# The Unique Role of Science Centres in Immersing Students and Teachers in Real-World Science and Technology

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## Background

The Ontario Science Centre, an agency of the Ontario Government, is located in the large Canadian multicultural city of Toronto. Since its opening in 1969, the Centre has served more than 1 million visitors a year with a variety of experiential exhibits, interactive public programmes, as well as a unique selection of educational programmes.

The 12,000 square metres of public exhibition space cover topics ranging from physics, chemistry, and biology, to the Internet, psychology, cultural studies, sports, engineering, space technology, and environmental studies. Inseparable from this public exhibition presence are a number of educational programmes aimed specifically at students and teachers working within the formal provincial school system. These include special short programmes for class visits, teachers' guides to the exhibits, half-day-long and day-long classes in subjects such as DNA finger-printing, class experiences in the Challenger Learning Centre (a simulated space science laboratory), and even an in-house school for students in their final year of secondary school.

## OSCLUB – Launching a New Programme

Enhancing the regular school curriculum, Centre educational programmes inspire teachers and students to think about their studies from a somewhat more lateral viewpoint. Cross-disciplinary associations and engaging demonstrations characterise a class visit to the Centre. Recently, the Ontario Science Centre has taken this approach a step further. Responding to an invitation from the internationally-based Lucent Technologies Foundation to submit proposals for educational programmes, Pamela Kay, Director of Science Education, and Dr Allan Busch, Senior Advisor for Product Innovation and Development, led the successful grant application for a new programme.

Launched in May 2000, 15 regular and pre-service teachers, and 60 students who have just graduated from grade 9, are participating in OSCLUB. Conscious of an increasing interest from the college/university, business and industrial sectors, OSCLUB has the objective of working together with these groups to

find engaging new methods for immersing students and teachers in real-world science, technology and mathematics. OSCLUB is formulated around a partnership between the Ontario Science Centre and the Toronto District School Board in collaboration with Shad International, the Ontario Institute for Studies in Education at the University of Toronto, the York-Seneca Institute for Science, Technology and Education, and Lucent Technologies.

OSCLUB consists of a four-part intensive programme. In the first part, begun in May 2000, sessions have been designed specifically for teachers, to prepare them for work in the Centre environment and for the development of relationships with the research and industrial partner associations. In August, teachers began to work with the students to develop small teams with common interests for projects that will come to fruition by October. At that time OSCLUB participants work on real-world problems, challenges and product development in close association with external research, business and industrial partners. At this point it is anticipated that the interests of the students and teachers in OSCLUB will lead to extending partnership associations with experts working in areas such as biotechnology, aerospace, engineering, telecommunications and global environmental monitoring. Projects may range widely in subject matter, from the development of exhibits on the latest discoveries in biotechnology, for example, to the creation of a computer game on telecommunications for the Lucent Technologies website.

The intent is to allow as much freedom as possible while creating a connection to the real-world of the *business* of science and technology. Finally, during the following July in 2001, at the same time as the next group of students and teachers are beginning their programme, the year-2000 students will return to the Ontario Science Centre to gain work experience, in the Summer Camp programme, or in the exhibit halls where they will host visitors to the Centre.

## Collaborating with Teachers

Why does this particular educational programme warrant special attention? One of the emphases of OSCLUB is reaching teachers with the goal of achieving long-term changes to the Centre's relationship with the school system. Working together with teachers specifically has the potential of influencing far more students than is possible through normal class visits to the Centre. Being conscious of the fact that a visit to the Centre, while anticipated with delight by both teacher and student, is often thought of as an alternative approach not connected to, nor reachable within, the typical daily classroom routine, it is gratifying to imagine teachers, once initiated into the OSCLUB approach, carrying this information with them throughout the school year.

A further benefit lies in the decision to include both experienced and pre-service teachers. The inevitable alliances that follow a programme of this nature will lead to the development of coaching networks and mentoring relationships, as the teachers pursue their regular work in the school community. Ultimately, many more students than can be accommodated in the OSCLUB programme itself will be reached through this Ontario Science Centre initiative.

