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Walter S. Borowski
Eastern Kentucky University, w.borowski@eku.edu

E. Baer

J. Wenner

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Using The-Math-You-Need modules in a general education, oceanography course

Walter S. Borowski, Eric Baer, Jennifer Wenner, and the TMYN team

The Math You Need (TMYN) is a series of on-line tutorials designed for students to increase their mathematical abilities while taking geology and other science courses. The aim of the program is to increase the quantitative abilities of students while demonstrating mathematical applications in an effort to make students more comfortable with and aware of the utility of mathematics. Over two semesters, we implemented targeted-TMYN modules into a general-education oceanography course that is typically populated by non-science majors with a wide variety of mathematical skills before calculus. Students participate voluntarily in TMYN modules with extra credit given for their successful completion. Every class day in the course involves exercises and/or a laboratory that applies oceanographic concepts into which we frequently weave elementary mathematics; also, quantitative questions appear on course exams. For example, understanding rates is particularly fundamental, so exercises frequently concentrate on rate calculations and re-arrangement of simple rate equations and this in-class instruction is complemented by appropriate TMYN modules. To reinforce the importance and utility of mathematics, the instructor continually makes connections between course material and TMYN tutorials.

Pedagogical results are mostly positive. Because participation in TMYN modules is voluntary, two-thirds of students participate partially or wholly in the modules; the complementary fraction do not access a single module. We use pre- and post-tests to recognize gains in student mathematical competence. About one third of students either have lower or no change in performance whereas the balance exhibit varying gains. Some students' scores saltate markedly by doubling, whereas other students achieve more modest gains. Not surprisingly, larger gains tend to be seen by students that have completed more modules with better scores, but this tendency is not absolute. TMYN modules are looked upon favorably by students. The preponderance of students think that TMYN modules improved their mathematical abilities and helped with the class. We plan continued use of TMYN modules with the goal of augmenting student participation, in anticipation of associated improvement in quantitative skills.

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