- Allows for differentiation by difficulty & grade level
- Summary: provides a platform to realize and extend the power of Euclidean constructions.

Background

- 1980s
 - Geometer’s Sketchpad – U.S.A.
 - Cabri – France
- 2000s
 - GeoGebra (free)
- Moving beyond being used as a visualization tool

Geometry Standards & Mathematical Practices

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena...

- MP5: Use appropriate tools strategically
- G.CO.D.12: Make geometric constructions
 - Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line

In Class Discussion vs. CSCL

- More reflective
- Increase in individual student participation
- Ability to look back at the discussion

DG Task: Midpoint of a Segment

Given a segment AB, find the midpoint C.

DG Task: Varignon's Theorem Midpoints of a Quadrilateral

Construct any quadrilateral ABCD. Find the midpoints L, M, N, P of the four sides. Which properties does the quadrilateral LMNP have? What type of quadrilateral LMNP is?

Extension:

- Explore ratio of areas
- Explore perimeters and diagonal sums
- Start from an "inside" quadrilateral, and discover properties of the "outside" quadrilaterals.

DG Task: Constructing Stick Figures
DG Task: Dynamic Triangles
DG Task: Adding Segment Lengths

Lets students:

- Manipulate constructions using dragging
- Make observations regarding dependencies
- Explore to discover hidden objects
- Validate their ideas by making similar constructions

My Research

- What collaboration looks like in an online synchronous dynamic geometry environment?
- Which DGE tasks:
 - engage students
 - account for diverse levels of prior knowledge
 - elicit collaboration
 - build mathematical practices

Thank you



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