As a new doctoral student I was really excited about the opportunity to do some “real” teaching. While working on my Master’s degree I had enjoyed teaching classes with as many as 30 students. However, I was now beginning a doctoral program and I was going to be able to spread my insight and knowledge to well over 100 students in a basic Foods/Nutrition class. I couldn’t wait.

I was teaching very traditional basic mathematics to a Food Service Management class. It was an undergraduate junior/senior level class and the entrance level mathematics ability of many of the students was extremely low. We were using paper and pencil exercises and trying to get the students moving from simple addition and subtraction into fractions. I had assumed that everyone knew this sort of stuff. I was wrong.

It soon became clear that a third of the class really needed a lot of extra help. It was that group that couldn’t remember the math rules for dealing with a complex equation. They couldn’t take a fraction and convert it into a decimal. They couldn’t express a decimal as a percentage. These were all critical skills for someone working in food service and I needed to find a way to effectively teach these skills.

It would have been nice to break the class into two separate groups, but that would have meant twice as many teaching hours for me and I really didn’t have the time. I saw no other option than to drag everyone in the class through basic mathematics and hope that we could move on once the basics were established.

Before long I was spending most of my free time creating remedial take-home assignments for the students to practice these skills. These practice assignments were handed out in each class and returned to me the following class. I was aware of the importance of immediate and personalized feedback so I would try my best to read the homework each night, correct it, add comments and get it back to the students as soon as possible. It tuned into an unending task. I quickly learned that there were far too many students that needed help for me to personalize my instruction for each of them.

The two hour class session soon turned into two one-hour segments with the first hour devoted exclusively to reviewing mathematics concepts and the second hour focused on the content I was supposed to be teaching. I encouraged those students who didn’t need the remedial mathematics to skip the first part of the class and only come to the second hour so they wouldn’t be bored with the class. As the instructor I started to feel rather helpless. I was not moving ahead with the curriculum in the manner that I had planned. Was this what teaching was all about?

At the end of my first semester I had my worst fears confirmed. The final examination showed that, even with all of my extra attention to mathematics, a large number of the students were terribly deficient. Their math competence was far below the level that was required of their profession. I was
in trouble and I felt that I had failed.

**A possible answer**

As I was commiserating over my situation I spotted an announcement for an upcoming seminar entitled, “Teaching Large Classes: How To Get Students To Understand The Content.” It sounded like it might be an answer to my problem. And even if it wasn’t a complete answer I could probably learn a few strategies to help me manage the hours that I was spending teaching mathematics. I enrolled in the seminar and was surprised to find that it dealt with some new computer software named CAPA (Computer-Assisted Personalized Approach) that had been created by the physics/astronomy department on campus. It was being used to teach math concepts to chemistry and physics students.

With CAPA, an instructor could create and/or assemble personalized assignments, quizzes, and examinations with a large variety of conceptual questions and quantitative problems. It could include pictures, animations, graphics, tables, and links. The program provided the student with immediate feedback and relevant hints and allowed the student to correct errors, without penalty, prior to an assignment's due date. The system kept track of each student’s participation and performance, and records were available to both the instructor and the individual student.

**Rolling up my sleeves and building the problem sets**

So here I was, a doctoral student in food science with negligible computer/technical skills, attempting to learn how to write computer code from a group of scientists. It soon became apparent they had never considered that someone outside of the basic sciences might want to learn how to create curriculum that could be used with CAPA. They thought I had lost my mind but agreed to give it a try. I spent the entire Christmas break sitting at a computer terminal in the Cyclotron Laboratory, talking to the software designers, and learning how to code in CAPA - trying to understand how I might be able to use their system for teaching math concepts to my students. I knew that there had to be a better way of teaching math than what I was doing and I was hoping that this software would be the answer.

The following Fall semester, almost a full year since I had first heard about CAPA, I was ready to try it with my students. And what had I accomplished in that time? I had figured out how the CAPA system operated and was able to develop a total of 5 problem sets – each problem set included 25 different mathematical problems that I felt were important for the students to be able to master.

That year had also allowed me to clarify exactly what it was that I wanted to achieve with my students through the use of this technology. First, the use of the technology would have to free up the large amount of time that I was spending to teach remedial math. And second, this technology would have to significantly improve my ability to graduate students who were competent in using math concepts in their professional life.
It Worked! However…

As we began that Fall semester I was really excited about being able to use this computer-based method for teaching. Then all of the problems started to surface. Some days turned into nightmares! These problems occurred in two areas. First, there were coding errors where the student selected the right answer for a problem and was told it was wrong. And, secondly, there were numerous typos that had managed to escape the many times I had proof read the problem sets.

