

MATHEMATICS THROUGHOUT THE CURRICULUM

PROJECT NEWSLETTER

► Summer/Fall 2002

► Volume 5, No. 2

Packing Our Suitcase

MTC STEPS UP PRESENCE AT NATIONAL MEETINGS

Traveling to spread the word is more than ever a part of MTC's dissemination efforts. This year, MTC expanded its presence to four national meetings sponsored by major mathematics organizations.

On March 14-16, 2002, the MAA hosted a workshop titled *Meeting of PIs and Other Senior Personnel in NSF DUE Projects in Mathematics*. The workshop, held at NSF headquarters outside Washington, DC, targeted key personnel in projects supported by NSF's Division of Undergraduate Education (DUE). The focus was on strategies, opportunities and resources for dissemination. MTC project PIs Dan Maki and Bart Ng attended, along with Marc Frantz of IU Bloomington, Morteza Shafii-Mousavi and Paul Kochanowski of IU South Bend, and Chris Lang of IU Southeast. The MTC representatives also did some dissemination by participating in a poster session set up in NSF headquarters.

During August 1-3, 2002, MTC Director Dan Maki and Assistant Director Marc Frantz attended MAA's annual MathFest in Burlington, Vermont. MTC's booth in the exhibition hall attracted considerable interest from math educators, who sought information on courses, workshops, and textbooks. Many also took copies of this newsletter. Next year's MathFest in Boulder, Colorado, July 31 - August 2, is already on our calendar.

Shortly after MathFest, MTC received an invitation to present at a poster session at the Annual Conference of the American Mathematical Association of Two-Year Colleges (AMATYC). The session, titled *Explore The Future of Math Education: NSF Projects Poster Session*, has been slotted for 1:00 pm - 3:00 pm and 4:30 pm - 5:30 pm, in the ballroom of the Phoenix Civic Plaza



Suitcase stickers: MTC's new itinerary includes MAA's PI Meeting at NSF, MAA's MathFest, AMATYC's Annual Conference, and the AMS/MAA Joint Meetings.

Convention Center, on Thursday, November 14. The AMATYC poster session, organized by Catherine Curtis, is designed for educators interested in innovative materials, curriculum reform, and grant writing.

In January of this year, MTC again had a booth at the Annual Joint Mathematics Meetings of the AMS/MAA in San Diego. Here, as at MathFest, there was considerable interest in our newsletters, materials, and workshops. We will repeat our performance at the Joint Meetings in Baltimore, on January 15-18, 2003. MTC's VIEWPOINTS Mathematics and Art workshops will also host a reunion/special session at the Joint Meetings. The reunion is sponsored by MAA's Professional Enhancement Program.

A New Chapter

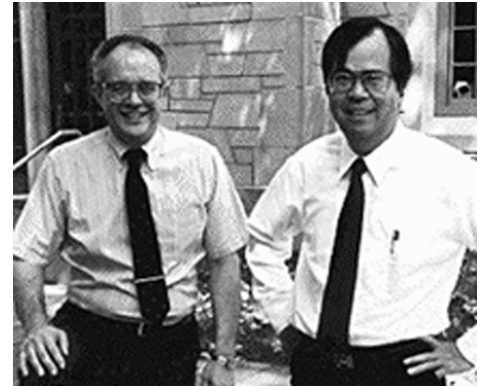
A NEW YEAR BRINGS NEW OPPORTUNITIES

This issue marks the end of the first year of the three-year, no-cost extension of our grant—a new chapter in the life of our project. Appropriately, this year offered new challenges and opportunities. We'll mention a few here, and of course you can read about more in this issue.

In March, we visited NSF to attend a *Meeting of PIs and Other Senior Personnel in NSF DUE Projects in Mathematics*, hosted by the MAA. In addition to exchanging information about dissemination in formal sessions, this gave us a welcome chance to talk about our project in person with NSF officers and PIs from other related projects. It was a great way to kick off a busy year of presentations at national meetings (see “Packing Our Suitcase,” page 1).

Earlier this year, Professor Peter Henderson, Chair of the Department of Computer Science and Software Engineering at Butler University, contacted us about the possibility of working with Butler on developing interdisciplinary courses. We were delighted to hear from Peter, who has considerable experience of this sort, having worked with the MATC project at SUNY Stony Brook. After an initial meeting in late August, Peter agreed to contact various departments at Butler, with the hope of arranging talks by our personnel, and ultimately, assistance in adopting and adapting our courses. We look forward to working with Peter and Butler University.

Perhaps most appropriate for our “new chapter” was the recent invitation from IU Economics Professor William Becker to contribute a chapter on MTC in the book, *The Scholarship of Teaching and Learning in Post-Secondary Education: The Contributions of Research Universities*, edited by Becker and Moya L. Andrews. The book will be published by Indiana University Press. The goals of the book are to show how the research of faculty members influences their teaching; how faculty members’ research leads to more meaningful student activities and the assessment of student outcomes; and to demonstrate how IU’s central position in the broader research community enhances the dissemination of ideas about teaching and learning across disciplines. We feel that the accomplishments of MTC touch on all these areas, and we’re honored by the opportunity to contribute to this new book.



