

An iPad-Based Dynamic and Visual Introduction to Function Concepts

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Students should “describe transformations as functions that take points in the plane as inputs and give other points as outputs.”

[Common Core State Standards for Mathematics, Standard G-CO2]

In this session, you’ll learn how students can experience functions through a geometric approach made vivid with the iPad. They drag variables, observe function behavior, learn function notation, explore domain and range, and identify function families. They even dance functions, both physically in the classroom and virtually on the iPad, taking turns dancing the two roles: independent variable and dependent variable. Sketchpad Explorer is a free iPad app, described here:

<http://www.keycurriculum.com/resources/sketchpad-resources/sketchpad-explorer-for-ipad>

Workshop materials, including the presentation sketch, are at http://www.geometricfunctions.org/ipad_function_into.html

Identify Functions

We begin with an activity which provide students with a number of examples and non-examples of functions. Students work in small groups to drag a variable on the screen, observe the result, discuss their observations, and invent their own definition of function. In the ensuing whole-class discussion, groups report their findings, discuss problematic cases, and with the teacher’s guidance decide on a class definition of *function*.

Identify Function Families

Small groups of students drag independent variables while observing the behavior of their functions. With four functions on each page, they use relative rate of change of the variables, locations of the variables and fixed points to decide which one behaves differently from the other three. With each puzzle, they refine their descriptions of the observed behavior of each family, with particular attention to the features they will eventually use to construct their own functions.

Function Family Challenges

In these challenges, an independent variable is restricted to a domain, and students can drag or animate it. Students also have a target shape: the desired range of the function, and their job is to position the function’s parameters (center point, mirror, vector, scale factor, or rotation angle, depending on the family) so that the dependent variable traces out the target shape when the independent variable varies along its domain.

Function Dances

What is it like to be the dependent variable? How hard a job does the dependent variable have? You never know until you try it – and you’ll find that some dance functions are much harder to follow than others. There’s no better way to appreciate the meaning of “function behavior,” “relative rate of change,” and “covariation”!

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Opinions and views are the presenter’s, and not necessarily those of the NSF. Additional activities are available on our web site at http://www.kcptech.com/dynamicnumber/geometric_functions.html.)