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Mathematics, Science and
Technology
Education through:**

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- Program evaluation

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- Curriculum
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- Teachers
- Youth
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**A Tribute to Graham Orpwood, Founding
Co-Director of YSIMSTE**

It is with mixed feelings that we bid farewell to Dr. Graham Orpwood, founding Co-Director of YSIMSTE. Graham is on sabbatical this year and will retire in 2007. Dr. Margaret Sinclair has taken over the role of Co-Director in the interim. Given the auspicious occasion of Graham's retirement from York, it seemed only right to pay tribute to the driving force behind YSIMSTE.

It's hard to believe that YSIMSTE is entering its seventh year of operation. It was established in 1999 as the York/Seneca Institute for Science and Technology Education through the efforts of Stan Shapson, then Dean of Education at York University, and Tony Tilly, who was the Senior Vice President at Seneca at the time, to support teachers and the teaching of mathematics, science and technology. It was a bold idea at the time; that a college and a university would work together as equal partners in an institute that didn't quite fit any existing structure. It was left to Graham and me to determine how we would work together to achieve the goals set out for us. I admit I had feelings of uncertainty until I "reacquainted" myself with Graham, whom I had met some 10 years earlier.

Graham's passion, enthusiasm and commitment to YSIMSTE and his understanding of the college system, gained first hand from his experience as a faculty member at St. Lawrence, quickly quelled any fears I had. Graham treated me as a colleague and Seneca as an equal partner and actively looked for opportunities to include Seneca in YSIMSTE projects. It was refreshing and unexpected. I appreciated his directness (well, most of the time), his ability to get to the issue quickly, his sense of humour and intellect.

In the early years the projects were York driven. Seneca was actively involved in outreach initiatives and presented sessions on the college system and on applied science and technology to teacher candidates enrolled in the York Faculty of Education Math, Science and Technology program, we had a joint exhibit at STAO, etc, but it was when Graham had the foresight to include Mathematics (and Margaret Sinclair!) in the mandate that a major project led by Seneca and supported by YSIMSTE came to the forefront. And it was at this point that the “penny dropped”; we realized what YSIMSTE could be. I believe Graham always saw the potential. He was simply waiting for the right time and the right project. He knew we had the right people and institutions. That’s what vision is all about.

Graham, we wish you all the best.... You will be missed.

YSIMSTE receives Success in Partnership Award

Each year Seneca College recognizes its exemplary partnerships with education, industry and government. We are thrilled that this year, Seneca recognized its partnership with York University, specifically the York/Seneca Institute for Mathematics, Science and Technology Education at its Success in Partnership event, held on September 20, 2006 at Seneca’s new Markham Campus. Graham Orpwood, founding Co-Director of YSMISTE and Rod Webb, Associate Vice President, Academic accepted the award on behalf of York. Graham and Rod recognized the contributions of York administration, faculty and staff, including Paul Axelrod, Dean, Faculty of Education, Gill Wu, Dean, Faculty of Science and Engineering, Ray Bowers, Margaret Sinclair and “founding father”, Stan Shapson, York’s Vice President of Research and Innovation and members of the YSIMSTE team from Seneca, Margot Wassenaar-Faber and Laurel Schollen.

Open Source Symposium and Workshop for Educators

Symposium: October 26-27th, 2006 - 8:30 a.m. to 5:30 p.m.;

Workshop for Educators: October 28 from 10:00 a.m. to 1:00 p.m., Seneca @ York Campus

Open Source is changing the way we think about computers, culture, education, and even politics. We invite you to join the discussion about open source and its derivatives, as we gather the architects of this change at Seneca College for the 5th annual Free Software and Open Source Symposium.

The Symposium is a two-day event aimed at bringing together educators, developers and other interested parties to discuss common free software and open source issues, learn new technologies and to promote the use of free and open source software. At Seneca, we think free and open source software provides real alternatives.