That first class did get some things out of it. However, they appeared to be very frustrated with all of the errors. And, of course, due to my errors in coding, it turned into a very popular excuse for why a student might have gotten a problem incorrect – “You must have coded this one wrong.” Being a bit insecure with the technology I always assumed at the beginning that it was my problem rather than assuming it had been a student error. I think this was very important for the eventual acceptance of the program by the students.

The other major barrier was the material that I was teaching them, the mathematical concepts needed in food service, was not available in a textbook. I had searched everywhere for a textbook from which I could merely “lift” the problem sets and insert them into the CAPA software but I wasn’t able to find one. So I was not only trying to create a unique way of presenting the material to the students through the use of the computer software but I was also faced with creating these materials based entirely on my own mathematics knowledge and what I thought needed to be done to help them understand how to get to recipe conversions.

This added another major dimension to the significance of the challenges that the students created for me. If the student had a problem/question, I found that I would begin by questioning myself. And, of course, I would often wonder if I knew what I was doing. If there was an error, was it a function of bad programming or was it a function of bad pedagogy? My role had to be both a programmer and an educator.

By the end of the semester I began to feel, for the first time, that all of this effort might have some payoff. In fact, I had something to show for my efforts. A major group of problem sets had been created that would be very useful for our program of studies, regardless of whether or not the CAPA software was used to present the problems. With this bit of good news I was able to get the Provost to provide funding for the Spring semester that would allow further editing/refining and the creation of additional problem sets to make the material more comprehensive.

Moving to the Next Level

I felt like I was doing something unique. And, I truly believed that in the end the students would benefit. I never dreamed that my efforts would go beyond this class and that was okay. I had always assumed that the students in my class, and the development of their mathematical competencies, was as far as this project would go. However, that Spring semester, as part of my own graduate studies program, I took a class in the area of instructional design.

The semester assignment for that class was the development of an instructional manual that would be supportive of some aspect of my own teaching. The teacher provided a format and then I was instructed to take my topic and organize it into a manual that would guide my students, in a self-directed manner, to the class materials. What a great assignment. I was now able to create a manual
that could accompany the problem sets that I had developed. This new piece of the puzzle fueled my resolve to continue the efforts to develop the instructional materials.

This manual became a very significant add-on to the development of the teaching materials. The manual, 50 pages in length, gave the student something to visually focus on during their computer exercises. It provided instructions on how to use the computer software, a clear outline of what needed to be learned and samples of the different problem sets. It provided the missing link – the student could now be guided through the problem sets by the manual, be fairly assured of success, and there was now no need to spend class time for any of it! Though I had started with the idea that CAPA would be the central curricular element, the manual now took over that role and CAPA became secondary. The manual was the curriculum guide and the CAPA software became the drill-and-practice system for helping the student learn the material. This was such a revelation to me. At the beginning I had no idea this is where I would end up.

The next Fall I was able to implement the homework sets, delivered via CAPA, with the manual that I had developed in my graduate class. The materials were introduced to the students as self-learning activities. They were to cover the materials completely on their own without any class time devoted to the materials. The students, of course, could schedule time to speak with me about any of the problems that they had worked on in the self-directed mode for which they still had a concern.

The exciting thing for me was that I was now able to check into the CAPA system on each homework “due date” and easily see how my students were doing – how many each person had gotten correct, how many they got wrong, how many times they had to answer each question before getting it correct, which problems were causing the most difficulty (and could use some additional computer-based instruction), etc. As an instructor, the computer-based system was now allowing me to feel very empowered in being able to understand my students and how I might be able to better assist them in their learning. The program not only provided feedback to the learner but it also prompted them in better understanding the concept that was involved so they could be successful the next time.

Turning the Program into a Distance Education Offering

After the third semester of implementation on campus, when the program seemed to be working quite well, the word got out at a national meeting and all of a sudden we started receiving requests from other institutions to make our problem sets and software available for others to use. The concerns that we had been having with our students were the same on other campuses and they were in need of the same kinds of assistance.

