Mathematics takes an exciting new direction with MICA program

By Professor Bill Ralph

What’s revolutionary, unique in Canada, starts in September and was created by mathematicians here at Brock? Give up? The answer is Brock’s new mathematics program called MICA (Mathematics Integrated with Computing and Applications) that puts Brock in the vanguard in mathematics education. The creation of MICA was an enormous team effort by the mathematics department in which every detail of our program was rewritten from the ground up. To understand the rationale for MICA, let’s go “back to basic.”

Most people would agree that students should be able to divide 14 by 8 without a calculator. But do they really need to spend hours and hours of valuable class time learning to divide 2348.77 by 139.453 using pencil and paper? A parallel situation has emerged in mathematics courses at universities due to the appearance of powerful computer programs, such as MAPLE, which can do so much of the algebra and calculus we once taught. Fifty years ago, you would be guaranteed a job if you knew how to find the area under curves using calculus. Much of a calculus course would be devoted to teaching students the hundreds of tricks and algebraic manipulations required to perform those calculations. These days, a Grade 8 student with MAPLE can find such areas faster and more accurately without knowing any calculus at all! So where does that leave the teaching of university mathematics?

In his article in the April 1997 Mathematics Notices, renowned mathematician John Conway writes: “We have to embrace technology, I don’t mean just tolerate it, embrace it and celebrate it… The professional mathematics community must adapt and learn how to best incorporate technology into instruction. With the existence of powerful, inexpensive computers, I see mathematics departments rethinking their entire curriculum… Otherwise, we are out of business…”

In order to create a curriculum that makes effective use of technology, Brock’s Department of Mathematics began by looking at some of the most successful mathematics programs in North America. That exercise was an important step in defining the goals and objectives for MICA.

“This is an exciting direction for the study of mathematics at Brock,” says Professor Eric Muller, Chair, Department of Mathematics. “MICA is a cutting-edge program that will prepare students for mathematics careers in our technology-driven society.”

The pedagogical goal of the MICA program is to help students internalize a unified framework of mathematical concepts by interpreting them computationally, visually and algebraically. Lectures will focus on motivating and applying mathematical concepts as much as possible. To encourage creativity, our MICA courses will challenge students with interesting projects that require them to develop their own strategies for handling complex real world mathematics problems. To help them understand the relevance of the mathematics they have learned, students will regularly prepare projects based on data from researchers in other departments.

With its special attention to the role of technology, the MICA program will be unique in Canada and of particular interest to students looking for careers involving applications of mathematics that require technology. We expect our students to be in demand for their ability to apply, interpret and present mathematics using modern tools. Our new graduates will meet the need for mathematicians who are computer literate and we anticipate them making significant contributions to the practice, creation and teaching of mathematics.

We are looking forward to welcoming the first students this coming fall.

Guiding principles of MICA

1) Encourage Creativity and Intellectual Independence

The new MICA courses in first, second and third year will constantly present students with applied problems which require experimental and heuristic approaches. In these situations, students will be expected to develop their own strategies and make their own choices about the best combination of mathematics and computing required to obtain approximate solutions.

2) Develop mathematical concepts hand in hand with computers and applications

All students in the MICA program must learn a programming language in first year. This programming language, along with programs like MAPLE and statistical packages like SAS, will be used intensively in the MICA courses to explore mathematical concepts and applications.

3) Guarantee Prerequisites

A detailed course outline and a minimum skill set was written for each course. Instructors can look at the minimum skill sets for prerequisite courses and be reasonably certain that students have a solid background in those concepts.

4) Strengthen our BSc/BEd program

The concurrent program in mathematics and education has been very successful at Brock and attracts some of our best students. A very exciting aspect of the new program is that these future teachers will now learn to design and create educational computer programs that their students can access over the net. We expect graduates of our teaching program to be leaders in the use of technology in the classroom.

5) Create upward mobility

Course prerequisites have been kept to a minimum in order to maximize the program’s flexibility and student’s options. Many of the third-year courses are accessible with first-year prerequisites.

