Faculty Development Panel Discussion Abstracts

AMATYC Conference
November 2001

Tutorial

Tools of the Trade: Linking Problem-SolvingTo Math Applications

"Oh NO, not story problems," a familiar lament heard often in math classrooms and learning centers. The ability to transfer problem-solving strategies and skills from instructors and tutors to students in large classrooms and tutoring centers has always posed a special challenge for those involved. This presentation uses the idea of a construction company and construction tools to emphasize the building blocks for forming the foundations to support mathematical problem-solving. The goal is to construct the four steps in Polya's plan to solve word problems with more confidence.

The construction tools that help build problem-solving skills are as follows: 1) Patience, like the blueprint, provides order and timeliness to reach the end product, 2) Observation, like protective eyewear, allows one to see the details, 3) Past experiences, like the hammering of nails into boards, allows for practice to perfect one's techniques, 4) Reasoning, like a level, helps balance one's thinking, 5) Questioning, like a saw, allows one to view the components of the structure being built, and 6) Critical thinking, like the hard hat, symbolizes analysis.

Polya's four-step problem-solving process uses all of these tools. To facilitate the proper use of the tools, it becomes the job of the math instructor or tutor to ask questions that draw the student into deeper thinking. Listening goes hand in hand with the questioning. As construction supervisors, math instructors and tutors must model problem-solving. This is accomplished through questioning techniques that fit the four-step process of understanding the the plan and looking back at the final product. Probing questions that engage students help build a foundation of confidence in their own problem-solving abilities. Teachers can use these questioning techniques in lecture and assessment, while tutors can do the same when assisting students.

Presenters: Darlene Kohrman (dkohrman@kvcc.edu)
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Title of Presentation: A DYNAMIC LEARNING CENTER MODEL

Description of Presentation:

A student-centered learning environment that promotes alternative instructional presentation styles and accommodates diverse learning modes will be explored. This Mathematics Center empowers the teacher as content facilitator and designer of group and individual learning plans, thereby empowering students as managers of their own learning process.

A multimedia presentation will focus on the strategy at work in the daily operation of the Center by highlighting activity areas (open study, tutorial service, computer and video tutorials, self-paced classes and mentoring) and support staff (45 professionally trained student assistants and instructional associates, many of whom plan to become teachers).

In addition to print formatted multimedia frames with note-taking space, handouts will include sample description of Math Center services, courses, diagnostic test results, tutorial reference guide, instructional resources, and record-keeping report forms.

Professional Qualifications:

Ms. Blair, whose master's thesis was entitled *A Model Development Math Center*, has directed the Orange Coast College Math Center for the past tens years. In that capacity she has been responsible for the design, development, and evaluation of the Center. Ms. Blair has provided consultation to ten other California community colleges in their attempts to initiate similar programs and has shared this presentation with several groups, among them The American Council for California Learning Assistance, the Secondary School Workshop for Writing across the Curriculum, and was a 1998 Master Presenter at NISOD in Austin Texas. As feedback from each program is received, Ms Blair modifies and expands her presentation to anticipate the audience's questions and incorporate those answers. In 1999 Ms. Blair was the lead author of a prealgebra book, which has been included in a successful series of four developmental books by John Tobey and Jeff Slater.

Technology

Creating and Teaching Online Mathematics Courses

As distance learning has expanded, so also has the use of the Internet. More and more we are seeing the expansion of course material to the Internet. What are the issues for teaching course material on the Internet?
What students will benefit from such opportunities? These are some of the issues addressed in creating an online developmental mathematics course and other mathematics courses. This presentation will provide both resources and methods for teaching a course on the Internet as well as an emphasis on the new technologies becoming available.

Several online mathematics courses will be used to demonstrate some basic forms of communication and evaluation that are necessary for a course to be successful.

