

## TAKING THE PLUNGE, ONE FOOT AT A TIME

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Although we have seen a plethora of testimonials to the ability of a number of online mathematics tutorial/assistance/assessment programs to lead to improved student learning and performance, and to increased student persistence both in the course and into the subsequent course, nonetheless some institutions remain hesitant to redesign their entire course to include such programs. The effort involved may seem prohibitive, or at least out of line with the expected advantages. Instructors may be resistant to learning the new technology, or to changing the way they assess their students' learning. There may be a concern that students will be unable to access or to use the programs, or will be unwilling to use them.

At my institution (public, baccalaureate, mixed urban/rural, liberal admissions policy, many adjunct instructors, about 3800 undergraduate students), we faced all three sources of resistance: institution, instructor and (perceived) student. This is the story of how we have addressed them in our two-course developmental mathematics sequence by adopting a gradual and piecewise approach:

- Select software tied to, and supplied by the publisher of, the textbook already in use
- Allow instructors to choose whether or not to require use of the program in their sections of the course
- Allow students to choose a section that does, or does not, require use of the program
- Use the program for homework only in the first semester of implementation, then allow instructors to extend to online quizzes in the next semester if they chose

In this way the university incurs no extra costs except for one technician running the installation wizard on the student-accessible computers; each instructor is teaching and assessing in her or his preferred mode, which enhances instructor enthusiasm and satisfaction; and students are working in their preferred mode, at their preferred location (home or on campus), and to some extent at their preferred pace (massed or distributed).

Because both multi-section courses are fairly highly structured and closely coordinated, we are able to work closely with our adjunct instructors who choose to use the program. This is important, because they teach about three-quarters of the sections in each semester. Additionally, we host a workshop before every semester, for users and non-users, run by the publisher's experts. This helps experienced users expand their capabilities, new users set up and get started, and nonusers find out what's involved. It also allows users and experts to share experiences, observations and information.

### First Step: The Innocent Adjunct

For several years we have used a package that allows us to include, at no extra charge to the student, the MathXL program from Pearson Education/Addison Wesley (PE/AW), which we listed as “optional” on the bookstore form. During the Spring 2007 semester, one of our adjunct instructors took that to mean that the option was hers, and she required it for her students. The Department opted to allow the policy, since her students had already begun to use the program, and after considerable discussion revised the departmental policy on “optional” materials to follow what she had already done: instructors would be permitted to require such materials with the approval of the course coordinator.

The instructor reported that she was seeing nearly all of her students doing the assigned homework, which for these courses at our institution is a major change. A MathXL workshop facilitated by two PE/AW experts was scheduled for April 2007 and all instructors teaching, or scheduled to teach, in the developmental mathematics program were invited to participate. All of them did! Recall that these are for the most part adjunct instructors who have day jobs and who are not paid for this extra time (except for a sandwich supper, hardly a powerful inducement). As a direct outcome of the enthusiasm and expert instruction on the part of our visiting experts, and the limited but positive experience of the one adjunct, and keeping in mind the remaining (though less adamant) reluctance on the part of several instructors, we decided to proceed with partial implementation in both courses, keeping it on a purely voluntary basis. The two courses – GNC 064: Fundamentals of Algebra, and MA 111: Algebra – use the same text, so the bookstore found it relatively easy to handle the differentiation between sections that would use MathXL and sections that would not.

### Second Step: Pilot and Policy

After the April 2007 workshop, instructors were asked to indicate whether they would be requiring their students to use MathXL in their sections for the 2007 Summer and Fall terms. For the Summer 2007 session, all three sections of the second course included required use of MathXL (we don’t offer the first course in summer) and for the Fall 2007 semester, four of the eight sections of the first course and ten of the sixteen sections of the second course were scheduled to require use of MathXL.

The summer session thus served as a pilot for the implementation. The instructors teaching the course talked quite a bit both among themselves and with their course coordinator about how the program was working for them, and near the end of the semester administered an open-ended questionnaire soliciting students’ comments on their experience. Of particular interest to us was the item asking whether or not they would recommend to their friends that they take a section of the course that required use of MathXL for homework: not a single student would not recommend it. This was hopeful for the future implementation.

An informal “debriefing” session was held in August to allow the instructors who had required use of MathXL to share their experience with the instructors who were about to require its use for the Fall semester. This was particularly valuable in terms of specifics: how much did you assign, did you allow students to continue to work after the due date, how did you count the MathXL scores in the overall grade, and so on. As it turned out, the grading point generated a fair amount of the discussion, especially for the first course.

Because the department allows individual instructors in the second course a certain amount of leeway as to how they will count homework, no one scheme was imposed or even decided upon, except that all instructors agreed that if MathXL were to be required, it must be counted in the course grade. Weights ranged from 5% to about 15% of the course grade.

A thornier problem was what to do with the MathXL scores in the first course, which is highly structured, pass/fail only, and operates within a modified “mastery learning” format: passing the course depends solely upon passing the six unit tests (75% or better, no partial credit, limited retakes allowed) and passing the final exam (70% or better, partial credit allowed, no retakes) with no weight at all given to homework or quizzes. Finally most instructors decided to use the MathXL component as a “gateway” to the unit tests: students would have to show that they had achieved a certain level of mastery via MathXL (typically 70% to 75%) before they could take the test, and a higher level (usually 80%) before they would be permitted to retake an unsatisfactory test. Since the tests are regularly scheduled for the entire class (not individually), students are encouraged to stay on track.