6) Strengthen ties with other departments

One of the first things in developing the new program was to send out questionnaires to departments interested in our courses. This feedback was useful in constructing the new courses and joint programs.
At the heart of good teaching is the community of learning, says Brock Professor Anna Lathrop, recipient of the 2000 Brock University Award for Distinguished Teaching.

Teaching doesn’t begin and end with faculty, says Lathrop. The best teaching happens as part of a shared experience that results from the valuable contributions of faculty, students, seminar leaders and teaching assistants.

That level of collegiality is what attracted Lathrop to teaching at the post-secondary level. And it is what has inspired her career at Brock for the past 12 years.

Lathrop graduated from Brock with a Physical Education degree in 1978. She went on to complete a master’s degree and doctorate in education, which was granted in 1997. She has taught full time at Brock since 1989 and was named Chair of the Department of Physical Education in July 1998.

“I think I always knew that I wanted to be a teacher,” says Lathrop, who got her first taste of teaching as a seminar leader during her first year of teaching at Brock. “Initially, I thought I would teach high school but because of the wonderful undergraduate experience I had at Brock, I wanted to keep going through the system. My undergraduate experience introduced me to that sense of the community of learning. I became very attracted to that level of collegial learning.”

Lathrop’s passion for teaching is unmistakable. Her teaching philosophy is built on the importance of establishing learning relationships that are supported through sharing knowledge and mentoring as well as establishing a strong connection between teaching and research interests.

“Research is incredibly linked to the process of creating a shared community of learners,” she explains. “My research informs my teaching so that I can awaken students to the possibility of their own agency.”

Lathrop says that her interests in history and physical education have led to a “wonderful fit” for her research into the history of physical education, the history of women in higher education and gender issues in sport. Her research has also channelled her activity around curriculum analysis and curriculum design.

“Research also allows me to convey knowledge in a helpful and meaningful way so that students see how they can use this knowledge in their professional and personal lives,” she adds.

Lathrop has some very strong opinions about the future of teaching at Brock.

“In order for Brock to continue to place a high value on teaching, she says, it must be prepared to deal with the challenges created by an increase in students as a result of the 2003 double cohort and a changeover in faculty due to retirements.”

“The students coming in will be younger and they will have fewer skills than we have seen in students before,” she says. “At the same time, we’ll be hiring teachers who, generally speaking, will be younger and less experienced. Brock must be ready to make accommodations to recognize the needs of both groups.”

Lathrop would like to see Brock increase resources and support for teachers in areas of new technology, teaching conferences, and mentoring programs. She also thinks it is important to extend merit criteria to include credit for curriculum development, TA supervision, personal development and leadership, and the number of students and required courses.

It boils down to greater visibility for teaching at Brock. That visibility, adds Lathrop, could be served by the University naming a Vice-President, Teaching — a position created to champion the valuable role of teachers.

Looking back on her career, Lathrop feels that one of her most significant impacts has been as a teacher of first-year students.

“I like to think that I have had an impact on retention and generating an interest in physical education so that I’ve provided them with an anchor in the overwhelming transition form high school to university,” she says. “I also like to think that I’ve challenged the way in which some students have been conditioned to see and understand the world around them.”

Overall, she likes that her career represents a commitment to teaching excellence that energizes a passion for scholarly passion.”

2000 Brock University Award for Distinguished Teaching

Teachers and students are partners in learning

In 1998, Brock University established the Brock University Award for Distinguished Teaching. The award recognizes a significant commitment to providing and developing quality learning experiences for students in addition to valuable contributions in curriculum development and mentoring of colleagues.

Professor Anna Lathrop, of the Department of Physical Education, was the 2000 recipient. Dean Robert Kerr, of the Faculty of Applied Health, described Lathrop as a consummate professional who is respected as much by her students and colleagues. He says she continues to excite and surprise students, and finds new ways to give more of herself.

