Paul F. Donahue and Claude Faubert

Canada Science and Technology Museum, Ottawa, Ontario, Canada

The Canada Science and Technology Museum Corporation is comprised of the Canada Science and Technology Museum, the Canada Agriculture Museum and the Canada Aviation Museum. It is mandated "to foster scientific and technological literacy throughout Canada by establishing, maintaining and developing a collection of scientific and technological objects...and by demonstrating the products and processes of science and technology and their economic, social and cultural relationships with society." The corporate mission statement is: "To discover and share knowledge about Canada's scientific and technological heritage in order to increase understanding and appreciation of the role that science and technology has played and continues to play in the transformation of Canada." This paper focuses on the educational programmes of the Canada Science and Technology Museum, the only general science and technology museum in Canada.

Fun with mirrors!

Locomotives from times past are on display at the Canada Science and Technology Museum.

It should be noted at the outset that education is a provincial responsibility in Canada. Formal science education is generally focused on the present, with the goal of producing more scientists, engineers and technologists, and the corporate mandate is to preserve and interpret Canada's scientific and technological heritage. The challenge is to meet the needs of students and teachers while fulfilling the museum's mandate and mission.

In 1999 the museum offered guided programmes to over 50,000 schoolchildren. More than 60,000 other students came to the museum for a general visit. The number of students who participate in programmes has been growing over the past few years and the increase can be attributed to the development of innovative programmes that meet the needs of the teachers while preserving the unique character of the museum. Teachers who bring their students to the museum do not want a classroom experience for them. At the same time, they have a curriculum to cover and also face a lack of resources and great demands on everyone's time. Teachers, therefore, are looking for experiences that offer great relevance to the science and technology material that must be covered in class and that are presented in fun and stimulating ways.

The museum is fortunate in that it presents real objects from Canada's rich scientific and technological past to the public. It displays locomotives and cars, computers and bicycles and also offers students controlled access to the real thing. This "real" environment can only enrich the students' visit. Furthermore, the programmes give the students ample opportunity to participate and experiment. Because of its dedicated resources and experienced and knowledgeable staff, the museum offers programmes that go beyond what many schools can offer.

Staff at the museum guide young visitors through interactive activities

The museum quickly embraced the internet (www.nmstc.ca) and has over the last two or three years, created a number of pages to support its school programmes. The pre-visit and post-visit kits that are available to teachers in print form are now also available on the museum's web site. The museum has also developed a number of pages that offer supplementary information on a range of topics of interest to teachers and students alike. The number of visits to these pages has increased regularly over the past few years and the feedback received from teachers seems to indicate that they are making great use of the information available.

Examples of some of the efforts undertaken in these innovative programmes are *Fun Days* and *Curriculum Days*.

Fun Days

All who work in a museum or science centre in North America are familiar with the invasion of students that happens every May and June as the school

year comes to an end. Of late, schools have had their budgets cut dramatically. This has resulted in approval for school trips having become more difficult to obtain. Five or six years ago, the museum's manager of school programmes suggested that we offer programmes that combined learning and fun in a unique way. It was thought that teachers would be more than happy to put together a school trip to the museum at the end of the school year if their students could participate in activities related somehow to the science curriculum.

When Summer Fun Days were first introduced they were an immediate success. The format is quite simple: the museum offers between six and ten activities, each given simultaneously in a different part of the building. Each school group can select two of the 45-minute activities. All activities start and end at the same time. The groups then move on to their next selected activity. Each activity begins with a short demonstration performed by one of the museum educators. The rest of the activity is dedicated to hands-on experimentation. The content of each activity is loosely based on the Ontario grades 1 to 6 science and technology curriculum. For example, in one activity for grades 1 to 3, students use basic forensic skills such as fingerprinting, identification of footprints and microscopic examination of samples to help catch a museum thief.

In another activity, recommended for grade 4 to 6, students build their own space station while finding out about the International Space Station, the *Canadarm* and Canada's role in space exploration. This particular activity takes place in the Canada in Space hall, so students can see many of the objects mentioned by the educators. Holding the activity in the Museum's galleries not only offers an unusual teaching space, but it allows repeated contact with the Museum's rich collection of artifacts. In June 2000, the museum held eight days of Summer Fun Days and received over 4,000 students.

These programmes offer students the chance to do hands-on learning activities, through our equipment, environment and knowledgeable staff. The museum staff incorporate as much heritage content as is possible, including using the museum as the "classroom" and visiting some exhibitions as part of the activity itself. The result is fun, education and a lot of activity within the museum over the 90 minutes of participation. On those days the museum is not a place of quiet introspection, but rather one full of supercharged adolescent energy.

Curriculum Days

In 1998, the province of Ontario introduced a new science and technology curriculum. Most teachers were not adequately prepared to teach the new curriculum and resource materials were not available to them. At the time, one of our educators proposed that we offer a series of new programmes, designed to present to students specific aspects of the new curriculum. This series of new

programmes followed more or less the same format as Fun Days and was offered to students from grades 1 to 6. The main difference is that the activities are grouped in pairs for each grade level. The teachers cannot pick and choose as in Fun Days. For example, grade 4 students take *Pulleys and Gears*, and *Light*.

In the programme *Light*, students face a new challenge a each of the stations and work co-operatively to solve a problem. By experimentation and exploration they see principles of light in action at the telescope, microscope, periscope and kaleidoscope stations. A visit to the Helen Sawyer Hogg Observatory wraps up this workshop.

In *Pulleys and Gears*, students explore gear systems to discover amongst other things the relationship between the number of teeth on a gear and its speed of rotation. Hands-on construction of gear systems illustrates the roles that gears can play in a system such as idler gear or spur gear. These concepts are further reinforced when the students view various artifacts in the museum's exhibits that illustrate gears at work. In March and April 2000, there were six Curriculum Days and over 3,000 students participated. The dates in March and April were chosen because they coincide, more or less, with the end of one science unit and the beginning of another one.

The response from teachers and students was overwhelming in favour of our efforts. Teachers who were not able to register for lack of room immediately register for the next year. Similarly those who did successfully register, pre-registered for the next year. If anything, the programme was too successful and in our relatively open museum of 10,500 square metres, the noise level became excessive and it was difficult to both hear and to concentrate. The following year we increased the number of days. We were able to register more students but there was less "bedlam".

Other initiatives

The museum offers as part of its regular programmes a number of demonstrations that highlight its collection. These demonstrations are open to all students, whether they are here on a general visit or to take part in a school programme. For example, volunteers from the Bytown Railway Society operate a restored lumber yard steam locomotive every Wednesday and Sunday between May and October. Many schoolchildren are able to take a short ride on the cars pulled by the locomotive while staff guides explain to them how steam locomotives work and how this Shay locomotive came to be part of the museum's collection.

All year round, staff ride replicas of old bicycles around the museum. Schoolchildren often ask questions and many get to take a short ride on one of the replicas.

Finally, the museum's floor staff, called guides, constantly interact with schoolchildren when they are in the "free" part of their visit to the museum.

This blend of displays of outstanding real objects illustrating Canada's rich scientific and technological past, interactive exhibits, live demonstrations and classroom-type activities produces a rich experience for every one of the more than 110,000 students who visit us every year.

Dr. Paul F. Donahue *is Director General of Public Programmes for the Canada Science and Technology Museum Corporation, P.O. Box 9724, Station "T", Ottawa, Ontario, K1G 5A3, Canada*

Email: pdonahue@nmstc.ca

Claude Faubert *is Site Director and Director, Education and Interpretation, for the Canada Science and Technology Museum.*