IU math Professors Daniel Maki and Bart Ng

**We welcome
people to
contact us
for more
information
or with
suggestions
for new
courses.**

**Please see the
back page for
our mailing
address, phone
number, web
address and
our e-mail
addresses.**

**We look
forward to
your
comments.**

My Personal Tutor

SOFTWARE TO GO BEYOND ASSESSMENT

Good tutors and their students are well aware of the potential for tutoring to accomplish significantly more than standard classroom instruction. This potential has been verified in well-known studies by educational researcher Benjamin Bloom. Now MTC materials developer Jeremy Boggess aims to push testing and assessment software to a new level by making it imitate a human tutor.

Boggess, a visiting lecturer in mathematics at IU Bloomington, calls his concept “My Personal Tutor.” He wants his software to help mathematics students “by figuring out what concepts the student understands instead of which problems they are capable of doing.”

For instance, many students learn the distributive property as mere symbol manipulation, and apply it where it shouldn't be applied. When such a student mistakenly thinks that $\log(a+b) = \log a + \log b$, standard testing and grading software might notice that the student misses a lot of logarithm problems, and simply recommend doing more. Not only is this inefficient, but when such students move on to trigonometry, they may simply repeat the mistake by thinking that $\sin(a+b) = \sin a + \sin b$, etc.

Like a good tutor, however, Boggess wants his software to notice *which* wrong answers are chosen and *why*, so the misconception can be quickly addressed. In Boggess' words,



MTC developer Jeremy Boggess is designing software to give instructors and their students the benefits of personal tutoring, along with detailed assessment.

“By understanding the student's misunderstandings, the software can focus instruction to remove the misunderstandings. As Mark Twain said, ‘Education consists mainly in what we have unlearned.’ ”

In addition to handling testing, homework and grading, the software will quickly bring students' misconceptions to the attention of instructors, allowing instructors to use their time more effectively.

Such an ambitious project must be broken into stages. Last fall, Boggess tested a predictive component of his software. He input the midterm question and answer data from his business calculus class, and had his

software predict student performance on the multiple choice final, by estimating the probability of each answer choice for each student. Although he was pleased with the results, he says the next step is obtaining more data for calibration.

To be sure his software will have an effective outlet for dissemination, Boggess is working with Brownstone Research Group to develop his product as a “back-end” component of Brownstone's web-based EDU software.

Jeremy Boggess can be contacted at jboggess@indiana.edu.

Reaching Out on All Fronts

A MISCELLANY OF DISSEMINATION EFFORTS

In addition to the national meetings mentioned on page 1, MTC has continued its dissemination efforts in many other areas, including the following.

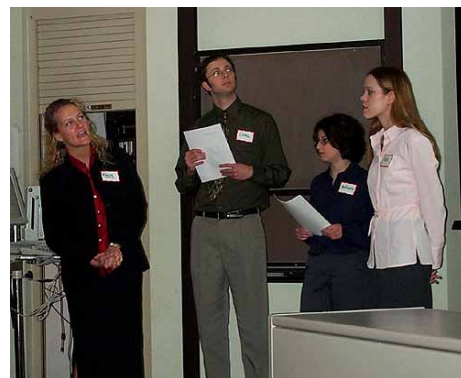
CLASS PRESENTATIONS

MTC Director Dan Maki's prototype LAMP (Liberal Arts Management Program) course continued its outreach to government, industry, and other institutions via student consulting (see "Revitalizing Mathematics," this *Newsletter*, vol. 1, no. 1). In spring 2002, Maki's IU Bloomington students consulted for the IU Registrar's office and Steak & Shake, Inc. The consultants for Steak & Shake addressed the problem of optimizing the time period for special offers on selected items.

Indiana Purdue Fort Wayne Professor Peter Hamburger continued his outreach to faculty in other disciplines this spring through his honors calculus course, "Catch the Waves to Calculus." Spring presentations by Hamburger's students showcased their collaborative research with Professors Tim



Clients and Consultants: *On the left, Steak & Shake representatives listen attentively to a presentation. On the right, Dan Maki's LAMP students Emily Oliver, Carl Gierhan, Bethany Carron, and Kris Wilson make their presentation to the client.*



Grove and Mark Masters (Physics), Don Linn (Chemistry), and Tom Laverghetta (Electrical Engineering and Computer Technology). Pictures of the presentations can be found on the course home page at www.ipfw.edu/math/h-calculus/.

CD ON SALE

David Eddins, Diane Kewley-Port, and Paul Kehle, developers of the MTC course, "Mathematical Foundation for Speech and Hearing Sciences," recently signed a publishing contract for their CD, *Mathematics and Physics for Speech and Hearing, A Problem-Based Approach*. The CD is being marketed by Thompson/Delmar Learning. The course home page is

at www.indiana.edu/~acoustic/s319/s319home.html.

