

The TISP Canada Courier #1



December 14, 2011

Improving our grades in Science & Technology education “Hands-on” teacher workshops build confidence in curriculum-supportive lesson plans

According to the most recent OECD survey, Canada ranks only eighth in science education, behind China and Finland, and places only 10th in math, trailing China. Not that teachers are to blame, though. With provincial budgets almost universally tighter, the accepted need to increase the depth in the science curriculum isn't matched by easily available complementary lesson plans. IEEE Canada's Teacher In-Service Program (TISP) means to give these stats an upgrade. Volunteers are bolstering teacher confidence through “hands-on” workshops

demonstrating curriculum-supportive lesson plans ranging from wind energy, to oil spill containment to Ohm's Law. At the core of each lesson, though, is getting students to “build something.” Other volunteers are working directly with students in the classroom. For the details, read on, in this, our inaugural newsletter.

Message from the IEEE TISP Canada Chair Anader Benyamin-Seeyar

I am delighted to be given the opportunity to address the members of IEEE Canada as the Teacher In-Service Program (TISP) Canada Committee Chair in the first Issue of the TISP newsletter. We have witnessed a considerable growth in the activities of IEEE TISP Canada since the beginning of 2009 until now. We hosted the first Canadian IEEE TISP Workshop in May 2009, in Montreal for which we had an attendance of over 115 participants from across Canada and beyond the Canadian borders. Workshop preparation is a demanding process in which the TISP Canada steering committee has been actively involved with IEEE TISP/EAB managers to bring a real success to this program. In fact,

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with this mutual collaboration, we were able to organize the second TISP Canada Workshop, in Mississauga during April 28 – April 29th, 2011. We are pleased to report meeting and working with over 80 participants from all sections.

In addition, thanks to the hard work of TISP Canada Champions and team members from all 20 Sections, we were able to become an official IEEE Canada TISP Committee. IEEE Canada has allocated a reasonable budget for each year, which permits us to run many exciting programs at numerous school sites within Canada.

The main engines of the TISP Canada program are the tireless and dedicated volunteers from all sections. I have personally seen the growing interest and enthusiasm of the volunteer committee members who have applied their talents in initiating and expanding the TISP mission across the country. It is a pleasure to list a few of the other major successes of the program during the year as follows:

- TISP Canada continued organizing formal monthly telecon calls between all participating sections in TISP Canada Committee.*
- Each section has its own champion / committee member and many other team members to execute the TISP program objectives towards schools in their areas.*
- Each section has created its own website and also everyone has access to the IEEE Canada TISP website (www.tispcanada.ca) set up to reach all members within Canada.*
- In most provinces of Canada, sections have actively approached and made presentations to their school teachers and school boards.*
- TISP Canada Committee members have made contact with their corresponding science teacher associations. Those from Ontario have for several years been effectively involved with the Science Teachers' Association of Ontario (STAO) and attended their annual conference with more than*

2,000 teachers gathering every year in November for 2 days. TISP Canada has a booth and makes presentations at the event.

- TISP Canada is preparing to run the next IEEE TISP Canada Workshop in Vancouver in year 2013.*

As Chair of this committee, I am proud working with my dedicated team in Canada and having direct collaboration between TISP Canada and with IEEE EAB / TISP Management. Keep the excellent momentum for the coming year with more successes on the horizon. As a united team, we will continue our mission towards encouraging the next generation of engineers and scientists.

Thank you all.

Anader Benyamin-Seeyar
Chair, TISP Canada Committee
anader.benyamin@ieee.org



IEEE and TISP

The Teacher In-Service Program provides a forum for IEEE volunteers to demonstrate engineering, science and mathematics concepts by sharing their real-world experiences with local pre-university educators. IEEE offers workshops for its volunteers on how to provide in-service programs.

More information is available at www.ieee.org/education_careers/education/preuniversity/tispt



Have you tried www.tryengineering.org lately?