Previous award winners were: Professor John Lye, English Language and Literature, and Professor Barry W. K. Joe, Germanic and Slavic Studies/Communication, Popular Culture and Film, 1999.

Tips for good teaching

Brock Professor Anna Lathrop, recipient of the 2000 Brock University Award for Distinguished Teaching, shares the following tips for good teaching:

- be authentic;
- be vulnerable — be open and teach in an enjoyable, non-hierarchical way;
- strive to create a learning environment;
- be patient with your own professional development as well as the development of your students — recognize that you are both on learning curves;
- teach with three things in mind: be fun and make it an enjoyable experience; be sure that your teaching is meaningful; ensure that the treatment of your students is seen as valuable and respected;
- talk about teaching — scholarly passion is caught from one another. (Mindorff, D., 2000a)

Spring Institute: Reflections on Teaching and Learning

June 27 - 28, 2001
Join us for a two day retreat at the Oman Inn, Niagara-on-the-Lake to relax, reflect, connect with colleagues and discuss effective classroom practices. For more information, contact the CTEF at ext. 3913.

Inaugural address featured award-winning Brock professor

The new President’s Lecture Series on Teaching and Learning, co-sponsored by Office of the President and the Brock Centre for Teaching, Learning and Educational Technologies, was launched in late January of this year. The series is intended to provide an annual public forum for the discussion of teaching and learning in higher education. Once each year, Brock University will invite an expert in the field of teaching and learning to provide insight and to encourage dialogue on the challenges of university teaching today. In times when our institution is moving towards becoming a comprehensive university, with new and expanded graduate departments and research programs, it speaks eloquently of Brock University that it seeks to sustain the vigorous conversation about teaching and our classroom accountability to our students through this lecture series.

On Tuesday January 30, 2001, Dr. Don Ursino, who retired in December 2000 from Brock University, delivered the inaugural address “Meaningful Learning and the Scholarship of Teaching” to a rapt audience of 300, comprising University faculty, students, and members of the community at large.

It was only fitting that Ursino inaugurate the series as one of Brock’s finest and most gifted teaching professors.

Ursino has long been regarded as an exemplary reflective practitioner in the Brock academic community. While a faculty member at Brock, he has been recognized institutionally with Brock’s Alumni Award for Teaching Excellence (1983), provincially with the OCUFA Teaching Award (1986), and nationally with the 3M Teaching Fellowship Award (1991).

Ursino underscored the need for universities to acknowledge that there is a scholarship of teaching that is as creative, as demanding, and as important as the scholarship that advances knowledge. He also impressed upon teachers in the audience to recognize that there is a difference between teaching that aims to achieve meaningful learning outcomes and teaching that aims at mere information transfer.

For teachers to facilitate learning, he said, they must establish learning objectives and write down those questions about what they want their students to know, to be able to do, and to value. This process will lead to more “purposeful” teaching that will lead to more significant outcomes such as higher order thinking skills, problem solving, critical thinking, reasoning and reflection, and self-directed learning.

Deborah Mindorff, a Research Coordinator at the Faculty of Education, was the 2000 recipient. Dr. Ursino set a lofty goal for us at Brock to carefully consider during our academic careers.

Mindorff, D. (2000). "I can’t remember the last time I sat through a lecture, for so long, with rapt attention," said Mindorff. "Dr. Ursino set a lofty goal for us at Brock to carefully consider during our academic careers. (Mindorff, D., 2000a)"
TA Award Winners

The Teaching Assistant Awards, sponsored by the Brock Centre for Teaching, Learning, and Educational Technologies, were established in 1998 to recognize the outstanding contributions to the University by teaching assistants, lab demonstrators and seminar leaders. Individually, or as a system. Apart from being cost effective for the University, many Brock TAs are involved in extracurricular activities. They hold graduate degrees elsewhere; some are full-time TA, seminar leader or lab demonstrator. They are indeed a distinct society and as we move towards being a comprehensive university, Brock employees will continue to support the benefits of teaching and learning of having such a diversified portfolio.“

