

Implementing the Crossroads as a Pilot Program

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Westchester Community College is located 20 miles north of New York City. We have about 20,000 students, 17 full time members of the mathematics department and 50 adjunct faculty. Our department is mostly conservative and only a few of our colleagues attend conferences like AMATYC or ICTCM. It took us seven years to convince our colleagues to use graphing calculators. Now all of our Precalculus classes and beyond require the TI 85 and we are changing to the TI 86. We also use the TI 83 for Statistics. However it was the 1997 AMATYC/NYSMATYC joint summer faculty institute in Poughkeepsie, New York that gave us (the three presenters and our colleague Sheela Whelan) the push to reform our College Algebra course. We organized a faculty conference and invited outside experts to talk about mathematics reform at WCC. Many of our colleagues were skeptical but the department gave us permission to teach four pilot sections of reform College Algebra in the Spring of 1998. These sections ran concurrently with sections of traditional College Algebra. We started preparing for our reformed course during the Fall 97 semester and continued in the winter break.

It was important to allow plenty of time for this preparation as we felt that we had a lot to learn. We decided to work together and held weekly meetings which continued during the semester. This cooperative effort was a very valuable experience. It was good to get each other's support and made the work less onerous. We prepared our syllabus and class teaching notes together, also supplemental materials and common examinations. We tried to be flexible and realistic about time constraints. It was important to make sure we kept to our resolution that depth is more important than breadth, and to realize that the students were going to need additional time to absorb these new ways of learning. They would need a lot of help learning how to use the TI 83 and we also used class time for group work and extensive explorations in which students investigate algebraic concepts through use of a guided activity.

The syllabus included the following topics:

- Collecting, reading, interpreting and visualizing data
- Functions and fitting functions to data
- Average rates of change, slope
- Generating linear functions
- Systems of equations
- Exponents and logarithms
- Exponential functions, growth and decay
- Quadratic functions

In choosing a text book we learned that you should consider the technology that you will be using. We choose a book that had originally been written to be used with a computer and a compact disk comes with it, and although it had been adapted to use a graphing calculator it was not obvious until we started teaching from it how much further adaptation remained to be done. In general you may not really like or dislike a book until you have prepared from it. The title is important: it needs to describe the course you are teaching and not conflict with other courses. When we were choosing books, most

reform texts were still in preliminary stages and the supplemental materials were not available. After considerable discussion we choose Explorations in College Algebra by Kime and Clark.

We were fortunate to be able to make arrangements for tutorial assistance. One of us went to the tutorial center and gave a workshop for the tutors on the new course and we had two tutors sit in on the class. It is very important to keep the tutorial center informed of developments such as upcoming exams and projects and to share handouts and solution sets. We decided that since many of the homework problems involve writing and/or have more than one possible solution we would try to grade all the homework and we have developed various ways to make this less time consuming than it might otherwise be. We had some difficulties at first in structuring the group work but we persevered (don't give up!) and have each come up with slightly different ways of organizing it that we now feel comfortable with.

Our students are using a graphing calculator for the first time in this class. In the first semester some students waited weeks before getting the calculator. Now we require a technology dependent assignment early in the semester so that students realize that it is an essential part of the course. We have tried various calculator swap and loan programs and these are very helpful.

At the time of this presentation, we have taught the course twice. After the first time through we summarized what we had learned and made some corresponding changes for the second semester. Here are some of the results and lessons from the first semester.

- We had hoped that the reform methodology would begin to address issues of poor attendance, low retention and low pass rates that are traditionally experienced in our College Algebra. At least in our first attempt, there was little to no improvement in these areas.
- We found that the students experienced great difficulty adjusting to new expectations regarding their performance (for example, answers in writing, non-mechanical modes of thinking, no cookbook procedures to follow).
- Although many students experienced difficulty learning to use their calculators they eventually grew to like them and find them helpful.
- Certain students, including the most mature, were very enthusiastic about a math course that was more real world based, but others were upset that they weren't getting the same old stuff. Some students just didn't understand the objectives of the course.
- Most students enjoyed the group work and it usually held their interest.
- Students need careful guidance in the exploration activities, homework assignments, and preparation for exams because they are used to math as learning a series of procedures and they are not used to open ended questions.
- We were (and still are) convinced that we were doing the right thing, mainly because of feedback from and the performance of those students who did assimilate the objectives of the course.