Since the system used the Internet as a way to deliver the problem sets to the students, it was now feasible for us to consider offering it at other locations. However, the Family Educational Rights and Privacy Act created a major hurdle for us. Student data and scores/grades were the responsibility of the student’s home educational institution and since scores on the problem sets were being stored on MSU’s server it created a liability issue. This forced the development of a legal agreement between MSU and each institution that wanted to use our online program. The agreement would allow MSU to maintain the grades without being in violation of the privacy act.

The next few hurdles were related to how we would provide the grades back to the instructor at the student’s home institution. How would we do it? What form would it take? How would we charge the student/institution for using the materials? Who would collect the money? How long would the
students have access to the homework sets? Would the faculty at the other institutions have full access to the system? How would we assign login names and passwords to students from other institutions? Would our system be able to recognize these “foreigners” as valid users of the system? And finally, what would we name our system and how much would we charge?

Luckily we found a campus unit that was able to step in on our behalf, establish the necessary legal agreements and market the program for us – including all of the needed interfaces that would allow distant students to interact with our on-campus system (which had not been created to facilitate such a plan). Whenever I would receive a request from another institution to use our materials I would contact out campus unit and they would set up the system. I would then receive the student roster from the other institution and I would go about assigning login identities and passwords, log them individually into the server, print their homework sets, go to a local print shop and duplicate their self-instructional manual, and bring the whole thing to the marketing unit that would then assemble the individual packets and send them directly to each registered student. It was a rather laborious process for me, setting them up to effectively use the system. However, without this front-end time there would have been no strong guarantee that the students would be successful with the program.

Issues of students attempting to access the system and do the work for others was a responsibility of the instructor at the student’s home institution. We had early realized that any attempt on our part to police the system from a distance would probably create major problems. We felt it would appropriately be a responsibility of the contracting institution. In most cases this concern was dealt with by the contracting institution by offering the problem sets at an on-campus computer laboratory at which the student would have to use their local login to gain access. Also, the use of locally proctored examinations was another way that concerns of cheating could be effectively accommodated. It was essential, of course, that the local instructor still knew his/her students. We weren’t attempting to completely remove all responsibility from the other instructor. We were only attempting to provide one specific module of instruction that could be added to their existing curriculum.

Food Service 2000 was born. Approximately 50 different institutions have been involved with offering Food Service 2000 to their students. And, approximately 800 students each year have been enrolled in the program at a distance.

The next major hurdle occurred when the product started being noticed by non-educational institutions that wanted to offer the problem sets to their employees. Hospitals, prisons, hotel catering departments, dietetic internship programs and other similar settings that regularly trained food service workers began to see the value of what we were able to offer through this type of instruction. Suddenly we were facing an entirely new set of very diverse problems. What to do if the employees were prison inmates and they were not allowed access to the Internet? Or, what if the institution wanted to offer the instruction at a time that didn’t coincide with the beginning of a semester? Could the program be used in a continuing education format rather than as a semester-long graded course?

For these non-traditional learners we allowed 6 months of access to our system. We assumed that the learner, in that amount of time, could meaningfully work their way through the problem sets with enough repetition and feedback to learn the concepts and be able to put them to use.

What Would I Do Different the Next Time?

The process of discovery was such an important part of the development of Food Service 2000. I
don’t think it would have turned out nearly as well if I had known, at the beginning, what I was about to become involved with. As it turned out, though, I was able to treat each step along the way as a significant learning event. And the most important aspect of that learning for me was my concern for the student. I wanted to make sure that the outcome of my learning would not only be a viable approach for teaching but it would also be the best possible outcome for student learning.

I was able to deal with each problem along the way as it occurred. The area that turned out to be the most foreign for me was learning about marketing and pricing. I had never imagined these aspects as very essential to the development of an educational program. I had always assumed that they would be done when the time was right and they would sort of just happen. That was far from the truth.

As the program moved to an Internet-based distance education offering, marketing took an inordinate amount of my time and energy. Unlike the development of the curriculum, which was always guided by my concerns for the student, the marketing/pricing part of this project had me working in an unfamiliar area without any referent to help guide me. This segment of the project had been thrust upon me when it appeared the university began to realize that there was potential money to be made. They wanted to make sure that they were appropriately “positioned” if there would come a time when a profit could be realized.

Would I do it again? Certainly I would. The challenge of creating an instructional program for my students was an unbelievable journey and a wonderful set of learning experiences for me. Plus, moving the program to the Internet so that it could be used by students at a distance taught me so many things about people, how they learn and how the distance education instructor must respect the individualistic qualities of each learner in order to be successful. My success was clearly dependent on the success of my students.