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Let's Talk Science

Making Science Education Exciting, Relevant and Rewarding

BY DOUGLAS WATT

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Let's Talk Science (LTS) is a national charitable organization that is striving to improve scientific literacy through innovative educational programs, research and advocacy. LTS exists to motivate and empower young Canadians through science education.

About Let's Talk Science

Let's Talk Science (LTS) began in 1991 as an outreach project pairing 10 University of Western Ontario graduate student volunteers with teachers in local schools to raise awareness of science. Today, LTS continues to make science exciting, interesting and relevant for youth and educators through a range of age-appropriate, hands-on learning programs.[1] As well, LTS is a strong national advocate for, and promoter of, science literacy skills development across Canada—supporting both the formal and informal education systems. However, it is LTS's commitment to understanding how people learn science and how its science programs affect participants that sets LTS apart from other science promotion organizations in Canada. Through research and development, testing and evaluation, LTS's team of teachers, scientists, graduate student volunteers and adult educators seek ways to continuously improve upon their portfolio of constructivist-based science workshops, programs and conferences. This in-house approach to developing, delivering and evaluating its own science programs enables LTS to

1 Let's Talk Science includes technology, physical and life sciences, engineering and mathematics in its definition of science.

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consistently offer programs of the highest quality and value to its learning audience.

What LTS Does

Let's Talk Science is committed to the idea that science is important and fascinating—not to mention fun—and to conveying this message to learners and educators. Its activities include:

- supporting and supplementing existing science curricula by offering resources, training and structured learning paths to youth and educators who may not otherwise have had ready access to these facilities;
- offering youth meaningful, exciting, interesting and appropriate science learning experiences;
- offering educators the knowledge, tools, activities, learning environments and meaningful learning opportunities needed to positively reach and affect their students' science literacy; and
- offering young and up-and-coming scientists an opportunity to communicate the benefits of science literacy to children through its volunteer programs.

The LTS Way: A Triple-Bottom-Line Approach to Learning

Let's Talk Science offers a blend of science literacy *platforms* for children and educators through which comfort levels are enhanced, understanding is achieved and relevance, or context, is attained. LTS maintains that if youth and educators have a good foundation in science, or even an appreciation or basic understanding of it, they will be more successful in their daily lives. In today's high-tech, fast-paced, knowledge-based world, youth and educators alike are exposed to, and are often required to use, new technologies and apply their understanding of math and science concepts on a daily basis, such as when using computers in the classroom, interpreting statistics in a newspaper, learning about global warming, shopping for best values or converting measurements from miles to kilometres—all of these activities require the use of science literacy skills and knowledge.

The science literacy platforms offered by LTS include:

- innovative, hands-on, minds-on science education programs for youth and educators;
- a research component to develop, demonstrate and, where required, enhance the effectiveness of all LTS programs; and
- a strong national voice that advocates a holistic approach to science literacy skills development in schools, homes and communities across Canada.

This triple-bottom-line approach to science education advancement in Canada—through programs, research and advocacy—has enabled LTS to reach well over 120,000 youth and educators every year (over 500,000 since 1996).

Mitchell Baran, volunteer Chair, LTS Board of Directors, believes that LTS is making a difference. "The more youth we are able to touch the better Canada and our future quality of life will be…. Today's kids are tomorrow's decision makers. To make informed decisions on science-related issues dealing with biotechnology, crop science or stem cell research, for example, they will need to have a good background and understanding of science. LTS is a first step in the right direction in getting kids interested in science."

LTS Is a Lot More Than Just Science

An *eye* on science is not all that Let's Talk Science supports or encourages. The long-term goals of LTS are to:

- interest young people in science and encourage all people to become lifelong learners of science;
- develop the science literacy, as well as essential problem-solving and critical thinking skills (the peripheral components of science literacy), of young Canadians and the general community;
- improve the confidence and competence of educators, particularly elementary school teachers, in teaching science effectively; and
- understand and support science learning and develop effective teaching strategies through applied research.