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Examples of the use of calculator technology will be used to show how to increase understanding, to reinforce topics, and to replace tedious manipulations. The graphing calculator allows students to graph functions quickly so they can focus on understanding concepts rather than concentrating on manipulative skills. Calculator Based Laboratory (CBL) experiments will be used to generate and analyze data describing real world situations. A discussion on the appropriate use of technology will be the culminating activity of the workshop.

Calculator Workshop

For several years, I have taught courses using the TI-83 Graphing Calculator. I have taught courses from Beginning Algebra to Business Calculus and Statistics. I have done workshops for students as well as faculty. If needed I can conduct a workshop on basic calculator features. For first time calculator users, the graphing calculator can be a bit overwhelming. Teaching Order of Operations is a good topic to use when trying to get students to become familiar with the basic calculator features. Also, I can provide workshops on the graphing and statistical aspects of the TI-83. The graphing aspects of the calculator can be useful in getting students to understand the concept of slopes, lines and functions. This would lead into a good demonstration of the table and calculation features of the calculator. Finally, I can show faculty members how to use the TI-83 to perform matrix algebra, to illustrate math modeling, and to supplement the teaching of traditional mathematical concepts by using a graphing calculator.

For further assistance, I can be contacted at the information given below;

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Abstract for: **Donna Saye**

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An important topic of concern, study, and discussion for mathematics teachers in recent years has been the use of graphing calculators in teaching. Any staff development service that I have done has been concentrated on the use of graphing calculators in mathematics classrooms. It is my belief that students in classes using graphing calculators demonstrate a greater understanding of topics being taught and a more positive attitude toward mathematics because of the "hands-on" use of graphing calculators. I teach a lot of algebra, and in my classes, along with teaching algebra, I teach my students to learn to use a graphing calculator, to learn to think logically about algebraic concepts, and to solve practical problems. I have done many conference presentations on use of graphing calculators such as the TI-83 in math classes. I also have attended many presentations on the same topic in an effort to learn more about use of calculators in mathematics classes. Perhaps one of the most serious issues still under discussion regarding the graphing calculator is how to test students effectively and be sure students are not academically dishonest. Some teachers have said they have a special set of calculators that students use during test taking, but that could be expensive. Other teachers have said they check students' calculators prior to tests, but that is rather time-consuming. Perhaps the best solution is to carefully phrase test questions so that the calculator is an enhancing tool, not a new method for cheating. That's what I endeavor to do.

Algebra Curriculum With Graphing Calculators

The use of graphing calculators has changed the environment of the developmental mathematics classroom. However, many mathematics faculty members are asking, "Is the calculator driving the content of the course or is the content of the course driving the use of graphing calculators?" Upon reflecting on ten years of teaching elementary and intermediate algebra using a graphing calculator, the answer to this question is yes to both parts.

The next question then arises, "What calculator skills are needed to support the content of these courses, and what additional content is needed to support the use of graphing calculators?" A careful analysis of the required course content, goals for student outcomes, and instructional strategies must be made in order to answer this question.

Possible workshops may include:

- Uses of the graphing calculator in elementary and intermediate algebra.
- Discussion of the course analysis process using your institutions' course of study.

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Activity: Calculator

In an ongoing effort to support faculty who incorporate technology into their courses, the department sponsored a year-long series of workshops dealing with both the "how and why" behind the incorporation of graphing calculators into our curriculum; along with specific sessions on how to develop effective classroom presentations. One such session early in the year, focused on the TI-83+, and was designed for the more "reluctant faculty". The session began with an overview of TI products, as individuals were walked through the Texas Instrument website. Next, faculty viewed a TI-83 instructional video, which we make available in our Math Tutoring Center to all students enrolled in classes where the calculator is required. Then faculty presented short mini-lessons from specific areas in the curriculum, (such as how to graph absolute value equations in Intermediate Algebra, how perform linear regression in College Algebra, or how to approximate areas under curves using upper and lower sums in Calculus.) Finally faculty discussed key issues relating to the incorporation of technology. These sessions not only served to introduce faculty to the benefits of the graphing calculator, but they highlighted the positive features of using the calculator as an integral part of the classroom experience. In using colleagues as presenters for these workshops (instead of outside presenters) there was much more interaction and conversation since everyone was facing similar issues in the classroom. Finally the presenters provided concrete examples that faculty could use in their own classes, and the session wrapped up with a discussion of key implementation issues. Throughout the year we continued this important dialog, and a Technology Committee is a standing committee of our division.