The **Workshop for Educators** will be presented by John Selmys, the originator of Seneca's Open Source Symposium. The workshop will examine the open source movement with specific emphasis on software for schools; including its integration into curricula, classroom deployment, utilization and benefits. Lessons learned from Seneca's partnerships with several local secondary schools will be tabled and examined - exposing the good, the bad and the ugly sides of becoming an early adopter. Attendees will be encouraged to discuss a broad array of issues - including the consequences of failing to act. The workshop will include a hands-on component in one of Seneca's state of the art open source labs. Teachers of all disciplines, principals and support staff are invited to attend.

Registration is now open! Note that there are a limited number of places available for the workshops so you are encouraged to register now. Contact Robert Boyczuk for information on the symposium at Robert.boyczuk@senecac.on.ca or visit the symposium website at <http://cs.senecac.on.ca/fsoss/2006/index.html>

College Mathematics Project

The College Mathematics Project (CMP) received funding last year from the School/College/Work Initiative (SCWI) as part of the Connecting GTA Teachers Regional Planning Team SCWI Phase 9 proposal.

The Pilot B project, which involved six colleges (Sheridan, Georgian, George Brown, St. Clair, Fanshawe and Seneca) and nine partner schools boards, examined the patterns of mathematics preparation at the secondary school level associated with success in first year college technology mathematics. A qualitative study, conducted by Trish Byers, a professor of mathematics at Georgian College examined participating college policies, programs, subject outlines and institutional assessment tools to provide context for the quantitative study, which involved approximately 5000 student records.

The CMP team made presentations on the project to the Mathematics Education Forum of the Fields Institute, the Coordinating Committee of Vice Presidents Academic, the annual conference of the Ontario Association for Mathematics Educators (OAME), and the First Year Experience Conference. In addition presentations will be made at STAO 2006 and AMATYC 2006. However the key event for the project was the CMP Mathematics Forum, sponsored by SCWI and Connecting GTA Teachers. The Forum was held at Seneca's King Campus on June 15 and was attended by more than 100 representatives of GTA colleges and boards. Participants considered the findings presented in the morning during afternoon breakout sessions and each group made recommendations to the Forum. Speakers included Anthony Azzopardi, Education Officer, Ministry of Education, Bernice Blackman, Vice President Student Success and Enrolment Services, Seneca College and the CMP team.

The Forum presentations and Proceedings are available on the Connecting GTA Teachers Website:

http://www.cgtat.org/event_060615_CMP_Forum.html

The CMP team prepared a proposal for a province wide project as part of the Phase 10 SCWI funding opportunity, but unfortunately it was not supported. The team will continue to analyze data from the Pilot B study and will seek funding for an expanded study.

The TI-Navigator Project

Researchers at the York/Seneca Institute for Mathematics, Science, and Technology Education are involved in an exciting new project to evaluate the use of the TI-Navigator.

In contrast to the main type of networking (accessing the internet), which is centered around expertise from outside the classroom, the Navigator - a wireless system for linking graphing calculators, helps students network with one another within the classroom. Four calculators are connected to each “hub”, which communicates wirelessly with the teacher’s hub. The graphs or diagrams on the students’ calculator screens can then be projected so that the whole class can discuss the mathematics.

YSIMSTE researchers will investigate how use of this new technology affects student learning in grade 9 applied and academic mathematics. The study will involve approximately 600 students whose mathematical progress will be tracked over a period of 2 years. Researchers hope to answer questions such as - What are the effects on student attitudes and achievement in grade 9 applied/academic mathematics?

Supporting School Improvement (SSI)

In the last issue we reported that we were embarking on a study to review school-level improvement in mathematics and to learn more about the factors associated with such improvement. Our study, which was completed in June of 2006, involved two boards – Simcoe-Muskoka Catholic District School Board and Greater Essex County District School Board. The study was the second part of a two-part project designed to identify factors associated with school-level improvement in mathematics at Grades 3 and 6. The first part, conducted in 2004-2005 and supported by EQAO involved the design and testing of a novel system for measuring improvement at the school and school board levels. The second, supported by the Literacy and Numeracy Secretariat of the Ontario Ministry of Education, involved observing classes, and talking to teachers and principals in twelve schools that had shown a marked level of improvement on our new measure.

