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Flipping the Formula in Active Learning Classrooms.

The University of Minnesota has shifted its PreCalculus sequence from a lecture-style course to an active learning course that focuses on problem-solving skills, communication skills, and an understanding of algebra as the language of abstraction. Instead of asking students to find numerical answers to specific problems based on a general formula presented by the instructor, we instead ‘flip the formula’. We begin with specific problems which lead students to build to a generalization. Students find solutions to specific problems until they can find a pattern, then describe an algorithm for solving problems of that type, and use that algorithm to solve the general case. The program is now in its seventh year, with over 1000 students annually in three courses, taught by a staff of 40 instructors including professors, post-docs, grad students, and undergrad teaching assistants. Early measures of success include a decline in the withdrawal rate, increased retention of students in the PreCalculus sequence, and an increased likelihood of completing Calculus. The biggest challenge is finding appropriate ways to measure student proficiency in higher-order thinking skills that translates to a valid determination of course grades at the end of the semester. (Received September 16, 2019)