Evidence of TA commitment at Brock is easy apparent in the numbers who avail themselves of some Centre for Teaching, Learning and Educational Technologies (CTLET) resources, such as the Basic Certificate program. The program consists of a series of workshops dealing with a wide variety of teaching and learning issues such as TA rights and responsibilities, facilitating effective seminars, evaluation of class participation, grading of essays and assignments, and maintaining a positive classroom environment. One of the benefits of participation in the program is the opportunity for TAs to meet with colleagues from other disciplines to discuss problematic situations and to share ideas and strategies. This year, over 120 TAs attended different sessions offered by the CTLET with a record number of TAs working towards either a Basic or Advanced Certificate in Teaching and Learning. Attendance at eight CTLET workshops offered throughout the year earned a Basic Certificate; participation in the Banquet Certificate, participation in a further eight workshops and submission of a statement of teaching philosophy earned an Advanced Certificate. A total of 68 TA certificates were awarded at a reception on April 6 hosted by the Vice-President, Academic.

Donna Vukmanic, Senior Lab Demonstrator

Donna Vukmanic is a senior demonstrator for second year undergraduate labs in analytical, physical and inorganic chemistry. She is responsible for equipment, physical biotechnology and third year analytical instrumentation. She received her undergraduate degree from the University of Waterloo and her MSc degree from Brock in 1988. Vukmanic has had an impact on a considerable number of Brock students, having worked for the Chemistry department at Brock for 16 years. In addition to developing new experiments and writing the lab manuals, she instructs students in experiemental theory and laboratory techniques. Although there are a number of demonstrators working for her in the labs, Vukmanic remains involved in each step of the lab work. According to Professor Heather Gordon “Donna actively participates in the teaching and learning section of every laboratory course of her in charge. “ One reason Vukmanic was nominated for the award is her willingness to spend considerable amounts of time with her students. As she is always available, Donna is in her office, then there is a student in there with her as well. In fact, one student has made it a point to always have the opportunity to talk with her. “

TA Award

Marsha Salmon, Seminar Leader, Psychology

Marsha Salmon has been a seminar leader for a number of courses within the Psychology department for the last two years. She has also acted as peer mentor and as the departmental liaison at Brock’s Open Houses. Salmon first developed her classroom skills while completing her research. Although Brock TAs are still pursuing other commitments and careers, work for the, etc. many have chosen to apply for a TA position simply because they love to teach. Those who are “professional TAs” have chosen Brock as a career; those who hold full-time jobs outside of the University welcome the chance to continue academic discussions in the classroom. Undergraduate students appreciate the opportunity for skills development in the areas of facilitation, motivation, time management, organization and leadership. Brock TAs are indeed a distinct society and as we move towards being a comprehensive university, Brock employees will continue to support the benefits of teaching and learning of having such a diversified portfolio of TA.

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3M Fellows adjust to the spotlight

By Dr. Barry W.K. Joe, Director, Centre for Teaching, Learning and Educational Technologies

The announcement that I had been named a 3M Teaching Fellow was an occasion of immense personal pride for me as a teacher and of great professional pride as a faculty member of Brock University. For many years, I had looked up to Brock’s 3M Fellows, Professors Clarke Thomson and Don Ursino, as role models for my teaching, and now I had been invited to join their ranks. I was also delighted because, as a result of the publicity surrounding the award, community attention was focused on the importance of university teaching specifically on teaching at Brock. I looked forward with eager anticipation to sharing my experiences and ideas with the other 3M Fellows at the Quebec retreat in November 2000.

It was an awkward moment, that first meeting of the 10 new 3M Fellows. After our separate arrivals at the Chateau Montebello, we gathered for an informal reception in the hotel lounge, chatting quietly before the huge stone fireplace that is the focal point of the lobby. Although we didn’t externalize the feeling, each of us was aware of being in the company of nine other colleagues who had been recognized with this national award of singular prestige.