The hallmark of LTS's approach to science learning is that it recognizes that practical know-how and ingenuity are at an all-time premium, and

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everybody—from students, to scientists, to mathematicians, to educators, to skilled tradespeople—needs to build and sustain a high-performance blend of skills, attitudes and behaviours. As such, the LTS platform of science literacy, advocacy and research programs targets the "whole" person by offering a comprehensive—holistic—approach to learning and skills development in youth and educators. LTS's learning platform fosters both science literacy skills and essential life skills such as working with others, effective communication, critical thinking and problem solving. "We try to reach as many kids (and teachers) as possible to give them opportunities to learn about science," says Spencer Seiler, an LTS staff member. "The kids are getting the idea behind science and how it fits with other subjects. Through our programs, their attitudes to and interest in science are enhanced, and they come to realize that science is about more than just numbers and formulas."

Target Audience

Let's Talk Science defines its target audience as youth aged 3 to 14 years and those individuals and groups that affect and have the most educational contact with them—most significantly elementary school teachers. LTS also offers science programs to high school students and teachers. "It is through educators, supplied with quality learning programs and resources, that youth become excited and interested regarding science," says Bonnie Schmidt, President and founder of Let's Talk Science.

Groups Served

- Children and students aged 3 to 14 in the formal and informal education systems
- High school students
- Educators in the formal and informal education systems
- Professional scientists (volunteers)
- Post-secondary students
- Parents and community members

Activities

LTS offers three major program streams—professional development for elementary school teachers; hands-on, minds-on science for children aged 3 to 14; and a Partnership Program for elementary and high school teachers and students. Each stream is targeted to match the specific needs of the intended audience through tailored learning strategies and curriculum-relevant activities.

Professional Development Programs—Science Now!!

LTS believes that educators are a key component to systemic change in the way science literacy is taught and learned. The Science Now!! (SN!!) professional development portfolio of workshops, conferences and summer institutes is designed to empower teachers to be "facilitators of learning" (rather than "sages on stages") by focusing on their confidence levels and abilities to deliver science curriculum using interactive, integrated and hands-on learning approaches. In 1999, over 2,000 educators participated in SN!! professional development activities. Extrapolating this number to include students (based on 25 children per teacher participant) means that approximately 60,000 students are indirectly affected by SN!! professional development activities each year.

SN!! Professional Development Workshops

SN!! workshops are targeted at teachers who wish to teach specific curriculum-related topics in their classroom, or who wish to understand how to teach using hands-on science. The workshops:

- help teachers learn techniques—based on experiential and constructivist learning theories—that effectively break down walls to learning (e.g., the perception among some children that "science is boring");
- require minimal costs to implement and operate: SN!! workshops (such as Crime Lab, Good Vibrations, Some Like It Hot and Build Your Dream House) use equipment available in

Let's Talk Science is an organization that helps supply and inspire educators with the skills, knowledge, confidence and resources needed to be effective science ambassadors. ▶

schools, as well as household supplies and blue-box "junk"; and
- are tested with students to ensure that they are age-appropriate and stress the importance and relevance of science in their worlds.[2]

SN!! Conference and Summer Institute

In addition to workshops, the SN!! portfolio offers educators an opportunity to attend an annual conference and summer institute.

- The SN!! Conference consists of a day of speakers and workshops to enhance and enrich the delivery of science education in the classroom.
- The SN!! Summer Institute—A Symphony of Learning—is a three-day intensive course designed to help teachers learn about hands-on science activities and share effective methods for developing science units to meet the requirements of the elementary science and technology curriculums.

Focus on Youth—Hands-on Science for Children

LTS believes strongly that students receive the maximum benefit from science learning and increase their appreciation of science if they participate in the *exploration of science* itself and if this learning experience happens earlier rather than later in their lives. This philosophy is paramount in all of LTS's youth-centric activities. The Focus on Youth (FOY) umbrella of programs provides hands-on, in-class, after-school and summer science programming for children aged 3 to 14 years and reached over 100,000 children during 2000–2001. Scientific principles, science literacy skills and peripheral skills such as communications, problem solving and teamwork are communicated and developed through fun activities, many of which contain a take-home component so that children can involve their parents in their science discoveries.

Build Your Dream House—A Science Now!! Workshop

The Ontario Science and Technology Curriculum for Grades 1 to 8 expects students to understand basic science and technology concepts; relate science and technology to the world; and develop skills of inquiry, design, problem solving, application and communication. All of these expectations are met through Let's Talk Science's innovative Build Your Dream House workshop.

Science Now!! workshops approach science in an integrated and holistic manner. ▶

The Build Your Dream House workshop—which asks students to construct a house to scale and to design and create brochures and advertisements promoting features of the house—is able to address each of these expectations by integrating elements of experimentation, inquiry, assessment and reflection into the different workshop learning components. Through designing their dream home, through construction and maintenance, and through oral, visual and written presentations, youth and educators alike get to explore and develop the principles and theories surrounding the construction of a house.

