Using GeoGebra to Enhance Mathematics Instruction

by Samantha Cruz
Access the slides on your Device

http://tinyurl.com/ggbslides1
What is GeoGebra?

- Dynamic Math Software for Learning and Teaching Mathematics
- Graphing Calculator
- Statistics Calculator
- Spreadsheet
<table>
<thead>
<tr>
<th>Grade  K-5 Math</th>
<th>Grade 6-8 Math</th>
<th>Algebra 1</th>
<th>Geometry</th>
<th>Algebra 2</th>
<th>PreCalculus</th>
<th>Calculus</th>
<th>Statistics</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
</tr>
</tbody>
</table>

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What's GeoGebra Good for?

Geometry

Middle School Math

Calculus

Algebra

Statistics

Compatible with Mac, PC, iPad, and Android Devices
Features

Computer Algebra System

\[ a = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 \]
\[ a = 55 \]
\[ c: \ y = (x + 1)^2 \]
\[ c: \ y = x^2 + 2x + 1 \]
\[ A = \text{Midpoint}[(1, 2), (5, 6)] \]
\[ A = (3, 4) \]

Dynamic/Input Tools

Construction Protocol

Probability Calculator

Spreadsheet

2D/3D Graphics View
Download GeoGebra

On a Computer

● GeoGebra.org
● Scroll Down to "Downloads"
● Select your Device
● Download & Install

iPad, SmartPhone, or Tablet

● Go to App Store or Play Store
● Search GeoGebra
● Download GeoGebra Classic
  ○ Graphing Calculator and Geometry are also available
  ○ Augmented reality available on select iPads
GeoGebra Tube

- Like YouTube, but for GeoGebra applets
- Go to GeoGebra.org and select "Materials"
  - If you are already logged in, press in the top right corner.
- Search for activities like "Fractions" or "Pythagorean Theorem."

Check out my page for activities:
http://www.geogebra.org/scruz10
Go to GeoGebra.org and select "GeoGebra Classic"

○ If you downloaded the program, you can open it and create in there.

Try drawing each of the following things:

- Point
- Line
- Ray
- Triangle
- Circle
- A Written Message

Experiment with other tools when you're done.
Create Interactive Materials - Dynamic Equations

Dynamic Equations

- Create two sliders named \( a \) and \( b \)
  - settings: Number, Min: -5, Max: 5, Increment: 0.1

- In the "Input," type \( y = ax + b \)

- Move the sliders, and notice how the graphics view changes
Create Interactive Materials - Dynamic Shapes

Dynamic Shapes

- Create two sliders named $n$
  - settings: Integer, Min: 3, Max: 10, Increment: 1

- In polygon menu, select "Regular Polygon"
  - Make two points in the Graphics View
  - Put "$n" into vertices pop-up

- Move the sliders, and notice how the graphics view changes
Dynamic Spreadsheets

- In Input, write equation $f(x) = x^2 + 2x + 1$
- In the menu, select "View" and check "Spreadsheet"
  - In column A, list number -5 to 5
  - In column B, type $f(A1)$
  - Select cell B1 and drag down to B11
Dynamic Spreadsheets
Works only on Downloaded program

- Select cells A1 to B11

- Right click (on Mac Ctrl+click) selected area
  - Select Create -> List of points
  - Notice the points created in graphics view

- In the input, change $f(x)$ to $f(x) = x^3 - 8$ and notice how the graph/points change
Create Interactive Materials - Spreadsheet cont.

Dynamic Spreadsheets
Works only on Downloaded program

- Select cells A1 to B11
- Select "One Variable Analysis" from top menu
- One-variable distribution, like a histogram, is created
GeoGebra in the Classroom

● Example Assignments Using GeoGebra
  ○ Exploring Vertical Angles:
    http://www.tinyurl.com/GeoGebravertical
  ○ Exploring Equations of Parallel/Perpendicular Lines:
    http://www.tinyurl.com/GeoGebraparperp

● Example Student Projects Using GeoGebra
  ○ https://www.geogebra.org/m/ZMTWGXuu
  ○ https://youtu.be/BjUrTSW6jNc
  ○ https://youtu.be/i5jN50avxoE
  ○ https://youtu.be/ngrz5-D3_LU
  ○ https://youtu.be/KS-EF65VrWM
Download/Edit from GeoGebra Tube

- Find a **simple** applet you like in GeoGebra Tube
- Think about what you might edit/add
- Press three dots in the top right corner :
- Select "Download"
- Download the .ggb file
- Open the file you downloaded on the computer
- Select View -> Construction Protocol
  - This allows you to see how the applet was created
- Edit features you would like to change
Useful Links

- GeoGebra website: [https://www.geogebra.org/](https://www.geogebra.org/)
- GeoGebra twitter: [https://twitter.com/geogebra](https://twitter.com/geogebra)
- GeoGebra Groups: [https://www.geogebra.org/b/r Qrbooeq#chapter/59731](https://www.geogebra.org/b/r Qrbooeq#chapter/59731)
- Contact me: [Samantha.Cruz@nbps.org](mailto:Samantha.Cruz@nbps.org)
Tell us what you think!

1) Open the app and select Schedule and Sessions.
2) Select Friday Sessions.
3) Select the appropriate session time.
4) Select the session title.
5) Click on the link at the bottom of page to take the 3-question survey.