

Elizabeth Morrison: Recent Innovation Paper

A recent innovation I have found useful and effective is the use of textbook-provided test generators to create homework assignments for mathematics classes. This may not sound very innovative or useful, but it has solved a problem that had been a cause of great annoyance and stress for me as a community college math teacher.

I believe any math teacher at any level will agree with me when I assert that math students need to practice new skills and demonstrate their understanding of new concepts by solving problems, specifically by doing homework! I have always assigned and graded homework for all classes I teach. I know from my personal experience as a student who loved math and was good at it, that I learned best when I was required to work lots of homework problems, write them up neatly enough to meet the teacher's requirements, hand the homework in, knowing it would be graded. I know I benefited not only from the time spent reading the text, going over notes, getting help when necessary, and completing all assignments, but I also learned from the feedback my best teachers provided. In classes, undergraduate and graduate, where no homework was required to be handed in and grades depended only on tests, I did not feel I learned as deeply, even when I earned top grades.

As a teacher, I learn much about how my students are learning from grading my students' homework. After grading a class set of a set of problems, I can easily identify common mistakes, pitfalls, what most students are doing correctly and what needs to be looked at again. So what was my problem?

Several years ago, while grading a Calculus problem (an even-numbered one not in the student solutions manual) in a set of application problems that involved several steps, I noticed that virtually all the students' work looked identical—identical to the worked-out solutions in the instructors' solutions manual. Later in class I asked for a volunteer to put the problem on the board. Then I asked the student, who had turned in the problem's solution completely correct, with all steps like the instructors' solutions manual, to explain the problem, including the diagram he had drawn. Said he, "I'm sorry Mrs. Morrison, I have no idea what's going on. I just copied it from the solutions manual." I thanked him for his honesty, asked someone else to explain the problem, and got no other volunteers. I was surprised to find out there were copies of the instructors' solutions manual in the library and math support center for students to check out. "Why?" you may ask (I did). Because students could buy the manual on ebay, and it was not fair to students who did not have a copy not to have equal access (the department chair had decided). I continued to assign homework and continually admonished students not to become reliant on the solutions manual. Many "good" students continue to use the solutions manual as their text, believing memorizing different types of problems is the way to learn math. The solution to my problem lay ahead—technology provided that solution.

I was a late convert to "test gen" and other computer software provided by publishing companies with the math textbooks. I finally started using it for tests and homework, mainly so I could easily make several forms of the same test and combat cheating. I had an epiphany of sorts sitting at my computer making out a quiz during a six-week summer term, when I decided to make out a homework assignment instead—one where there was no solutions manual to copy! I started with a prep math class—the test generator provided plenty of good sample problems, and because of the compressed time of the summer term, I could make each assignment cover two or three sections. Students got used to receiving a take-home assignment most days to be turned in at the next class; I used the answer key provided to grade and return the homework with little turnaround time, and I reaped the benefits of being immediately aware of how well my students were learning new material. I now do this for all my classes at all levels, with whatever software is provided. I have created a library of homework sets for some courses, and every time I access a set, I can change values of numbers in problems so copying from previous students is eliminated. I devote a lot of time to revising and grading, but I have my students who are willingly working together, coming to see me in my office when they need help and getting help from the tutors in the math support center. Math students truly solving math problems—a math teacher's dream come true!