

Using Desmos to Construct Interactive Mathematics Tasks for Future K-8 Teachers

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Introduction to Desmos

In courses using physical manipulatives and groupwork, we struggle to adapt instructional materials to support both in-class and out-of-class students in both synchronous and asynchronous interactions in the time of COVID-19. Because of Desmos' power and ease of use, we plan to use it still after the return to face-to-face interaction.

Desmos is a free, online graphing calculator, launched by Eli Luberoff in 2011. The Desmos Activity Builder allows teachers to create, copy and edit, or adopt their own or others' activities. Its user-friendly design allows us to build basic activities first and more complex tasks later as we learn. We can integrate images, video, graphs, and calculators. A variety of student inputs allows us to quickly scan, view, and present student strategies and responses.

Because Desmos is based on a graphing calculator core, it is particularly powerful for mathematics tasks because students can easily explore mathematical objects or processes, manipulating or creating tables, graphs, and sketches. Card sort tasks are also easily created, incorporating mathematical notation, text, images, or graphs.

Getting Started

add visuals / explanations:
text box, an image, or a video

add student input:
text or math notation

multiple choice, checkboxes,
or ordering

add exploration tools:
manipulate or create tables,
graphs, sketches

analysis tools: card sort tasks
using mathematical notation,
text, images, graphs

Learning by Copying and Editing

Our main learning has come from searching for activities our colleagues have created, and then copying and editing. We can copy individual screens from one activity to another, or copy the whole activity and edit it to fit your students' needs.

To copy and paste individual screens into your own activity, simply copy and edit the activity and preview the screen you want. Use `<command><c>` or `<ctrl><c>` or click on the "copy" button.

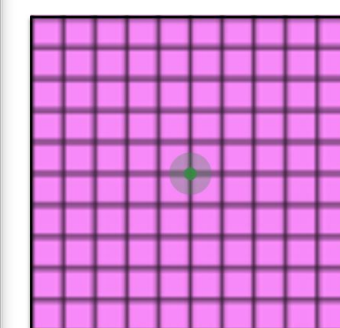
Interactive Virtual Manipulatives

In our classes, we often use physical manipulatives like fraction pattern blocks and base 10 blocks. There are very nice online manipulatives, but my students struggle to navigate multiple websites quickly in class. Desmos Graph allows any images to be imported that allow the student to use them as virtual manipulatives without leaving the activity.

To create virtual manipulatives, add a graph to a screen (alone, or add a note, image, or video for instructions). Click inside the graph to edit.

Click settings to hide grid, axis numbers, and X- & Y-axes.

To add virtual manipulatives (images students can move around), click the "+" on the left side of the screen. We'll add an expression (a coordinate point to attach an image to the axes), sliders (for moving the point), and an image (the manipulative, attached to the point).



Add an expression: (a_1, b_1) and then select to add "all" sliders. Add the image, and edit its center to be the point (a_1, b_1) . And it's done!

Supporting Discussion

Because COVID-19 limits our physical class interaction, our students cannot work together as easily as in a typical semester. In Desmos, we can share student work in real time, watching as they type responses or create graphs or drawings.

Teacher Dashboard:

One button features in the teacher dashboard are:

- Anonymize:** changes student names to names of mathematicians (male and female; varied nationalities) so you can easily share strategies or mistakes without shaming individuals
- Pacing and Pause:** humans have a tendency to want to look or work ahead; you can restrict students to a set of screens or you can "pause" the activity so they are unable to change work or screens
- Summary:** quickly see student progress, results of choice options or graphs, and scan through student strategies.

Snapshots: add photos of written work using another device or take snapshots of work in the Desmos activity for quick presentations

Supporting Reflection

Quick thematic analysis and / or present student responses

Graph how they feel today or about the lesson

One important thing they learned

- students make quick connections and notice how their thinking has changed

One question they still have

- try to answer in class, or email student directly so they feel supported