- The Build Your Dream House workshop touches on a number of required curriculum components, including structural strength, mathematics, language and visual arts.
- Elements of small group independent work and whole class activities are integrated into the Build Your Dream House workshop. Through such varied learning approaches, students learn many important peripheral skills such as being adaptable and flexible, working within a group, being able to carry out multiple tasks or projects, being innovative and resourceful, and being open and able to respond constructively to change.
- Basic concepts and critical thinking skills related to each aspect of the house project—for example, choosing a beam that allows elimination of a support jack in the basement, or selecting appropriate materials, construction techniques and tools—are developed through hands-on activities dealing with concepts such as triangulation, strength of I-beams, doorways and arches, tension, compression and cantilevers.

2 The current SN!! portfolio of workshops evolved from a two-year evaluation process, conducted by Derek Allison, Associate Professor, Faculty of Education, University of Western Ontario. The process included pre- and post-workshop surveys, a three-month follow-up with program participants and a case study of school-wide implementation.

A Focus on Youth workshop is like having a field trip come to your classroom. ▶

LTS cares about the equity of science learning in Canadian schools. ▶

FOY Workshops

FOY in-class workshops consist of hands-on, in-school activities that are modelled on effective practices and designed around specific science curriculum-connected topics. They are intended to inspire teachers and help students develop their critical thinking and science literacy skills as well as many life skills such as communication, problem solving and teamwork. Magnet Madness, for example, just one of many FOY workshops, offers K–3 educators a lesson on magnets and lets children discover many interesting things about magnetism, such as which objects are attracted to magnets and which aren't and how "opposites attract."

Teachers like Alex D'Arminio, at St. Bernadette Catholic School, in London, Ontario, feel that the FOY workshops offer a good learning experience for both students and educators. "Through my experience with LTS I know my students gained a lot by actively participating in the science learning. As well, I am now far more confident and willing to try new ideas with the kids." Most students feel the same way. At another school, when asked how they liked their FOY science workshop, facilitated by LTS staff member Sue Schofield, students responded: "Thank God for science, and thank God for Sue."

A Sampling of Focus on Youth Workshops

- ✔ *Balancing Act*—learn about the amazing force of gravity.
- ✔ *CCCCold!!*—what happens when liquid nitrogen is used to make "stuff" very cold.
- ✔ *Power Play*—explore the science of the playground.
- ✔ *The Wonders of Weather*—find out how the sun, air and water affect the weather.
- ✔ *Crime Lab*—become a forensic scientist and solve mysteries using fingerprinting chromatography and chemical analysis techniques.
- ✔ *Amazing Aviators*—design, build and test paper airplanes for long-distance and aerobatic flights using Bernoulli's principle and other principles of flight.

Currently, FOY activity workshops are offered through five program delivery centres in London, Toronto, Windsor, Edmonton and Vancouver. LTS staff and science facilitators along with the regular classroom teacher deliver the workshops—which can be purchased by individual schools or school divisions. The cost of a workshop varies depending on duration, grade level and FOY package selected. In 2000–2001, the workshops ranged from $60 to $225.

Let's Talk Science Bursary Program

Let's Talk Science cares about the equity of science learning in Canadian schools, believing that its programs should be accessible to youth and educators who may not be in "big city" schools or who do not have large budgets for ancillary training and learning programs. It is for this reason that LTS, with financial support from RBC Foundation, has devoted considerable effort and resources to providing equal science literacy educational opportunities to all through an innovative bursary program.

Since its inception in March 2000, the LTS bursary program has provided approximately 120 free days of FOY workshops to 103 geographically or economically disadvantaged schools across Canada. The bursary program has enabled LTS to touch the minds of youth and educators who would not otherwise have been able to experience the "wonderment and bedazzlement" of a FOY workshop. LTS currently offers bursaries in British Columbia, Alberta and Ontario.

FOY Community Outreach

Let's Talk Science knows that science is learned not only in the classroom but also on the sports field, in the home, on the bus or in the shopping mall. This is why LTS has developed its FOY Community Outreach stream, an effective approach that reaches youth outside the formal education system. By giving presentations and demonstrations at small community events, working with community groups such as the Guides and Scouts, and by participating in large community events such as air shows and employment fairs, LTS is able to reach a broad audience of learners.