Our results showed that all twelve study schools had implemented broad-based changes. They had analysed data, both from EQAO tests and from other assessments, had identified areas of concern, set goals, developed initiatives, and

focused on professional development. And in all schools teachers were working together to help students improve.

Across the two boards there were differences. One board developed mathematics initiatives at the system level. The same new text was bought for all schools. The board provided kits of manipulatives and gave workshops for teachers in how to use them. Numeracy specialists were assigned to groups of schools to model best practices and to mentor teachers. The teachers credited openness to new strategies, teachers who enjoy math and have backgrounds in it, teacher dedication, research-based mathematics curriculum materials, and “knowing what’s required” for the improved scores.

In the other board, there was no system wide approach. Each school analysed its own EQAO results and developed a variety of initiatives to suit its own community. In most cases, new programs were aimed at improving school culture and literacy, not mathematics skills. In this board, teachers believed that improvements in mathematics were side-benefits of a strong focus on literacy, that is, that students had achieved higher mathematics results because they were better able to read the questions and to write clear explanations.

These results show that programs to improve mathematics achievement can be initiated by a board or developed at the school level, and that use of research data to set goals, teacher collaboration, openness to new approaches, and opportunities for professional development are key ingredients for success.

York/Seneca Summer Science and Technology Project (YSSSTP) 2006 By Rachel Kennedy, YSSSTP Coordinator

This past summer, ten students from four area high schools came together for a six-week intensive Co-operative Education experience; for many it was the experience of a lifetime!

Faculty from Seneca College and York University hosted the students in their labs and provided training and mentoring. Professors from York’s Faculties of Science and Engineering and Health Sciences and Seneca’s School of Biological Science and Applied Chemistry and the Academic Computing Systems Department provided rich experiences intended to motivate and inspire the students. The end result? Students gained a deeper understanding of opportunities for participation in the science and technology fields, increased confidence and a sense of pride in their accomplishments.

In-class activities, from resume writing to team building, from silly scavenger hunts to WHMIS training provided students with the opportunity to develop leadership skills and knowledge about the world of work. Students “graduated” from the program having developed new skills and at the same time having earned a Co-operative Education Credit.

Some of this year's highlights included:

- participation in the Assertiveness Training for the Workplace with Goldie Newman,
- PowerPoint presentations on students' careers of interest
- and most importantly, the presentation of the students' Legacy Projects

This year's Legacy Projects were designed to demonstrate the power of this program and its positive impact on the lives of the participants while also promoting the YSSSTP to future participants, supervisors and sponsors. The students "gave back" to the program through the creation of a digital yearbook, a promotional video and a YSSSTP web site. The projects allowed students to build technology-based, organizational and interpersonal skills; they were unveiled at the Celebration Banquet. The projects were an unparalleled success and will be used to promote the program for years to come.

YSIMSTE appreciates the support of the YSSSTP donors; this program could not be offered without their generosity and commitment to youth and science and technology education. Our sincerest thanks to the following donors:

- The Lloyd Carr-Harris Foundation
- Donner Canadian Foundation,
- S.M. Blair Family foundation
- The Acapella Foundation
- The McLean Foundation

We would like to acknowledge the efforts of the Office of Resource Development, Seneca College, which undertook fundraising on behalf of the YSSSTP.

The students and coordinator of this year's program are indebted to the aforementioned donors as well as to the various organizers and faculty members of Seneca College and York University who ensured the success of this year's YSSSTP program. It is with excitement and anticipation that we await next year's program in the hopes that it too will be a pivotal moment in a student's life!

"We came as strangers and left as family." – YSSSTP 2006 student

Workshops and Outreach Activities

Youth Science and Technology Outreach Project – I CAN do this! Inspiring and Engaging Youth in Science and Technology

YSIMSTE is pleased to announce that Seneca's Youth Science and Technology Outreach Project proposal to the Ministry of Research and Innovation to offer to a wide range of hands on activities to at risk youth aged 12-17 (Grades 7-12) has been accepted. Ninety workshops in electronics, biotechnology, microbiology, precision skills & design, renewable energy, fire science and information technology will be

offered on various Seneca campuses, in TDSB classrooms and the community over a three year period. Partners include TDSB, IBM and the Jane-Finch Concerned Citizens Coalition. The goal is to connect youth with professional technicians, technologists and scientists and to educate and inspire participants to get excited about science and technology with the hope that more youth will consider post secondary studies and ultimately pursue a career in these areas.