Teaching Strategies

Changing Curriculum to Make Connections

Over the past ten years, the reform movement in mathematics has emphasized the use of technology, collaborative learning and contextual problem solving in an attempt to increase student achievement in preparation for subsequent courses and /or the workplace. The rapid advancement in computer-related technology has had an obvious affect in the classroom. Students regularly use calculators as problem solving tools. Engaging students in collaborative learning and contextual problem solving activities enables them to become active participants in the learning process while providing them with a rich problem-solving environment. Has it worked? Are students stronger mathematically? Are we producing proactive learners?

Many college faculty have adapted collaborative learning in their classrooms; most have used technology in some form, but few faculty have made the change to the contextual problem solving approach. Our traditional curriculum is a “mile wide and an inch deep”. Changing curriculum to incorporate a problem solving approach will involve shifting the order of some topics to make connections and eliminating other topics to allow time for students to discover and problem-solve. Because of the different philosophies of faculty within the department, changing to a problem solving approach will not be an easy task.

The presenter will address reform versus traditional teaching with a special focus on curriculum. Topics in mathematics have been taught in isolation. There is not only a need to connect topics within mathematics, but also to connect these topics to the real world. Will students make these connections? Is there a reason for students to learn mathematics? How do skills factor into the whole scheme? The presenter will share her successes, frustrations and challenges, and engage the audience in a discussion of their experiences related to curriculum change.

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Workshops will focus on how project materials and teaching methods encourage students to become actively involved in learning mathematics through real world problem solving activities and collaborative learning strategies. Examples of curricular topics from Elementary and Intermediate Algebra will be used to illustrate realistic applications.

Engaging Students in the Learning Process at the Beginning/Intermediate Algebra Level

Interactive technologies and techniques can enhance the traditional developmental mathematics classroom. Hands-on activities, often based on contextual problem solving, encourage students to take responsibility for their own learning as they construct, reflect on, apply and describe mathematics. This "reform approach" stems from the AMATYC Standards. Activities that involve manipulatives as well as the appropriate technologies (scientific or graphing calculators) help students bridge the gap between abstraction and application. Collaboration with fellow students in the classroom fosters understanding and study skills. This workshop involves active participation by attendees in a classroom simulation.

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Faculty Development Workshops

*How to implement the 7 Principles of Good Undergraduate Education- A highly interactive workshop.
*Everything you always wanted to know about student centered learning/teaching.
*The synergy of student centered cooperative learning/teaching and (WAC).
*Writing in math courses- what the heck do you write about?
*Using cooperative learning techniques for alternative student assessing.
*Any combination of the above

Workshops are tailor made for each institution's specific needs or interests based upon the topics listed above.Workshops are generally a minimum of 2 hours in order to incorporate hands on activities and may follow half day, full day formats, or more if desired for faculty or staff retreats etc.

For a complete list of workshops and consulting projects previously given by Ted Panitz please visit:
http://home.capecod.net/~tpanitz/resume.htm

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Mathematical Connections In Developmental Algebra

"When will I ever use this math?" Have you ever heard this question in your class when teaching mathematics? NADE addresses this student concern in one of its goals, stating that developmental mathematics should "develop in each learner the skills and attitudes necessary for the attainment of academic career and life goals." This question is also addressed by AMATYC in The Crossroads in Mathematics, Standards for Introductory College Mathematics,(Standard for Pedagogy, P-3): "Mathematics faculty will actively involve students in meaningful mathematics problems that build upon their experiences, focus on broad mathematical themes, and build connections within branches of mathematics and between mathematics and other disciplines so that students will view mathematics as a connected whole relevant to their lives." This workshop will help you answer this student's question.