## Science Centre Technology

What is special about the science centre setting for OSCLUB? The Ontario Science Centre is large enough to have within it several communities of staff, all professionals who create inspirational science and technology experiences, while focusing on different needs. OSCLUB has broken new ground here as well. The rich partnerships with outside industry and research groups are mirrored inside the Centre by a cross-departmental partnerships. Staff from the Educational Programme, whose background and activities are centred on the education of school students, have provided opportunities for the involvement of staff from the Visitor Experience branch, who have up to now been primarily focussed on creating interactive exhibits and programmes for the general public.

Secondary students work with Ontario Science Centre staff to explore real-world science and technology, using engaging interactive prototypes

The student/teacher interactions being explored in OSCLUB emphasise a quality peculiar to science centres. For a long time now, institutions focussed on the public understanding of science and technology have been developing their own form of technology. In an environment nurtured by a very real connection to the research world though interaction with mentors from the outside industrial, academic and business communities, the OSCLUB teaching material utilises the unique science centre approach of:

- mining the subject matter for that one particularly stimulating piece of information that suddenly can inspire interest for material often considered dry by secondary-school-age students
- allowing students to pursue projects that conjoin apparently unrelated disciplines, and that utilise the experience of experts studying a problem from many different points of view

- constructing quirky, fun exhibit prototypes, or developing novel group experiences, to make an explanation clear and communicative.

Ontario Science Centre staff provide opportunities for public and school visitors to *play and learn*. The science centre visit is a time for releasing the brain, for stretching a single concept to its logical, and often amusing, extremes. Chemical engineering procedures, for example the separation of liquids based on their densities, can turn into dramatic, apparently precarious, physical experiments where glasses of fluids are spun around overhead on serving trays suspended from cords. Studies on fibre optic communication may lead to home-made telephones using flashlights or novel musical instruments that can be played using nothing but light transmission. The basic materials of our scientific, technological and mathematical world are the tools for discovery. Science Centre staff can do what scientists would do if there were more time to play – and learn even more.

For the students and teachers in OSCLUB, the science centre environment is stimulating. Participants feel free and open to new ideas and ways of doing and thinking about things. Add the opportunity to interact with, and be mentored by, people from industry, business and research facilities and you have a "learning community," a significant step beyond the typical day-long visit to the Centre. OSCLUB teachers and students are immersed in the science centre environment, and they are a part of the larger science and technology network, a network that will increasingly owe a great deal to these particular participants.

## Next Steps

The Lucent Technologies sponsorship is in place for three years, until July of 2002. OSCLUB will be monitored by the Educational Program staff at the Ontario Science Centre for the purpose of developing future programmes with schools and the science and technology community. The Centre also sees an opportunity to use OSCLUB as a template for changes in the way we develop our exhibits and programmes for the public in general. Given the investment in time and effort, staff have a rare opportunity in the OSCLUB programme to participate in brainstorming and idea development and to watch prototype creation and building over a relatively long duration. The cross-departmental partnerships within the Centre will undoubtedly have an effect on the culture of the science centre as a whole. Through the student/teacher programme in OSCLUB, staff will be introduced to what is effectively a new kind of learning laboratory. Ideas generated here, in the rich environment of external partnerships and highly charged student activities, will be subjected to rigorous intellectual and physical testing. It is hoped that the external partners will equally benefit from the exercises.

The OSCLUB programme itself will be subject to evaluation by the Ontario Science Centre, the Toronto District School Board, and the Lucent Technologies Foundation. The most obvious outcome will be a model for future school programmes for students and teachers, with the goal of encouraging more students to consider careers that utilise science, technology and mathematics. Perhaps it is not too far-fetched to hope that the science centre mandate to connect the public more directly to the changing world of science and technology will be realised through mentoring programmes like OSCLUB, where students and teachers work together with professionals from industry, research and business – teaching them as much as the programme participants are taught themselves.

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