York/Seneca IBM-WIT Chapter Activities

The York Faculty of Science and Engineering has joined with the Seneca Faculty of Information Arts and Technology and the Faculty of Applied Science and Engineering Technology to form the first joint University-College chapter in Canada and YSIMSTE is providing support to the project.

The goals of the program are:

- to build awareness of exciting career opportunities for women in technology,
- to encourage girls/young women to keep their math and science options open in high school,
- to give girls/young women access to female role models in the Science and Technology fields, and
- to demonstrate to girls/young women that technology is fun!

During 2005-2006, the joint chapter hosted approximately 40 high school students at the Technology Enhanced Learning (TEL) building for a half day web design workshop and participated in the TDSB College Awareness Career Connections Conference hosted at Seneca. In addition to these on campus events, York and Seneca student chapter members were invited to present workshops to GTA high school students.

For 2006-2007, we are looking forward to developing a new series of half day workshops covering the basics of: creating and editing digital audio files, podcasting, publishing an e-zine and other neat topics.

Visit the website at <http://cs.senecac.on.ca/ibmwit> for more information on the chapter.

YSIMSTE Math-Science Workshops – JOIN US!

This year YSIMSTE is offering a new series of mathematics and science workshops, designed to let participants engage in hands-on math, science and technology activities. The first workshop held on Wednesday, September 27th, provided more than 100 participants with an opportunity to learn how to build mathematics lessons around culture. Anna Dutfield, an M.Ed. student at York University shared how she draws on Ethnomathematics to create activities for her elementary students. Our next workshop, “Engaging Students in Science” will be held on Tuesday October 24 from 4:15 -5:30 pm. Come and join presenter Mars Bloch in doing hands on/minds on science. Future workshop topics -- Visualization in mathematics and science, Math stories as starting

points, Robotics in the classroom, Math/science and Sports, Using the Geometer's Sketchpad. Watch the YSIMSTE and Faculty of Education websites for announcements of dates and times! A copy of our poster is available at www.ysimste.ca

Outreach Workshops at Seneca: A number of outreach workshops and activities were conducted in 2005/06. Seneca's Faculty of Applied Science and Engineering Technology held a Science and Technology Week during the College's study week in February. Students in Grades 7 to 12 were treated to a variety of workshops in biotechnology, microbiology, electronics, environmental science, flight technology and skilled trades. Our labs were extremely busy in the May/June period. We participated in the Grade 7 and 8 Career Conference (with TDSB) and Grade 7 and 8 Career Awareness Day as well as hosting workshops for a number of schools. When all was completed, more than 800 students experienced hands on science and technology at Seneca. 2006/07 is shaping up to be just as busy. Please visit www.ysimste.ca for a listing of our workshops and contacts.

Two New Electronics Projects for your students!

The School of Electronics and Computer Engineering Technology (ECET) announces the expansion of our Science and Technology classroom project activities for elementary and secondary school students. In addition to the basic electronics project that was presented to over 2500 students last year, ECET is introducing two new projects. The Audio Modulator project allows teachers and students to build a device that can be used to modulate the student's voice demonstrating concepts of sinusoidal waveforms and trigonometric multiplication. The project also functions as a basic audio amplifier. The RF Receiver project builds a crystal radio AM receiver, using the principles of wave propagation and demodulation. All three projects can be combined to create a radio. Workshops can be presented in one or two hours dependant on the learning objectives that the teacher wishes to demonstrate. All students are allowed to keep their work. Teachers wishing to have their students build the complete receiver should schedule the projects in sequence starting with the LED Flasher, then the Audio Modulator and finally the RF Receiver.