IEEE's source of information for counsellors, parents, students and teachers

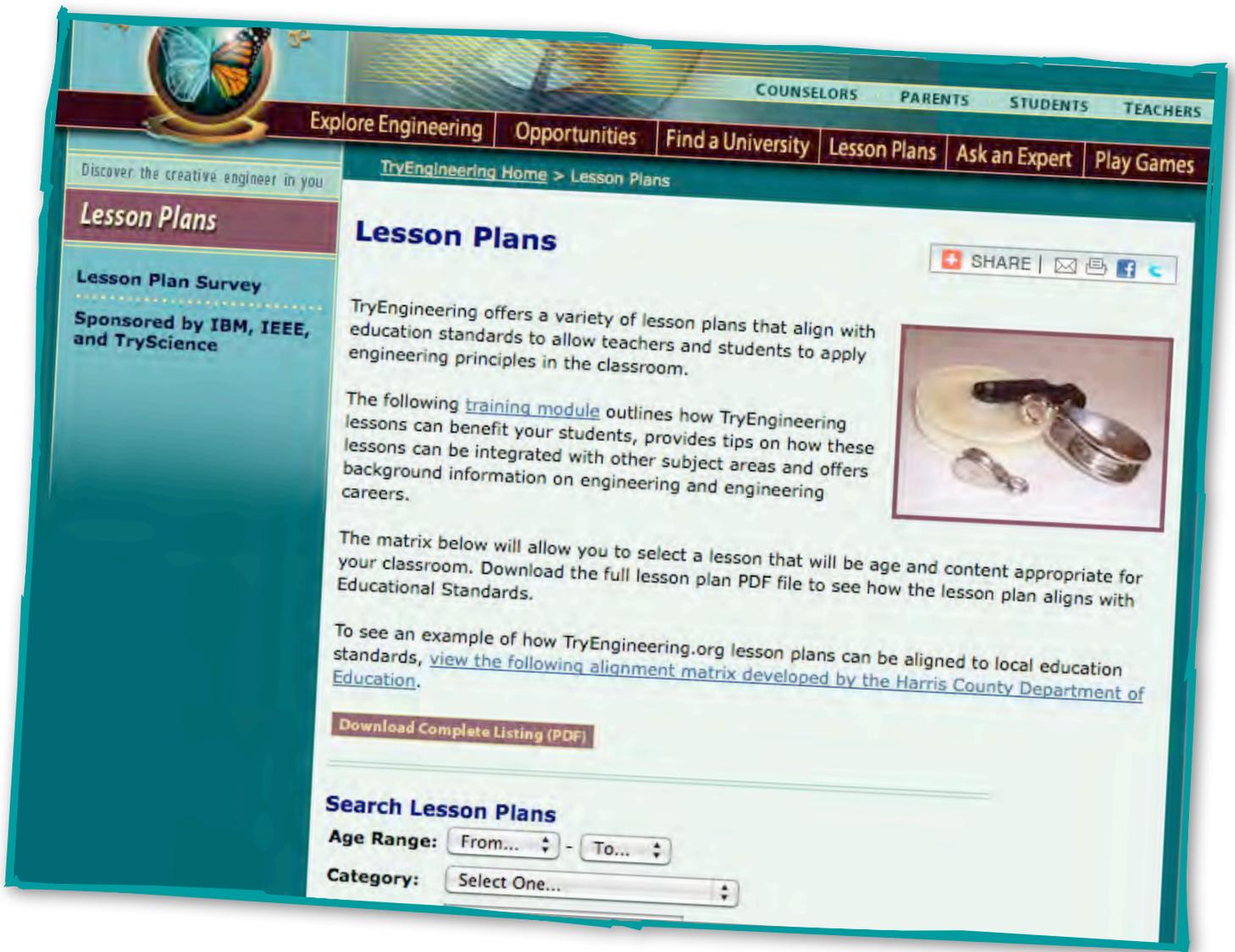
Welcome to TryEngineering!

TryEngineering has engineering & career resources to help students learn about and prepare for exciting opportunities in engineering. For further details see www.tryengineering.org.

