Bytes of π

The newsletter of the BSC mathematics and computer science department

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Letter From the Editor

As another semester comes to a close, let's take a moment to look back at our accomplishments this semester. It's always truly amazing to see everything our faculty has been doing over the past few months, from seminars, to publications and awards, to club activities.

As construction on the new science building began, we look forward to working more with the science departments. The recent approval of the STREAMS grant will facilitate closer work between our and other science departments as well as encourage course development. Our faculty has been hard at work to enhance our classes; with the introduction of MATH 143: Problem Solving in Mathematics, the math coaching program first introduced in FRSK 102 is becoming more structured and is expanding to other courses. You'll read about the math coaching program in the feature article below. The department is making changes to the curriculum and courses in the major, voting to relax the Physics requirement of the major to allow other science courses. We have also recently voted to convert from the current 4 semester, 3 credit sequence of Calculus to a 3 semester, 4 credit sequence, to be implemented in Fall 2011. We are expecting to see changes in Freshman Skills soon, and I hear rumblings in the hallways about MATH 100 as well!

Our students have been just as busy as we are. In April, our math club, The X-factor, brought a travelling theater group to campus to perform "Calculus: The Musical." That same week, the Computer Science Club hosted an event on campus to celebrate National Robotics Week. You'll read more about these two events in the stories to follow.

With the end of this semester looming, we can look forward to next semester (perhaps after a little bit of sun!), with a new hire and a new chairperson. Professor Phil Scalisi will be taking over the duties of chairperson this fall as Dr. Uma Shama steps down. Although we'll look forward to having her back in the classroom fulltime, I would like to take a moment to express our appreciation to Uma for the wonderful work she has done as department chairperson.

Enjoy reading!
Shannon Lockard

Feature Article

Drop, and give me log (10^{30}), by Laura Gross

Bridgewater's math coaching program has grown out of an effort to reduce the drop/withdraw/failure rate in precalculus. As peer learning assistants, coaches work with designated sections of developmental and core curriculum math courses. Students in many of these enhanced sections have chosen programs of study that require calculus, but they arrive at BSC testing into developmental mathematics. Math coaches assist instructors with classroom activities and assignment planning, coordinate a weekly group problem-solving session, provide additional help outside of class, and meet with students one-on-one to address their individual needs. Mathematics coaches have students do mental push-ups. They train students to win the game of math.

In 2004, precalculus was identified as a gateway course that kept many students out of their intended majors. Dr. Heidi Burgiel, then Director of Mathematics Services, considered reforms in calculus education that have occurred in the wake of well-known studies that Dr. Uri Treisman and colleagues conducted at the University of California at Berkeley in the late 1970s as well as examined the writing studio and "targeted" sections associated with English 101 at Bridgewater State College. Heidi then made suggestions to initiate a program that provided a structured environment in which students could study together under the supervision of a math coach.

The presence of the math coaches has proven to be an asset to not only the students in the courses, but to the instructors and to the coaches themselves. In the early years of the program, the organizers discovered that attaching coaches to classes provided valuable feedback to the instructors, that math coaches made natural mentors to the students they supervised, and that attaching assignments to coaching sessions improved attendance, increased time on task, and enhanced the connections between coaching and class.

The benefit to the students in targeted sections is clear to the math coaches as they report below:

"At least 75% of the students that I encounter in coaching have expressed that coaching helps them better understand the material that is covered by the instructor. These students complain that the professors cover the material too fast. The coaching classes address the topics at a slower and more comfortable rate." ---Greg Nahas

"I think that the coaching really benefited my students because after class I went over everything they needed help with, and it was more one-on-one than in a lecture setting. I was also able to explain things a little [more slowly and clearly]. I think students liked it too because they could [work] on their own time." ---Shannon Kelly

"I think the students benefitted from my coaching sessions because I was able to share my own approaches to the material. I also believe it is easier for the students to talk to

another student candidly about the material and what challenges them." ---Patricia Moberg

"My favorite part of coaching was watching the students grow. I really liked having that one-on-one or small-group experience, and I felt it pushed the students to work harder and do better. Knowing that they have more than just the teacher there to help them through the semester allowed them to see that people care how they are doing." --- Matthew Menard

During the first semesters of the program, students expressed reluctance to participate and resentment of what they saw as "extra" requirements. As the inclusion of targeted sections has increased and even spread to other courses, an effort has been made to dispel this hesitance. Dr. Matt Salomone, Director of Mathematics Services since fall 2009, attributes further "buy-in" among students to the introduction of a one-credit cognate course called MATH 143: Problem Solving in Mathematics, piloted by Dr. Uma Shama and modeled after a similar course in the English department. The class makes the small-group contact that coaches have with their students a formal, scheduled requirement for targeted sections of precalculus and freshman skills. The course, offered in both semesters of the 2009 – 2010 academic year has further increased attendance and time on task and allowed proper compensation of faculty for the additional responsibilities of teaching an enhanced course.