In response to the challenges of NADE and AMATYC, the presenter's institution encourages the use of realistic examples and exercises. The presenter has researched topics of interest for the students in order to write realistic real-world exercises and projects on a developmental algebra level. After using these exercises and projects the presenter and other faculty have found that they no longer need to answer the question of relevance because the question no longer arises.

The use of realistic examples and exercises as well as projects in lieu of the more traditional non real-life exercises in the algebra classroom illustrates examples of mathematics that occur in the students' lives. This workshop will present examples of exercises and projects that may be used in the developmental algebra classroom as well as how to develop such exercises for other algebraic topics.

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Study Skills

Study Skills Three Examples

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Example One – Study Tips Presentation for Student-Athletes

The Athletic Director asked me to prepare a one hour session on how to study math for the nearly 100 new freshmen student-athletes. I prepared a sample math assignment to demonstrate my seven study tips. The Athletic Director gave the homework assignment at the previous class then I spent an hour trying to demonstrate study skills through activities: the lesson plan and overhead slides are included here (Attachment A).

Example Two – First Day Syllabus for Math Course

My first day syllabus is thick and color-coded but I think it is worth the time on Day One to set students up for success. The first time we do something new as part of the class – homework assignment, quiz, scrimmage, group work, test – I give even more specific details as to why this is part of the course. About half way through the semester, there is a quiz or tough assignment that most of the class will perform poorly. At that point, we form groups and students brainstorm about what made them successful previously. I collate the "success" suggestions from all groups to get them back on track for more success. (Attachment B)

Example Three – Actual Student Success Stories

Over the years, as I have tried to infuse study skills into the math curriculum. These are stories of real students and how those efforts became student success stories. (Attachment C)

Math and Test Anxiety

Math and Test Anxiety

Many students have difficulty learning mathematics. One of the main reasons is the lack of math study skills, test-taking skills, motivation and anxiety. Bloom (1976) indicated that 25% of a students grade can be attributed to affective charteristics such as study skills, test-taking skills, motivation and anxiety. Most student have never been taught math study skills or how to reduce their test anxiety. Research demonstrates that math study skill training either through a math study skills course or through a math lab improves achievement by at least one letter grade. On some occasions students have gone from Fs to As. Teaching students how to study and learn mathematics is one solution to improve the success rate of developmental math students.

Paul Nolting and Kimberly Nolting

Subduing Math Anxiety: A Cooperative Effort

This workshop will present techniques that help to reduce anxiety in lower level college mathematics courses. The basic premise is that stress reduction can only be effectively accomplished if the instructor acts as a catalyst. The focus is on the interaction between the instructor and the student. A developmental math course may begin with a math anxiety component. A student realizes his situation is not unique and usually feels comfortable discussing his/her own experiences. Topics such as good study habits, focusing techniques, and relaxation techniques follow quite naturally. At this point, it is important not to abruptly shift gears and "start the math part of the course." Rather this is where the instructor needs to carry over stress reduction techniques into his presentation of mathematical topics. Specific activities will be discussed and demonstrated by the active participation of workshop attendees. Typically, students who have experienced varying degrees of math anxiety also participate.

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Mathematics Anxiety

Mathematics anxiety is prevalent on today's college campus. Scores of students dread taking their required mathematics courses. Likewise, faculty are at a loss when they encounter these students in their classroom. Based upon my own grant funded research, I have presented workshops for students, faculty, counselors, and administrators who desire to learn more about this very important problem which impedes successful learning. I have spoken at over twenty different conferences as well as on college campuses. In addition to mathematics conferences, my work has had wide appeal in the fields of psychology, student retention, adult learning, and counseling. Although grounded in research, my approach is "hands on." Through active audience participation, strategies designed to help students (and faculty) cope with math anxiety are considered. The session, which can vary in length from one to two hours, includes small group exercises. Resource materials to be shared with colleagues and students are distributed.