TryEngineering offers a variety of lesson plans that align with education standards to allow teachers and students to apply engineering principles in the classroom.

Bienvenue sur TryEngineering.org

TryEngineering.org est une ressource qui s'adresse aux étudiants (entre 8 et 18 ans), à leurs parents, leurs enseignants et leurs conseillers scolaires. Il s'agit d'un portail au sujet de l'ingénierie et des carrières en ingénierie et nous espérons qu'il aidera les jeunes à mieux comprendre ce que signifie l'ingénierie et comment se préparer en vue d'une carrière dans l'ingénierie: www.tryengineering.org/lang/french



Second successful TISP-Canada Workshop held in Mississauga, Ontario, in April 2011

The TISP Canada Workshop is a major event for our community, involving many volunteers and participants from across the country. In this report, Patrick Finnigan, Senior Member of IEEE, provides an overview of the proceedings and offers some insights into the discussions.

Overview and Welcome

On 28-29 April, 2011 the IEEE hosted a Teacher In-Service Program (TISP) Training Workshop in Mississauga, Ontario, Canada. The event was held for volunteers in the IEEE Region 7 area who were interested in working with their schools and school systems to increase the level of technological literacy of local pre-university educators and their students.

Dr. Ferial El-Hawary, Past President of IEEE Canada, welcomed all guests and IEEE members. She explained that the 20 sections of IEEE Canada run many continuing education and certification programs for members. IEEE R7 has participated in the TISP program and made TISP a stand-alone program with a budget reporting to the IEEE R7 board of directors.

Dr. Om Malik, President of IEEE Canada, welcomed all administrators, teachers and IEEE volunteers. He remarked that one of IEEE's core beliefs is that members are responsible for education and

mentoring. Particularly, they should reach out to pre-university students and teachers, since they have expertise to share in science, technology and mathematics. IEEE R7 has many active volunteers, especially working with the TISP program. In his view, the goal of the workshop is to cement the linkage between local TISP volunteers and their school boards, schools, teachers, and students. Dr. Malik concluded by thanking the volunteers, attendees and organizers of this TISP workshop.

Dr. Anader Benyamin-Seeyar, IEEE Region 7 TISP Chair, welcomed all of the workshop participants. He noted that TISP activities in IEEE R7 began in 2009 with a workshop in Montreal, attended by 100 participants. While this represented several R7 Sections, the current workshop involves almost all of the R7 sections from Victoria to Newfoundland. TISP, as an official IEEE R7 initiative has an activity-based budget and reports to the IEEE R7 board. The IEEE R7 committee meets monthly via teleconference calls. *(continued on page 5)*

Hands-on Activity: “Working with Wind Energy”

Lead by Brad Snorgrass, the participants in teams of two built a windmill to specifications. Using a hair dryer, the wind mills were tested to be able to lift a tea-bag on a short string. Although the designs were quite diverse – most worked. Designing the propeller to have a small surface area was a further design constraint – which some designs did minimize. Participants learned the value of upfront design and meeting diverse design criteria.



(2nd TISP-Canada Workshop, continued)

IEEE and TISP

Yvonne Pelham of IEEE Headquarters provided an overview of IEEE and TISP. She highlighted the fact that the IEEE has more than 400,000 members worldwide and an active volunteer network of 40,000. With its more than 1000 staff members and a budget of \$350 million, IEEE caters to all aspects of software, electrical, computer, and bio-electrical engineering. Part of the IEEE mandate is to address declining interest of students in engineering. IEEE needs to help raise everybody's awareness of technology. The "TryEngineering" initiative involves IEEE, IBM and the New York Hall of Science. The site has various great features, including a search function for accredited university and college programs in many countries, including Canada. To-date, *TryEngineering.org* lesson plans have been downloaded more than 3 million times. Ms. Pelham reported that a new *TryComputing.org* portal will be launched in 2012.

