

Instructions for this Strategy

F-IF.9-12.1

Teacher Directions:

Students often struggle with grasping functions right away because they're seemingly more difficult to teach concretely. Which is absolutely not true! When thinking of a function as anything that has an input and output, there are lots of examples we can pull from "real life" to help students visualize and understand the concept of inputs and outputs. For example, on a keyboard, there are many different keys, but each key has a pre-assigned letter or character, and there is only one character per key.

<http://www.coolmath.com/algebra/15-functions/05-domain-range-01.htm> provides a good introductory walk-through of this idea with great images! For your visual and kinesthetic learners, it might help to have them actually "draw" their functions while learning what functions are. At <http://www.shodor.org/interactivate/discussions/FunctionsAsProcesses/> you can find a great example discussion to lead students to think of functions as "machines". In fact, there are a series of great example lessons, discussions, and activities at <http://www.shodor.org/interactivate/lessons/IntroductionFunction/> that are common-core aligned to help you teach these standards.

By teaching functions as concrete "machines", "number-crunchers", etc, you're taking what would be a more abstract idea and giving students something they can visualize and manipulate. By teaching students that "INput", "domain", and "INdependent variable" are all what goes IN to the machine, and that "OUTput", "range", and "dependent variable" are all what come OUT of functions, you're helping to build basic vocabulary that they will be using for the rest of their mathematical learning experience.

When teaching domain and range as values of "X" and "Y" or "X" and "F(X)", a good way to teach the correlation between the "input" and "output" (aside from what has been provided in the links-which have some really great solutions for this problem) is simply to give students the series of rules:

"You must go IN somewhere before you can come OUT"

"You have to crawl before you can walk" or "You learn to sit before you stand."

The first rule applies to tables and ordered pairs, where your "X" or "INput" value always comes before your "Y", or "OUTput" value. The second rule applies to your graph. Have them picture a baby crawling along the x axis. When they baby has reached the required X value, THEN it can stand up and walk, which is when you plot the "Y" value. The X value is the independent value, which you always find BEFORE the dependent value, and they always come before the dependent value in ordered pairs or tables.

For example, if your ordered pair is (2,5) have students start at the origin, and move their pencil two places to the right, at which point their "baby" has learned to walk and can stand up and get to the "y" value. This might take some time for students to understand, but by taking a concept they're already familiar with and applying to a new concept, you create connections and memory triggers which help greatly with retention!

Major Mistake Territory:

Students might be tempted to see the f in a function as (doing something) it should not be confused as a variable; it is simply a signal that a function is at play. The vocabulary overlaps a lot such as; (input, x , domain (all meaning the same thing)) and (output, $f(x)$, y , range (also all mean the same thing)) but for various contexts. Students might be tempted to think there are a lot of different ideas going on because of all the vocabulary but remind them that functions only have one output for every input. If students are still struggling with understanding the vocabulary, give them the opportunity to earn extra credit or bonus points for researching YouTube videos or other sources and write these definitions in their own words.