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Assessment

Community College Collaborative to Maximize Teaching Effectiveness

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This presentation will report on a major developmental mathematics collaborative among five community colleges in Virginia carried out during a spring, 2000 sabbatical. Demographic and descriptive data—including gender, age, credit hours, enrollment, teaching method, attendance, class size, classroom participation, student success and retention rates—will be collected and analyzed to determine best scenarios for success in developmental mathematics classes.

A 1995 survey by the National Center for Education Statistics (NCES) found that 78 percent of higher educational institutions that enroll freshmen and 100 percent of public two-year institutions offered remedial courses (Institute, pp. v-vi). Twenty-nine percent, as compared to 30 percent in 1989, of first-time freshmen enrolled in at least one of these remedial courses, and freshmen were more likely to enroll in a remedial mathematics courses than in a remedial reading or writing course. In fact, a recent study of remediation by the Maryland Higher Education Commission found that for students who completed college-preparatory courses in high school and immediately attended a community college, 40 percent needed math remediation (Institute, p.8). Consistent with the commission's finding, a recent local community college study (July, 1998) showed that students taking developmental work account for over 40 percent of the graduates. Such statistics mandate needed research on developmental courses to implement changes to ensure quality programs which will adequately prepare students for college level courses.

A final concern of the Institute was that evaluation of remedial programs was minimal. Findings from their study of 116 two- and four-year colleges and universities found "that only a small percentage conducted any systematic evaluation of their remedial education programs" (p.10). Furthermore, the Southern Regional Education Board has raised the issue about the effectiveness of remedial programs by observing that "few states have exit standards for remedial courses" (Institute, p.11).

The Institute's report concludes by proposing strategies for the future—two mutually reinforcing goals (p.ix):

(1) Reducing the need for remediation in higher education, and
(2) Improving the effectiveness of remedial education in higher education.

This study concentrated on two charges—to improve the effectiveness of the developmental mathematics programs in higher education. The Institute's report lists three strategies to improve the effectiveness of remedial education. The first of these strategies—(c)reating interinstitutional collaboration among colleges and universities in a state or system, allowing best practices and ideas to be shared and replicated—is consistent with the charges to the 1998-99 state Developmental Studies Implementation Task Force. These charges require systemwide collaboration for standardized test interpretation, common objectives, exit criteria, and assessment methods for developmental courses.

This research is a response, first, to the Institute's recommendation to collaborate with other college faculty for best practices and second, to the state Task Force's efforts toward standardization in the field of developmental mathematics programs in the VCCS. The specific courses under study are Arithmetic, Basic Algebra I, and Basic Algebra II. Descriptive data, including credit hours, enrollment, attendance, class size, classroom participation, and success and retention rates will be collected. In addition placement procedures for developmental courses, methods of instruction, and other anecdotal data provide further insight. Findings from this study assist in maximizing the effectiveness of teaching strategies for developmental mathematics. Recommended changes will ensure an optimal environment for student learning to take place.

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Activity: Assessment

While it has been shown that a move toward cooperative learning, student-centered teaching will increase student success, there has not been as much discussion of alternative assessment in the mathematics classroom. In addition to our discussions on technology, the mathematics division has been examining both formative and summative assessment. We have talked about some tools for gauging the level of understanding on a day-by-day basis. Such techniques include the "quick write" or "one minute paper", or the "clearest point/muddiest point concept". We have held discussions on why these are beneficial to both the student and the instructor, and talked about how to use these techniques. Next we have discussed summative evaluation. We have had discussions on moving away from the traditional examination as the key element is assigning grades, and looking at portfolio assessment, especially in the courses for non-majors (such as Math for Liberal Arts.) As with the technology discussions, these workshops have been held "in-house" with faculty from the division facilitating the workshops. It has been especially rewarding to see the involvement and leadership taken by the newer faculty, who are more familiar and more comfortable in using these non-traditional methods.