As we became better acquainted with each other over the next three days, we noticed a common theme emerging in our conversations, both casually and in the working sessions: I don’t know why I am here when there are many other colleagues at my university who are good teachers; I am uncomfortable with this distinction, because it serves to isolate me as a certain class of teacher. Even as we continued to meditate on our dreams during our time in retreat, these doubts persisted and found expression in various ways. And of course, we wondered why.

The academic culture in which we practice the art of teaching holds broad hints to the answer to this question.

Traditional research is the university scholarship that shows overwhelming ability. It is rewarded with funding, with promotion and tenure, with prestige from within the academy and without. Research achievements are recorded in the curriculum vitae and these accomplishments are announced in print. Traditional research is the scholarship that is publicly celebrated; it is the scholarship around which there is a robust discourse that can be heard in the conversations of colleagues.

The scholarship of teaching, however, has traditionally been accorded less public recognition. The discourse around the scholarship of teaching is heard primarily in the hallway conversations of faculty members. Teaching accomplishments are not normally published in Brock News (‘Professor Smith re-develops course over the summer to include a particularly effective online evaluation component’), even though as much time, creativity and intellectual endeavour may have gone into the undertaking. Nor are achievements in teaching normally included in the curriculum vitae—instead, a web of structure, the teaching dossier, has been devised that further segregates teaching and research. Even being named the recipient of an institutional, provincial or national award does not legitimize teaching in the same way a published book or paper legitimizes traditional research in the evaluative hierarchy of the academy.

Some of our most gifted colleagues simply don’t know how to begin their meditations on their teaching practice. They appear to be so steeped in the institutional language and codes of traditional research that they do not recognize the scholarship of teaching, even in their own practice. Nor do they have the language that might help them value their own teaching as they ought to. This is not to suggest that these colleagues are incapable of comprehending the scholarship of teaching. It is to propose that, precociously because they are gifted teachers, they may overlook what might be included under this rubric as self-evident, too obvious, too matter-of-course to really count as “scholarship” for many of them — and again the scholarship of teaching is hijacked by traditional interpretations of scholarship that refer to research.

The academy has historically constructed teaching as an activity that is the presumed daily task of professors, so that public reward and special celebration of that task is a peculiar consideration. We have been co-opted by the very academic culture in which we engage in the scholarship of teaching, and we have bought into the constructed assumption that the scholarship of discovery, as Ernest Boyer called traditional research, is the only model.

In retrospect, then, it was not surprising that 10 teaching professors arrived at Montebello and still felt an uneasiness at the recognition of their teaching and the distinction the award brought. Indeed, some felt that being named a 3M Fellow had further isolated them from the other exceptional practitioners at their university. They were being invited to give public addresses because they were 3M recipients, not because they were exceptional teachers, and they expressed a certain disappointment that this policy signalled to the rest of the university that the experiences of other qualified reflective practitioners were not worth highlighting.

My contribution to this conversation was to suggest that we celebrate the scholarship of teaching for ourselves and as a model for others. As 3M recipients, we have already been set apart — nobles soleni — by the award itself, and that has both positive and negative aspects. No matter how modestly we try to dissociate ourselves gently from the distinction of the award, we have already been “marked.” Our institutions have expectations of us, our colleagues have expectations of us, and our students do as well. Since being a 3M Award recipient is a non-negotiable state, it seems to me that we as 3M colleagues would do well to embrace that distinction. And if this means being other than special to speak about teaching because of the award, then we should welcome the opportunity, knowing full well that those colleagues who could have been, ought to have been or yet will be 3M recipients. It seems to me that any colleague who is entitled to the special recognition that his/ her teaching has a responsibility to share the language and structures of that reflection with his/her peers. By our example, we demonstrate that this reflection is not inaccessible to the uninhibited; by sharing, we in some measure dispel the fears that a academic valuing of teaching.

For detailed submission information, please refer to the Web site at: www.mcmaster.ca/learning/popped/submit_info.html

Dr. Barry W.K. Joe