To address some of our concerns and improve success in the second semester we made some changes. We taught the class at night so that we would have longer class periods (one three-hour class as opposed to three one-hour classes). We felt that this improved the flow of the lessons. We wrote more supplements for the text book and learned to

improve the balance between lecture, group work and other class activities. We were more flexible as regards the content, eliminating certain sections when necessary to enable more time to be spent on essential concepts. . We developed a technology lesson with homework for the second week of class to teach the students the fundamentals of calculator use. We continued to meet weekly.

After two semesters of teaching the course, serious problems still remain. These have been among the most troubling:

- Students were aware that traditional sections of the course were still running, and had purposely not been informed in advance as to which sections were which. Some of them developed strong negative attitudes towards being in an “experimental” course, feeling that they were guinea pigs.
- At Westchester Community College this was the first (and possibly the last) math course the students have seen using the “reform” approach, so the entire burden of making the adjustment fell within one semester.
- There is a wide range of students’ *non*-mathematical skills. Some students fall easily into the habit of answering open-ended questions with appropriate verbal expression; others find this devilishly difficult.
- We constantly have had to pay attention to the pacing and in-class balance of the course.
- If we had had more experience with reform textbooks (beyond simply looking them over) it would have been easier for us to choose one.
- Finally, we have made very little progress convincing skeptical colleagues of the merits of “reform math” and whether the course would prepare students for Precalculus and beyond.

When we initially got permission to teach the pilot sections we promised to evaluate them. We have attempted to do this in various ways. We measured retention and passing rates. At the time of our AMATYC presentation we had not compared these with the traditional courses. Since then we have done the comparison and found that retention and passing rates are about the same. We find that very few students go on from College Algebra to Precalculus. For those that do, the reform students have done better but the numbers are too small to be statistically significant. We developed student questionnaires measuring attitudes and administered them at the beginning and end of the semester to see if there were any changes. We omitted to give the questionnaire to the traditional students. For our reform students we found very little difference in attitude between the beginning and end of the semester. However, those students remaining in the class at the end of the semester did have a generally positive response when asked whether they thought the reform approach was better than the traditional, and also to using the calculator. There were some interesting comments, for example:

“I understand the math parts, it’s the other stuff that’s the problem.”

“I spend more time on one thing instead of a little time on everything.”

“Are we always going to be having this much fun?”

We had planned to ask some common questions on the reformed and traditional exams and we invited other department members to observe our classes. The lack of interest in our department prevented either of these from happening. In the third semester

we did administer a test with common questions but have not yet fully analyzed the results.

At the end of the first semester, we gave a half-day symposium to the rest of the math faculty about our experiment. The highlight was a panel of students who answered questions from the faculty about their experiences. The students were much more enthusiastic than we had expected since we had not just chosen good students (their grades were already in). We were very impressed by the articulate way in which some of the students described what they had gained from the course particularly about the usefulness of math in the real world, and the rest of the faculty were impressed also. However, this did not address some of their concerns about whether the students would be prepared for Precalculus.

In spite of their positive response to the student panel, most of the other faculty are still not interested in reform. They have allowed us to continue with our pilot sections and want more information about student progress in later courses. We are concerned that the results of studying retention, passing and later performance may show no significant differences, even though we firmly believe that our students are getting a better mathematical experience. Another concern is how to evaluate the course for those students who do not go on with math, which is the vast majority of these students. We are continuing with the reform sections and finding ways to evaluate the results. If anyone has questions, (or, even better, some helpful suggestions!), we can be contacted by e-mail at Rowan.Lindley@sunywcc.edu.