IN THE MEDIA

The Indiana University magazine *Research & Creative Activity* gave excellent exposure to the MTC project in its Spring 2002 issue (vol. XXIV, no. 3). Three features highlighted MTC: "Mathematics Everywhere," the lead editorial by MTC Director Dan Maki; "Got Math?," the lead article which described the project and several courses; and "Math Plays the Market," an article on the MTC Mathematics of Finance course developed by IU Professors

(Continued)

Reaching out (Continued)

Victor Goodman and Joseph Stampfli. The issue is available online at www.indiana.edu/~rcapub/.

A NEW CHAPTER

MTC PI's Dan Maki and Bart Ng, and Assistant Director Marc Frantz, are currently writing a chapter on MTC for the forthcoming book, *The Scholarship of Teaching and Learning in Post-Secondary Education: The Contributions of Research Universities*. The book is edited by William E. Becker and Moya L. Andrews of Indiana University, and will be published by Indiana University Press.

A NEW GRANT SUPPLEMENT

On August 16, 2002, NSF awarded MTC a supplemental grant of \$7,775 (NSF-DUE 9555408). The money will be used to support participants at the VIEWPOINTS 2003 Mathematics and Art workshop, June 8-13, at Franklin & Marshall College. The VIEWPOINTS workshops are run by IU's Marc Frantz and Franklin & Marshall's Annalisa Crannell. The VIEWPOINTS home page is at php.indiana.edu/~mathart/viewpoints/.

CALCULUS WORKSHOP

On June 18-19, 2002, IPFW Professor Peter Hamburger again showcased his course "Catch the Waves to Calculus" at *Physics-Based Calculus*, a sequel to last year's workshop for teachers. The workshop included hands-on work in a physics lab with experimental and data-gathering equipment, as well as research presentations by some of Hamburger's students. Pictures from the workshop can be seen at www.ipfw.edu/math/workshop/PBC.html.

BUSINESS WORKSHOP

On May 22, 2002, MTC Director Dan Maki visited DePauw University to act as a facilitator in a week-long teachers' workshop for DePauw faculty. Using materials from his MTC course in which students consult for businesses, Maki trained instructors in using projects to teach probability and statistics to liberal arts majors. The training included data analysis in a computer lab.

JOURNALISM WORKSHOP

On June 16-22, 2002, the IU School of Journalism hosted the *Teaching Fellows Workshop* for Journalism instructors. Journalist Paul Voakes, co-developer of the

MTC course, "Mathematics and Statistics for Journalism," was a workshop leader. Voakes promoted his course and its emphasis on numeracy for journalists by using a draft of *Working with Numbers and Statistics*, a resource book for journalists and supplement for his course, written by Voakes and his co-developer, mathematician Charles Livingston.

TRAVELING COURSES

In Spring, 2002, Joseph Stampfli of IU Bloomington, co-developer of the MTC course, "The Mathematics of Finance," taught the course at Yeshiva University in New York. The course text was *The Mathematics of Finance: Modeling and Hedging* (Brooks/Cole, 2001), written by Stampfli and MTC co-developer Victor Goodman with MTC support.

MTC will introduce a new Mathematics and Art course on the Bloomington campus in the spring of 2003. Marc Frantz, who previously taught an MTC Math and Art course at Indiana University Purdue University Indianapolis, is currently developing the new course with IU Bloomington mathematician Ayelet Lindenstrauss Larsen, who is also an accomplished fiber artist.

For more information about MTC

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AMATYC ANNUAL CONFERENCE

MTC will participate in a poster session of the 28th Annual Conference of the American Mathematical Association of Two-Year Colleges (AMATYC). The session, titled *Explore The Future of Math Education: NSF Projects Poster Session*, will take place from 1:00 - 3:00 pm and 4:30 - 5:30 pm, in the Phoenix Civic Plaza Convention Center, on Thursday, November 14, 2002. The conference home page is at www.amatyc.org/Phoenix/AMATYC_2002_Phoenix.html.

AMS/MAA JOINT MATHEMATICS MEETINGS

Once again, MTC will have a dissemination booth in the exhibition room of the annual Joint Mathematics Meetings of the AMS/MAA. The Meetings will take place on January 15-18, 2003, in the Baltimore Convention Center. The home page for the Joint Meetings is at www.ams.org/amsmtgs/2074_intro.html.

VIEWPOINTS REUNION/SPECIAL SESSION

Annalisa Crannell and Marc Frantz will host a reunion/special session for participants in their VIEWPOINTS Mathematics & Art workshops at the Joint Mathematics Meetings in Baltimore (see above). The session, sponsored by MAA's PREP initiative, will take place on Thursday, January 16, 2003, from 6:00 - 9:00 pm. Participants will give presentations on their use of Math & Art in their classes.

MTC Advisory Board

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INDIANA UNIVERSITY



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ABOUT MTC The Indiana University Mathematics Throughout the Curriculum project is a National Science Foundation sponsored curriculum development initiative. MTC has developed, taught, and disseminated interdisciplinary courses linked to mathematics since 1996. MTC involves faculty from the Indiana University system, Franklin & Marshall College, Illinois Wesleyan University, and the State University of New York at Buffalo.