Challenges and Opportunities in Canadian Schools

Ms. Maureen Callan of the Ontario Ministry of Education (MoE) addressed "challenges and Opportunities in Canadian Schools, using many examples from Ontario. As a former teacher, Ms. Callan co-ordinates the review of all K-12 programs in math, science and technology.

A key challenge for her and her colleagues is to find ways to work together with non-profit enrichment programs, such as IEEE TISP. Ontario has 60 English school boards and 12 French school boards in two times zones. Unlike other provinces, Ontario does not produce texts and learning resources. Boards buy resources which are vetted and/or recommended by the province (public tender). Texts must cover 85% of the curriculum. There is an effort currently underway to produce remedial math material for grades 9, 10, 11 focusing on practical applications. Faculties of

education seem like a logical connection-point for programs like TISP. These are regulated by the Ministry of Colleges & Universities (MCU). The MoE works with a number of other organizations that TISP should be working with. Examples include the Science Coordinators & Consultants Association (SCCAO), the Ontario Association of Mathematics Teachers, the Ontario Council of Technology Teachers, the Provincial Physics Teachers Association, the Computer Engineering Teachers Association, the Teachers Federation, and the Ontario Skills Competitions (Robotics, Science Fairs).



Ms. Callan pointed out that school boards run regional events for consultants, as well as workshops and conferences for teachers, mainly in the summer. These events include some training and implementation discussion whenever a new curriculum like Ontario Science and Technology are introduced. For example, Toronto District SB has hundreds of science teachers who attend these events. These seem like the logical venue to run TISP information sessions. Teachers are also participating in "webinars." Since IEEE has webinar capability, why not offer one about TISP through school boards? There are a number of possible "entry points" for TISP into the Ontario educational system. Examples include the sector-based Specialist High-Skills Majors (SHSM) initiative; co-operative education, involving

(continued on page 6)

(2nd TISP-Canada Workshop, continued)

placement to gain credit; dual credit programs between high schools and universities; and Technological Education Programs.

Ms. Callan emphasized that it is very important to involve students in Grades 6, 7 and 8. Although students are required to take science up to Grade 10, they need to decide by January of Grade 10 whether they will choose science and technology courses in Grades 11 and 12. In her view, involving students in TISP programs before this point would have the biggest impact.

Alignment with Education Standards, Science & Technology in the Secondary Schools

Ms. Mars Bloch, of *Let's Talk Science*, gave a thought-provoking talk on the topic of aligning TIPS activities with education standards and science & technology. Ms. Bloch reminded workshop participants that, unlike in USA, there is no national Department of Education in Canada, as education falls within provincial jurisdictions.

Ms. Bloch observed that TISP lesson plans refer to "standards," but in Canada these are most often known as "expectations," and she noted that curricula do change. Hence, it would be wise for TISP to check with *Let's Talk Science* and their tracking efforts in all jurisdictions. In Canada, there is a *learning* focus, where the content is just a vehicle. Ideas are always *assessed* to determine what students really learned and remembered. Group projects are used extensively. Projects are always evaluated based on relevance, ability to provoke questions, an outline of assumptions, promotion of critical thinking, and evaluation of alternatives.

Hands-on projects are not enough -- they need to be "Minds-On". How well do projects contextualize the learning? The mantra is *Relate. Do. Apply.*

A question at the end of Ms. Bloch's talk sought advice on how TISP might address the matter of homologating our lesson plans in view of the need to deal with 15 jurisdictions across Canada. "Not easy!" Given that most curricula are available on-line, it would seem that the most pragmatic approach would be to try and form a single cross-Canada committee assigned to this task. Hopefully, there will be a good deal of commonality, and the task may not be as arduous as it looks. This is a crucial task, as all our efforts will be ineffective if the US-developed lesson plans are rejected by Canadian jurisdictions.

Panel Discussion

Ms. Jennifer Ng led the Panel Discussion on developing partnerships with local pre-university schools.

