Clarifying the Varied Roles of Variables

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Most algebra teachers are secure with varied roles of variables, and have forgotten initial personal confusion. This initial student confusion is usually evident when the following occurs, if not before.

Having solved equations using one or two steps, students are ready to use commutative and associative properties to simplify equation members of three or more terms before solving. The teacher wants to inductively (developmentally) present the commutative property. The teacher shows several examples from arithmetic, writing and speaking.

"Three plus four is the same as four plus what?" With class help, the teacher writes "3 + 4 = 4 + ____" and then "3 + 4 = 4 + 3." Similar examples follow. Then the teacher climactically writes

"$x + y =$ _____" and with class help writes $\boldsymbol{x + y = y + x}$.

The teacher then shows how this property is used to simplify members of equations, so solving emphasis resumes. Soon, however, a student hand goes up. The student says, "Go back to the equation with both x's and y's. Should we solve for the x or the y?"

At this point, if not before, the teacher should begin to explain to the class that variables are used in many different ways in algebra. An organic classroom poster may be started, added to as the "roles of variables" list expands throughout the course. At the point of the discussion above, the list would include a few at the top of this list.

A. An unknown number in an equation used for solving practice: $x + 2 = 5 - x$
B. An idea in a word problem: x = the first odd integer
C. A specific idea in a formula: $A = \frac{bh}{2}$
D. A non-specific number in a property statement: $(x+y)+z = x+(y+z)$
E. A variable in an expression for simplification practice: "Simplify $x + x(x+1) + 3x + x^2$ = ?"
F. A constant: $ax^2 + bx + c = 0$
G. Substitution practice: "Evaluate $x^2y - \frac{x}{y}$ if $x = 4$ and $y = -2$.
H. The name of a set: I = {...-3, -2, -1, 0, 1, 2, 3,...}
I. Labels for axes, as the x-axis, y-axis, z-axis.

This poster would hang on the classroom wall and be added to as needed. For example, at some point later in the year, the teacher can makes further use of this issue as follows:

"Today we study an algebraic function. We label algebraic functions using alphabet letters to keep them separate. This may be confusing, so let's review our "Roles of Variables" poster and then add

J. Distinguishing one algebra function $y = f(x) = 2x + 7$ from another, $y = g(x) = 6 - x$ for ease in discussion and thought.