Matt reports a plan to make the assistance provided in targeted sections more uniform in fall 2010 via a common set of assignments and activities for each section of a given course. The standardized materials will help assess the program across sections, perhaps resolving some ambiguity in outcomes measured in the early years of the program. Some of the data from the first few years showed a big improvement in student performance. Some did not. Uma says having students work on these assignments in small groups will promote learning, as in the successful Mathematics at Bridgewater program from the 1990s.

The coaching program has had another, perhaps unexpected, benefit to the coaches themselves as evidenced by the following comments.

"Coaching helped me to see the different way kids learn. When I sat in the classroom I observed how the students responded to different techniques the professor used." --- Shannon Kelly

"Coaching was a review of all those little things that I have forgotten over the years. It has made me a better math student, and I'm also convinced it helped me pass my high-school mathematics MTEL exam." ---Matthew Menard

"I found that it was very helpful in many ways to go back through some of the material covered in the class that I coached and that it was helpful in the math classes that I was taking at the time. I also learned a lot about my abilities to teach." ---Patricia Moberg

“Coaching has allowed me to review the more difficult concepts encountered as well as provided valuable classroom teaching experience.” ---Greg Nahas

Many of the current math coaches have plans to teach after graduating, so this truly is work that will benefit their futures.

The author would like to thank Heidi, Matt, Uma, and the math coaches for their contributions to this article. Shannon Kelly is a math major with a physics minor and a secondary education minor. She plans to do her student teaching in the fall and graduate in December. She then plans to teach. Matt Menard is a senior double major in mathematics and elementary education. He is interested in teaching at all levels. This summer he will student teach fifth or sixth graders in England for eight weeks. Patty Moberg is a senior mathematics major. She plans to teach high-school mathematics after graduation while working on a master's degree in either mathematics or education. Greg Nahas is a senior math major who plans to pursue a math teaching position in secondary education. He also wants to start working on a master's degree.

Student News

Calculus: The Musical, by Tom Gordon, sophomore mathematics major
Picture by Ashley Reis, senior mathematics and elementary education double major

The connections between music and mathematics are undeniable. This became ever more apparent as 'Calculus the Musical' took the stage in the library lecture hall one night. The musical follows a fictional and fanciful reenactment of Issac Newton and his struggle to define the physical world through mathematics. A two person show, the musical touched on iconic music from the 60s into the new millenium spanning multiple genres. With voice, guitar, piano and a little help from an engaged audience, Calculus revisits the historical figures who helped shape our collective knowledge of Mathematics from Archimedes to l'Hôpital with wit and humor, often not observed in the world of Mathematics. Professors and students, both inside and outside of the Math department gathered to enjoy the small production, nearly filling the small room to capacity.

Small pockets of laughter erupted from time to time, as people fondly recounted their own struggles with Math as theorems were unexpectedly placed in the confines of rap and pop music. The overall effect was hilarious as familiar tunes focused on basic rules of Calculus- a far cry from their original purpose. The favorite of the night seemed to be

one of their last numbers which recounted the proper application of l'Hôpital's rule to the tune of 'Total Eclipse of the Heart'. It provoked slow clapping and several students singing along with the chorus.

Everyone seemed to enjoy the two performers who gave their all to produce an entertaining and disturbingly educational production on the history of Calculus. As a Math major, I will never forget one of the fundamental theorems of Calculus in the tune of 'Under the Bridge' by the Red Hot Chilli Peppers. Hopefully humming under my breath during exams will not prove too distracting, at least until another fantastic event is sponsored by X Factor, a club on campus which focuses on Mathematics.

The picture above was taken during an audience participation portion of the performance. The BSC students participating are, from left to right, Tom Gordon, Vivi Liousas, and Matt Menard.

National Robotics Week, by Russell Nickerson, senior computer science major

National Robotics Week is a week celebrating robotics. Many institutions celebrated this week by holding robotics events to expose and educate people about robotics. Bridgewater's event was planned by the Computer Science Club.

Russell Nickerson, President of the Computer Science Club comments, "I share a passion for robotics with many people. I've attended other events this week and I've concluded that Massachusetts is the leading area for the growing robotics industry."

Andrew Allen of Vecna Technologies was invited to discuss various topics in current robotics. Allen is the project manager for the largest project in Vecna, the BEAR robot, which stands for Battlefield Extraction Assist Robot. This robot is a platform to help soldiers in various ways during operations and can lift 500 pounds. Allen discussed his experiences with robotics including an autonomous car DEXTER and FIRST robotics. Allen encouraged students to participate in FIRST because of the great learning experience it provides for the teacher and students. Allen finished his discussion with a picture from space that was taken from a weather balloon and low cost camera, inspiring students that you do not have to be NASA and have massive sums of money for amazing scientific achievements.

While the event was a successful celebration of National Robotics Week, it may sadly be the last event the Computer Science Club hosts for a while. Due to lack of members (many are graduating this or next semester) as well as lack of funding, the club is expecting to take a brief hiatus, hoping that the new science building will improve opportunities for the club.