Milan Sanader reminded participants that they need to understand what a non-profit organization like IEEE stands for and how its TISP program is organized to engage teachers in the Program. The lesson plans look to be applicable for all grades K-12.

Sean Hanna was happy that TISP volunteer David Hepburn was able to present a TISP overview to the Niagara Science Department Heads. They are focused on making science inquiry-based so as to promote student enthusiasm (every day). Lesson plans will be better if developed with a teacher. The core of a lesson is a good starting point. Curricula are currently jam-packed. TISP should piggy-back on existing training programs. TISP would be wise to choose two key lessons that apply at each grade level and align and promote these on initial contact with teachers and boards. Lessons need to be a fit-in not an add-on. Boards who have science consultants can promote and disseminate these lessons to teachers.

Richard Pardo reminded us there are already a number of engineering programs in the schools, for example the PEO Engineers in Residence and Extended Relationship programs. 

TISP Reports from the Regions

TISP-Canada relies on active participation from all regions of the country. These columns report on recent work and accomplishments of TISP volunteers across Canada.

Alberta

This summer the Southern Alberta section had four school programs at elementary level where its Committee Chair, Dr. Anis Haque, worked directly with roughly 100 students in a classroom setting.

Each program was approximately three hours long. A group of students from the University of Calgary and Lethbridge University volunteered a total of 85 hours.

Two of the activities were “*making a shaking flashlight*” and “*have fun with buoyancy*.”

The feedback from the parents, teachers, and students was encouraging; the children loved these activities. “I was thrilled when a curious grade-3 student hugged me and requested to stay longer with him so that he could ask more questions,” said Dr. Haque. Two of these programs were conducted in collaboration with the Association for the Advancement of Science and Engineering Education (AASEE). Please contact Dr. Haque for further information at sahaque@ucalgary.ca.

Manitoba

The Manitoba TISP experience has been especially rich, and the volunteer work has resulted in many activities. They are coordinated through University of Manitoba. We hope to present a more detailed account of the work soon in a feature article on these pages. The University runs one week-long workshop during the summer on “First Nations Science and Technology.” The U of M has extensive mentoring programs where university faculty and students mentor high-school students in space science and robotics. Please contact Mr. Witold Kinsner for further detail at kinsner@ee.umanitoba.ca.

Ontario

As part of the TISP Workshop held last April in Mississauga, the Peel Region initiative of IEEE TISP Toronto Section developed an action plan for “local next steps.” The plan involves two schools engaged in the provincial Computer Engineering program. Over a period of two months, students design and build a robot, including programming in “C” language and assembler. The total cost of robot parts is about \$50 - much cheaper than commercial kits - and they are re-usable. The original program was developed collaboratively, and many other lessons culminate to lay the foundation of building the robots. The “Teachers’ Corner” on page

10 contains a contribution by one of our teachers, relaying recent experience with robots and partnerships. For further detail on activities in Ontario contact Mr. Patrick Finnigan at pjfinnigan@gmail.com.

Working together with Provincial organizations

In Nova Scotia, the local CAS-TISP committee is working with the provincial engineering associations and local IEEE chapters to contribute to events celebrating the “Engineering Month” in March 2012. TISP activities will include a challenge to local junior high and high school teachers and their students to compete in TryEngineering.org activities. The event will take place in public at the largest shopping mall of the province. Prizes will be available for the winning teams. Contact the CAS-TISP Committee chair Dirk Werle in Halifax for further information at dwerle@ca.inter.net.

Some ideas for K to Grade 5 Activities

We are looking for ideas to engage teachers and students at the elementary school level. Please forward any thoughts, ideas and experience that you may have to Anader Benyamin-Seeyar at anader.benyamin@ieee.org.

TISP Participates in the Science Teachers' Association of Ontario (STAO) Conference

This article is a contribution by Dave Hepburn (dehepburn@sympatico.ca) and Pat Finnigan (pjfinnigan@gmail.com). Both authors are IEEE members and TISP volunteers. An expanded version of their article appeared in a recent issue of the STAO *Crucible* magazine.

