17. Mathematics: Community College / Secondary

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In spring 2002, I was asked to present a workshop on integrating technology and mathematics for teachers of Rockford's district. The participants were from varying backgrounds, including biology, earth science, counseling, and other areas of middle and high school.

I created the workshop "When Am I Ever Going to Use This Stuff?" to introduce interactive mathematics into the classroom and to show the significance of mathematics in everyday life. The session combined lecture, a PowerPoint presentation, and an instructor-directed use of technology to simplify real-life mathematical applications. Discussion also focused on possible careers in an effort to promote the importance of mathematics in the educational realm. I also participated in an articulation seminar designed to stimulate dialogue between educators and industry representatives about the expected skill level of graduates and potential employees. Middle school, high school, community college, and university faculty members discussed student preparation expectations.

Mathematics Workshop

I started with a short lecture concerning linear regression. Participants were shown an example of a small town whose population was growing. We looked at the population numbers over a time span and identified a linear model. Then I showed how we could determine the best fit line for the data and how we could calculate the best fit line and make predictions using traditional methods. I gave them another example dealing with *Kelly Blue Book* values for automobiles. Here we looked at the value of a car compared with its mileage. We looked at basically the same type of problem, but instead of working through all the tedious formulas and doing multiple levels of calculations, everyone used a TI-83 graphing calculator.

The problems gave participants an appreciation for the use of technology. They were able to see the overwhelming calculations replaced by technology and also the power that technology brings to the classroom to do real-world problems. I selected the problems to show that real-world data does not always work nicely and that technology can help solve the more complicated problems. The participants were all pleased to see these examples and enjoyed learning for themselves.

Career Workshop

We discussed job opportunities and salary ranges from the *Occupational Outlook Handbook* and online resources. We broke the discussion into two categories: jobs in mathematics, like teacher or researcher, and jobs that use mathematics, like engineer or doctor. I finished by asking, "What job can you have where you do not use math?"

Articulation

At the articulation meeting, we met with industry representatives to discuss what they look for in students entering the workforce. The representatives emphasized that they wanted people who could communicate effectively and be problem solvers. They stressed the importance of the sorts of logical thinking and problem solving that could be learned in a mathematics or science class.

We broke into subject/discipline groups and discussed gaps between middle schools, high schools, community colleges, and universities. Our group concluded that:

A. Access to technology varied greatly. Some participants had limited technology resources, while others had an abundance. This was a surprise to some of the college faculty members, who expect students to have learned how to use graphing-capable calculators prior to coming to college.
B. Some teachers were not really mathematics instructors but were needed to teach mathematics. That was a big difference compared to college and university levels where professors are trained to teach in their discipline.
C. Textbooks were used differently at the different levels of education. Once a text was adopted in the middle and high schools, it must be used for an extensive amount of time. The college instructor may switch the text as desired.
D. At the lower levels, students learned computational skills and basic facts, but when they arrived at the university, they were expected to have more critical thinking skills.
E. Mathematics was that rare subject where a lot of redundant concepts were taught and the subsequent material continued to build on itself.
F. The learning process of the students was hindered by having instructors conduct so much review at the start of each new class.
G. Many students were exposed to the procedures and learned a few basic calculations by rote memorization but had little chance to apply them.
H. Middle and high schools focused on holding the teachers responsible for the students' education, whereas at the community college and university levels, the emphasis was put on the students themselves.
I. Some teachers may cover certain topics, while some may not; it depended on the teacher and the class.
J. Some schools were concerned with improving the skills of lower-level students and keeping the school off a watch list as opposed to teaching the content necessary for the next level of courses.
K. Grading differences existed at the different levels. Where many of the middle and high schools placed the emphasis on attendance, homework, and participation, the community college and university placed the emphasis on exams.

Closing Comments and Lessons Learned

The articulation meetings were very beneficial for all. The college and university professors were able to relate what they expected of incoming students, while middle and high school teachers were able to convey the problems they had preparing the students. Additionally, it was

noted that middle and high school teachers were expected to keep attendance, take care of discipline problems, and be consistently interrupted by announcements, all of which disrupted learning. At times their days were interrupted by assemblies and other school-related activities that also detracted from learning. This was different than the college and university level, where professors specialized in their fields do not have to deal with as many distractions and put more emphasis on exam grades instead of attendance, homework, and participation.

The workshops were successful, with glowing comments that many of the teachers left with new information and mathematics-related activities they could share with their students. In addition to mathematics instructors, there were teachers from diverse disciplines. One biology instructor related that he would like to work with me on some projects (in particular a presentation on rates of radioactive decay) in his classroom that would incorporate more mathematics.

Before I wrote this I contacted one of the middle school teachers in the articulation group and asked her what she got out of the whole experience. She related she particularly enjoyed meeting the college professors and instructors and was able to relate to her students the importance of certain mathematics topics and how important mathematics and sciences are to their future success. She mentioned that she stresses more mathematics concepts now than she did before and reminds her students of what she learned by attending these events. She relates to her students what the professors will expect in college, as well as what the industries will be looking for. She hopes that she can better prepare her students for the future.

I am now better able to relate to my college level students what industries are looking for. More importantly, I am more aware of the background of some of my students. Before I had thought most students had the same opportunities, but I now have to keep in mind some students come from less technologically advanced school systems. Based on these experiences, I feel it is very beneficial to keep an open relationship between all levels of the educational process in each discipline.