Please contact Don Sodoski at 416.491.5050 extension 2445 or via email at don.sodoski@senecac.on.ca if you wish to book a workshop.

Biotechnology Courses and Workshops for Teachers and Students

The School of Biological Sciences and Applied Chemistry (BSAC) has been engaged in various outreach activities over the past several years that has served to extend the profile of the Biotechnology programme within the educational and industrial communities. Moreover, these endeavours significantly augment the ability of teachers at both the elementary and secondary school level to impart the sometimes abstract concepts encountered in science by allowing students to actively employ practical techniques that aren't usually available to them.

Several different paths have been constructed to reach teachers, students, and employers. To engage students directly, the BSAC biotech faculty and 3rd year students

have developed, organized, and run workshops that demonstrate Microbiological and Molecular Biological techniques. These are held at the college and off-site at venues like the Ontario Science Centre and at Healthfest, where the DNA workshop was voted Best Workshop by the participants. Each year, these workshops host approximately 800 students that participate in the Biotech Symposiums that run during the Sanofi-Pasteur Biotech Challenge. Over the past 2 years and this upcoming year, BSAC has provided 100% of the workshops and a Key note speaker (Dr. Alison Symington). Members of our faculty also mentor a group of high school students that participate in the challenge itself.

BSAC also provides teacher training in association with the Canadian Biotechnology Education Resource Centre (CBERC). This three day course provides high school teachers with an opportunity to experience and learn biotechnology. Once the teachers have completed the course, they can have access to the Biotech Toolbox – a kit (3 large boxes actually!) that provides all the equipment and materials required to perform basic recombinant DNA experiments (isolation, electrophoresis, restriction digestion) at their schools. The kit is maintained by BSAC staff, usually employing a student on a part time basis. Teachers that attend this course (so far close to 80), as well as others that have heard of our outreach, often bring their classes to Seneca to take part in an all day lab session where they perform various experimental techniques using our advanced instrumentation. Faculty and 3rd year students provide instruction and introduce the students to life as a Post-Secondary student in a science programme.

The toolbox is sponsored by Fisher Scientific, York (Region) Biotech, CBERC, York Region School Board, and Seneca College. We are also a member of the York Biotech group that consists of many companies in York Region (like IBM) and we host students and teachers that participate in the York Biotech organized BIOTECH DAY.

Contact Dr. Mike Gadsden at 416.491.5050 extension 3247 or email Mike at Michael.gadsden@senecac.on.ca for information.

STAO Conference 2006

Once again, YSIMSTE will participate at the annual conference of the Science Teachers' Association of Ontario, November 16-18, 2006 at the Doubletree International Plaza Hotel in Toronto. This year's conference theme is "Building Harmony in Learning". We would be delighted to see familiar and not so familiar faces, so please do stop by our booth (#603) and those of our sponsoring institutions to say hello, pick up program information and exchange ideas.

Laurel Schollen, Graham Orpwood and Margaret Sinclair will present findings of the College Mathematics Project at a session entitled "How are your students doing in college applied science and engineering technology programs?" on Thursday, November 16 at 8:00 am. We will have some competition, as York professor, Dr. Dawn

Bazely's presentation, "Getting Students to Understand Science", is scheduled at the same time. Dr. Michael Hempsted will facilitate "An Open Discussion on Curriculum and Study Aids associated with First Year Chemistry at York University" on Friday, November 17 at 11:00 am. And finally, don't miss the fun as Gary Taylor, aka, "Professor Pyro" will presents a workshop on Saturday at 11:00 am that is sure to set sparks flying!

York University Science Speakers Bureau

The York University Science Speakers Bureau is comprised of members of the Faculty of Science and Engineering who have developed targeted and specific talks. Topics range from exciting faculty research work, recent developments in science, or even current news items.

Whether you wish to complement or supplement your science curriculum, to inspire interest in post-secondary education in science, or to enhance scientific literacy, our Speakers Bureau is happy to help. Our speakers are flexible and can modify their talks to suit your needs. All talks are free.