A “joyful reunion”!

For some years now, the IEEE has been an active participant at the STAO annual convention each November. Starting in 2006, and every year since then, we have given a series of presentations outlining our multi-faceted education outreach program. In 2007 the IEEE also had a booth on the exhibit floor. This year we returned in strength, with a booth staffed by as many as four volunteers on each of the three days. There were more than 200 teachers visiting the booth. It was a joy to hear “returning” teachers from previous years describe how they were already successfully using the TISP resources in their classes.

Some Remarks on the Evolution of TISP

In 2005, the IEEE Board of Directors established an Educational Activities Board, whose mission is to recommend to our Board of Directors policies on educational matters and the implementation of programs specifically intended to serve and benefit IEEE members in educational pursuits. The Board also targets both the engineering and scientific community at large, as well as the general public. The work of the EAB is supported by an “Educational Activities” department. This department is headed by a full-time Managing Director, a former High School Principal with a science background. The department is based in Piscataway, New Jersey and has a full-time staff of about 20, supplemented by a much larger body of part-time volunteers – about whom, more later. The group is organized into functional areas, covering pre-university, post-university and continuing education.



David Hepburn and Cathie Lowell prepare to meet the teachers at IEEE's TISP Booth at the STAO Conference in 2011

The pre-university area is focused on the needs of pre-university students, their parents, teachers and counselors. This group operates the “Teacher In Service Program”, or TISP for short. This program can be accessed by dialing into the net at www.ieee.org/teacherinservice. The objective of the TISP staff, (full time and volunteer) is to reach out to Grade and High Schools in their local areas to make both teachers and students aware of the many items of valuable information available free of charge from the IEEE. One such resource is www.TryEngineering.org (see also page 3 of this Newsletter.)

Probably the most significant resource now available to teachers from TryEngineering.org is the large number of ready-prepared lesson plans. These plans cover a wide range of general science and engineering topics, and are not simply confined to electrical

matters. (Biology and Chemistry are only lightly touched upon). Experience has consistently shown that these are of great value to teachers because they save so much in preparation time, particularly teachers who are either relatively new or have been “recycled” back into teaching science after a spell teaching something else. This time last year there were 86 such plans. This year there are 97, which demonstrates just how dynamic this program is.

TISP Lesson Plans

Each plan is fully complete with reference sources and includes guidance for the hands-on activity. The plans, however, are not “cook-book” fixes, and the students are left to figure out their own solutions. Most plans can be adjusted to suit students from ages 8 to 18. On average, a lesson plan is about 10-12 pages long, although some are longer and represent a full chapter in a text book. The material has been developed by IEEE members and consultants from IBM and “TryScience”, and was reviewed by engineers and teachers. Typical reactions at this year’s STAO 2011 conference ranged from “*Exactly what I need!*” to “*Fabulous!*” Another teacher commented that he used the lesson plans on “FreakyFridays” about once a month, in order to engage his students in real building activities.



STAO Teachers enjoy the challenge of building from the “Working with Wind Energy” Lesson

About 50 plans are available in French and the work of translating others is a continuing activity. And for those who may be interested, other languages available are Chinese, French, German, Japanese, Portuguese, Russian, and Spanish.. These can be found by clicking on the appropriate box on the TryEngineering home page. These work well for students who are struggling with their technical English, and also helps them with some more technical English vocabulary, which is an added bonus provided by these convenient translations.

Additional features on the website are career guidance and help with selecting a university, as well as a number of computer simulations of general science and engineering topics – with tasks for “designing,” “building” and “testing” items such as parachutes and electrically powered cars. These different phases in the lessons align very well with the new Ontario curriculum.

A group of TISP and STAO volunteers has started mapping the TISP lessons directly to this new curriculum – so teachers know right away which lessons meet the student learning objectives. This is a little “customization” exercise which the teachers recommended would make adoption of the lessons much easier for them.

The STAO organization is busy building links from their “Virtual Library” - which teachers use extensively - across to our “tryengineering” lesson plans and simulations.