The Department again revised the policy on use of “optional” materials so that a course coordinator could routinely approve the use of such materials and would not have to consult individually with each instructor. At that point it became a simple matter of getting the list to the advisors and to the bookstore of which sections would be requiring MathXL.

### Third Step: Voluntary Implementation and Preliminary Assessment

In Fall 2007, then, we went ahead with the implementation of the voluntary program. Four of the eight sections of the first course (taught by four of the seven instructors) and ten of the sixteen sections of the second course (taught by six of the ten instructors) assigned homework via MathXL.

We hoped that use of MathXL would improve student learning, at least as shown by a higher proportion of satisfactory grades (P or ABC, as contrasted to N or DFW). We also hoped that it might reduce the number of “fades” we experience. These are the students who miss a class, then a couple of classes, and then disappear without filing the paperwork for a drop. By allowing the instructor to keep a closer eye on their homework and by facilitating earlier intervention, we hoped we might be able to encourage and

assist at least some of these students to come back, catch up and keep up. Finally, we hoped that the experience of the summer pilot would be repeated in fall: students would report themselves generally pleased with the MathXL process, and thus theoretically would be encouraged to put in the time required for learning.

To assess whether and to what extent we achieved the first goal, we examined grade distributions for the two courses for the two years before implementation and compared them with the grade distributions for Fall 2007. The results were mixed. In the first course, all sections showed improvement in the proportion of Pass grades (from 46.2% over the previous five semesters to 55.1%), and the sections that required MathXL use showed stronger improvement (58.8% P) than the sections that did not (52.3% P). But in the second course, we were surprised to find that although the overall proportion of satisfactory (ABC) grades had improved from the previous five semesters and two summers (from 43.4% to 45.9%), the sections using MathXL actually had a lower proportion (44.3%) of satisfactory grades than did the sections not requiring the program (48.9%). A closer examination revealed that the six instructors who chose to use MathXL were among those showing the lowest rate of satisfactory grades prior to the semester in which they used the program. We then compared the rates of ABC grades for the instructors who chose to use MathXL with the rates for instructors who chose not to use the program, and found that non-users went from 45.7% ABC grades to 48.9% in Fall 2007, while those who later chose to use MathXL went from a rate of 36.3% ABC grades to 45.8%. Whether MathXL particularly suited their style, or whether they chose to require its use because they felt a greater need for it, we obviously cannot tell. In fact, of these six, three showed strong increases in their rates of satisfactory grades, while three showed some decline, which is most intriguing even though somewhat disappointing. We are continuing to think about factors that might have a bearing on the results. In any case, these results – both positive and negative – are at this point very much preliminary, based upon one summer and one regular semester only. We will revisit the question in future semesters when we have more data.

Assessment of whether and to what extent we achieved our second hope must necessarily rely upon instructor report, because a student who fails is reported as an F, whether the student earned the F or whether the student simply quit; there's no way to report a grade of "fade." Instructors are strongly positive that they had fewer fades than usual once they began requiring MathXL, one instructor reporting none at all in any of the three sections taught as contrasted to a "normal" fade rate estimated at about 20%. Instructors further report that what seems to have made the difference was their ability to intervene early: we know immediately if a student is starting to fade out, because we see the "past due" on our MathXL gradesheet, and we can (and in most cases did) contact the student immediately to inquire about what the student would need from us to catch up. One instructor says that for the students to know that we know and care about their progress was perhaps as positive an aspect of the MathXL use as was the actual homework practice.

To assess whether and to what extent the students considered the MathXL experience a positive one, we administered the same questionnaire as we had used in summer, with similar results: students generally preferred MathXL to traditional paper-and-pencil homework, which is interesting because they have to work the problem out on paper before submitting it to MathXL anyway, and most would recommend a MathXL course to their friends.

#### Fourth Step: What Next?

Instructors using MathXL reported themselves highly satisfied with their experience, so we decided to continue the policy of allowing each instructor to decide whether or not to require MathXL for their sections. Of the instructors using MathXL for Fall 2007, all but one of them continued teaching in the developmental mathematics program for Spring 2008 and all of them chose to continue requiring MathXL. In addition, we've added two new instructors, one of whom is requiring MathXL, and one of our returning instructors who did not use MathXL in Fall 2007 is requiring it in Spring 2008. Faculty enthusiasm remains high among those who choose to require the program and seems to be rising gently among those who do not, with several non-users asking about our next workshop because they are considering requiring the program in Fall 2008. In fact, one of our most resistant instructors (not an adjunct) has even come to the point of declaring her willingness to use it if we tell her to, where previously she had expressed her willingness to teach in some other department if we began to require her to use MathXL. This is progress.

For the 2008-2009 academic year we will continue the current policy of allowing instructors to choose whether or not they will require use of the program in their sections and making sure students can make an informed decision about whether or not they will sign up for a MathXL section. We will continue to collect data on student achievement and in Spring 2009, when we have a fuller set of data, we will once again revisit the issue of full implementation.

In the meantime, we remain cautiously optimistic. We are stressing the desirability of early intervention when students seem to be running into trouble or fading out, and we will look carefully at our students' assessment of barriers to their successful use of MathXL with an eye to reducing or eliminating those barriers wherever possible. We fully expect that when we report back in Spring 2009, we will have even more positive things to say about our experience. We can already say that we believe strongly that the program has great potential for student learning and persistence, and for our students' sake we are determined to find as many ways as we can to fully realize that potential.