Our speakers offer age appropriate talks that can be delivered either at off-campus schools or at York University itself. Groups can participate in a campus tour, visit our science teaching facilities and even check out our research laboratories.

To book a speaker, view a list of our available talks or for more information about this program, contact us:

Online: www.science.yorku.ca/events/SpeakersBureau/

Phone: (416) 736-5051

Email: rmilton@yorku.ca

Science Explorations Summer Science Camp Program

This summer marked the very first summer of The Faculty of Science and Engineering's own Science Explorations summer camp program.

As a not-for-profit outreach program, the goal of this program is to increase scientific literacy and appreciation in our community. The curriculum offers fun, hands-on activities that engage and encourage youth to learn and explore topics in science and engineering. Offered this year for 4 weeks in July and August, campers were introduced to a range of scientific inquiry, from DNA to Astronomy, Engineering principles to Computing and beyond!

This program is targeted to the immediate community around York in the adjacent Jane-Finch corridor and surrounding area. This year, registration was offered to children ages 8 to 11 (grades 3 to 6) of all backgrounds, interests and aspirations.

Science Explorations is delivered and coordinated by undergraduate students and graduates of science and engineering. Our Science Instructors come together to represent a range of study in the pure, applied and life sciences to provide scientifically sound instruction on a variety of topics.

Our 2007 brochure will be available online February 1st. For more information on the camp program, contact us:

Online: www.science.yorku.ca/explore

Phone: 416-736-2100 x22814

Email: dgerrard@yorku.ca

Seneca Hosts the York Region District School Board's Science Olympics

The York Region District School Board held its Science Olympics event at Seneca's Seneca@York Campus in March 2006. Margot Wassenaar-Faber, YSIMSTE Assistant Director acted as the lead contact for this event, which was attended by more than 300 high school students from York Region. Students were organized into Junior and Senior teams and were provided with a number of challenges in the disciplines of Biology, Chemistry, Physics and General Science involving the main theme of the event: Toys and Games. Seneca is pleased to once again host next years event, which is planned for March 1, 2007.

York Region Sci-Tech Fair – 2006

Seneca College and York/Seneca Institute for Mathematics, Science and Technology Education hosted the York Region Sci-Tech Fair (YRSTF) in early April. Parents, judges, guests and fellow participants from the York Region public, catholic and private schools had an opportunity to view projects pertaining to Biotechnology, Earth & Environmental Science, Engineering, Life Sciences, Mathematics and Computer Science and Physical Science. Student participants were also invited to tour the campus attend workshops in biotechnology, microbiology and electronics offered by faculty in Seneca's Schools of Biological Science and Applied Chemistry and Electronics and Computer Engineering Technology. A total of 96 students with 65 projects showcased their talents at Seneca's Seneca@York Campus.

YRSTF was represented by seven finalists and their respective projects at the Canada-wide science fair (CWSF) in Saguenay, Quebec in May. Nadejda Novikova, a grade 12 student from Maple High School won a gold medal at the CWSF for her project entitled "Prime Time". Ulrica Wong and Janet Leung, grade 12 students from Brother Andre Catholic High School, won a silver medal at CWSF for their project entitled "The Pacers and the Peas".

YRSTF 2006 was supported by Seneca College of Applied Arts and Technology, York Catholic District School Board, York Region District School Board, Ontario Federation of Independent Schools, Pfizer, Wyeth Pharmaceuticals, Novopharm, ATI, Boreal, Can-Ar Coach, GFG Secure Transport Inc, York University Faculty of Science & Engineering, Sci-Tech Ontario, Township of King, Town of Richmond Hill, Town of East Gwillimbury and the York Region Amateur Radio Club.



CWSF medal winners

The organizing committee is now planning for the 2007 York Region Sci -Tech Fair. The fair will be held on Saturday April 14, 2007 at the Stephen E. Quinlan Building, Seneca College, Seneca@York Campus.

We welcome your participation as a volunteer, sponsor, or judge. We encourage all grade 7-12 teachers in York Region to offer this opportunity to their students. Please visit <http://yrstf.senecac.on.ca> for details and a full description of the fair and our 2006 winners.