Local sections of the IEEE (of which there are 20 in Canada), have members who are happy to visit school boards and/or individual schools to either discuss future possibilities or give presentations.

We look forward to seeing everyone again next November, but meanwhile visit the **TryEngineering.org** website ! There you will find almost 100 of our FREE lesson plans and 25 educational games. 

Line-following robots, trail-blazing partnerships

Brad North from Rick Hansen Secondary School in Mississauga tells how a group of computer engineering teachers expanded their cooperation from lesson sharing, to mounting an annual robotics competition — along the way picking up IEEE Toronto Section mentor Dennis Cecic.

In 2000, Ontario introduced a new curriculum for technology education. Like many of my colleagues across the province, I initially struggled. But a small group of us from the Peel Board (west of Toronto), decided to share ideas and resources. Every June during exam time we'd meet, each presenting a lesson plan for a lab, *e.g.*, stepper motor.

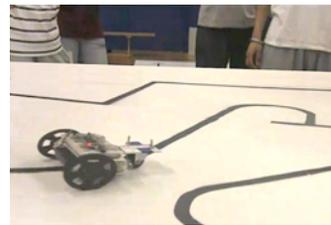


Four Boards signed on to a teacher workshop in November, lead by Dennis Cecic of IEEE Toronto Section (top). At right, a line-following robot from a Peel/Dufferin-Peel competition.

A grant of \$35,000 helped things really get rolling, thanks to the Ontario Ministry of Education. In 2006, our group, now joined by like-minded teachers from the Dufferin-Peel Catholic School Board, became the first ever to be awarded funds directly from the Ministry. Formally becoming the Computer Engineering Teachers Association (CETA), the funding enabled 25 teachers to be replaced for four classroom days to be trained in assembling a line-following robot, our chosen “vehicle” to teach the curriculum’s core computer engineering concepts. Each teacher received a kit to take back, committing to send at least one team to an inter-school competition. We now hold annually in May the “CETA Peel/Dufferin-Peel Robotics Competition,”

drawing 95 teams from 25 schools last year. Student teams of two enter into one of three challenge levels; see photo below showing a time-trial at the mid level. Outside judges with industry experience are recruited where possible.

Answering the call to adjudicate in 2006 was a training engineer specializing in micro-controllers from IEEE Toronto Section, named Dennis Cecic. Awarding full marks to our efforts thus far, Dennis gave us the confidence to begin migrating from the robot’s current 8-bit micro-controller to a 16-bit chip. With this advance, students can program in C



language, the industry standard, Dennis explained. But first our participating teachers must make the leap. With hundreds of hours of volunteer time, and the full support of his

employer, Microchip Technology Canada Inc., Dennis is contributing his expertise in the five-day workshop equipping teachers to incorporate the 16-bit micro-controller into the line-following robot, bringing the benefits of C programming. High-school teachers will cover the material over a semester. For details see <http://toronto.ieee.ca/tisp/>. For information on CETA and how you can join our partnership, contact me at brad.north@peelsb.com.

The Teachers’ Corner

The TISP community relies on feedback from educators. Tell your colleagues and our mentors what helps you teach science/technology better. Share your triumphs and trials, we welcome them both.

Some guidelines for contributors

Articles and newsitems are welcome and should be sent via email to the Editors.

The *TISP Canada Courier* accepts feature articles up to a length of 1000 words with suitable illustration material. Smaller newsitems should not exceed 500 words in length. Notices for upcoming events should be submitted in a timely fashion keeping in mind the quarterly publication schedule of the Newsletter.

Although the editors will usually consult with contributors regarding any significant change to material submitted, the *TISP Canada Courier* reserves the right to publish such material with any change(s) necessary to meet space requirements, or as otherwise deemed necessary.

Newsletter Editors

Patrick Finnigan
pjfinnigan@gmail.com

Dirk Werle
dwerle@ca.inter.net

Bruce Van-Lane
b.vanlane@communicationmatters.com

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