Publications, Grants, & Awards

Uma Shama received the Lifetime Faculty Research Award at Bridgewater's Awards for Academic Excellence event on April 22, 2010.

Heidi Burgiel collaborated with Jeff Bowen on the article "A Mathematical Notation for Symmetric Images" for an upcoming issue of the Bridgewater Review.

Mahmoud El-Hashash has published the paper "Iterated Neural Networks Time Series Forecasting and Applications" in the Proceedings of the 2009 International Conference on Artificial Intelligence.

John Maslanka published the book "Introduction to Programming in C++" in August 2009. He is currently working on the second edition of the book.

Mahmoud El-Hashash along with Ahmed Abdelal and Sandra Ciocci led a study tour to Egypt January 2-17, 2010. The tour was entitled "Sociopragmatics in the Egyptian/Middle Eastern Culture."

Events

Faculty Seminars

Wednesday, March 17, 3 PM
Phil Scalisi, "MAA Math Study Tour of Egypt

Monday, March 22, 3:15 PM
Al Galante and Bill Naylor, "A Demonstration of Winplot"

Wednesday, March 31, 3 PM
Becky Metcalf, "Concept Maps: What are they and what can we learn about students' understanding from them?"

Thursday, April 15, 3 PM
John Maslanka, "A Comparison of Recursion in Mathematics and in Computer Programming"

Events On and Off Campus

Wednesday, February 24
Stonehill/Wheaton/Bridgewater State College Colloquium Series
Matt Salomone, "Beach Balls and Phony Universes"
Stonehill College, Stonehill, MA

Thursday, April 8
Stonehill/Wheaton/Bridgewater State College Colloquium Series
Thomas Koshy, “The Ubiquitous Catalan Numbers”

Thursday, April 15
Calculus: The Musical

Friday, April 16
National Robotics Week

Sunday, April 25
Abramson Colloquium & Pi Mu Epsilon Induction Ceremony
Sarah-Marie Belcastro, “Topological Graph Theory (and YOU)”

Dear Alums and friends: Tax deductible contributions to the Abramson Colloquium Fund may be made through the Bridgewater State College Foundation. Checks may be made payable to the Bridgewater State College Foundation with “Abramson Colloquium” noted on the memo line. Please call the advancement office at 508-531-2609 with any questions.

Did you know…

...that MATH 202 used to be one of a sequence of four four credit courses?

In 1984 Bridgewater's math majors took MATH 101 and MATH 102 (Calculus I and II) in their freshman year and MATH 201 and MATH 202 (Calculus III and Linear Algebra) in their sophomore year. When the calculus sequence became four three credit courses, Linear Algebra remained as the sole four credit course in the major.
(Contributed by Heidi Burgiel)

Problems

Some Solutions to Last Newsletter’s BSC Magic Square Problem:

9	**9**	**18**	**40**
22	36	10	8
33	14	16	13
12	17	32	15

9	**9**	**18**	**40**
23	35	11	7
36	17	13	10
8	15	34	19

From NPR's Car Talk Puzzler:

Stevie and his Moto: Stevie had decided it was time to take his motorcycle to work. It had been in a garage all winter, and, finally, the weather had gotten nice.

So, he gets it out of mothballs, siphons gas out of the lawn mower, fires up the tank, and off he goes. He's enjoying the beautiful sunshine and the warm air. He comes to an intersection that he goes through every day...but he's usually driving his car, and when you're on a motorcycle you're keenly aware of everything around you.

He looks up at a building to his right, and he sees one of those big signs that display the time and temperature. He notices the time, and says, "Geez, I guess I'm really late for work! But, I'll stay late, not to worry!"

Then, the temperature comes up in Fahrenheit, and a few seconds later it comes up in centigrade. Stevie says, "Hah! That's interesting. The digits are exactly reversed." For example, it might have read 31 degrees Fahrenheit, and when it showed the centigrade reading it said "13." He thinks, "I've never seen that before."

The light turns green, and off he goes to work. Well, because he got to work so late, he decided to stay late. When he comes out of work, he realizes he should have checked the weather forecast, because it's drizzly, rainy, and cold.

He's riding home, when he comes to the same intersection. He thinks, "What are the chances I'd ever see that again?" He knows it's a different temperature because it's not warm and sunny like it was when he went to work, and now it's cold, drizzly, and rainy. He sees the temperature in Fahrenheit, and the temperature in centigrade.

TOM: Let me guess! They're the same digits reversed, again.

RAY: What are the chances? Only in a puzzler could this happen! The question is, what was the temperature in the morning when he went to work, and what was the temperature when he went home?

Call for Information

If you are an alumnus or alumna of the math and computer science department at BSC, we want to know how you're doing! Send us some information about what you're doing now, we may publish it here! Please send any information about events, alumni, and faculty to Shannon Lockard (slockard@bridgew.edu). We look forward to hearing from you.