- Adventures in Science, for example, provides hands-on science activities for Girl Guides and Boy Scouts that

are led by science undergraduate student volunteers. All activities count toward various badges, and all children receive an LTS certificate of achievement upon completing their Adventures in Science activity to further recognize, acknowledge and encourage their efforts in science learning.
- LTS also offers summer science programs for youth.

The Partnership Program increases student and teacher awareness and understanding of science literacy. ▶

Partnership Program

LTS's Partnership Program matches volunteer science graduate students and university science faculty volunteers with preschool, elementary and high school teachers in one-on-one science partnerships—usually for one university year or longer. The Partnership Program is the only national outreach program of its kind in Canada and is driven by the efforts of its university graduate student volunteers.

Sponsored by Petro-Canada, the program is available at no cost to elementary and high school teachers who enter into an extended science partnership with the graduate student volunteers. Among other things, the science graduate volunteers answer students' and teachers' questions about science, arrange class visits, provide access to resources such as microscopes, conduct in-class activities and demonstrations, lead professional development initiatives, bring the students to university labs for hands-on science activities, act as mentors, judge science fairs and facilitate activities at school science days.

Through extensive research, evaluation and assessment, LTS ensures that its programs, workshops and activities are positively affecting children and educators. ▶

The underlying goal of the Partnership Program is to increase student and teacher awareness and understanding of science literacy. By design, the program offers a win-win situation to all participants, including the children, the educators and the science volunteers:
- educators have a resource to enhance their science knowledge and science learning in the classroom;
- children get to know real scientists and develop role models; and
- graduate student scientists and faculty volunteers have an opportunity to communicate general scientific concepts and their research activities to a broad audience.

With Partnership Programs at 15 Canadian universities in seven provinces, each year more than 12,000 elementary and high school students, and more than 450 educators, come into contact with LTS's stable of 500 science graduate student volunteers.

Research

Understanding how people learn science and how science programs impact children and educators helps Let's Talk Science develop and deliver the best possible programs, workshops and activities. By actively engaging in the research, evaluation and assessment of its offerings LTS is able to:
- verify that what it is doing is right;
- ensure that its programs, workshops and activities are positively affecting children and educators;
- improve these offerings when need be (i.e., to address changes in provincial curricula); and
- develop new programs, workshops and activities in a professional and timely manner.

A national team of scientists, teachers and adult educators, who excel at designing hands-on learning activities, develops the LTS portfolio of programs, workshops and activities. Ideas for new programs come from a variety of sources, including teachers engaged in existing LTS programs—teachers are asked to complete an evaluation form and to indicate what new programs they would like to see. The team of program developers takes this input, matches it with provincial curricula and designs new pilot programs. These pilots are tested and reviewed by classroom teachers and students, who are asked to identify what they like and dislike, what works and what doesn't. Results are then incorporated into the final program offering. This rigorous and labour-intensive testing process ensures the highest quality

LTS is an award-winning national charitable organization. ▶

portfolio of programs possible. Between 1996 and 2000, LTS developed over 30 workshops using this process.

LTS has also undertaken a number of impact research studies to help better understand the dynamics and intricacies of science education and science learning. Studies have been carried out to assess, for example:

- the impact of an LTS outreach program on improving girls' (Brownies and Girl Guides) attitudes toward science;
- how hiring seven native youth as LTS assistant summer camp counsellors affected their science knowledge, communication and leadership skills; and
- the impact of LTS programs on teachers and parents of preschool children.

Advocacy

Let's Talk Science goes above and beyond the provision of programs and projects by promoting science literacy across Canada. Between 1996 and 2000, LTS staff participated in over 50 scientific and educational conferences and had well over 50 additional speaking and consultation invitations.

- Over the years, LTS has received a number of science promotion awards including two Michael Smith Awards.
- LTS participates in a variety of national and provincial forums where science literacy concepts and ways of thinking are explored. Forums include the Canadian Foundation for Innovation; the Canadian Coalition for Women in Engineering, Science and Technology; Canadians for Health Research; the Alberta Assessment Consortium; The

Assessing the effects of a workshop on student and teacher attitudes toward science and science teaching helps LTS understand how people learn science and how science programs impact children and educators. ▶

Building Life Skills Through Science Education

The purpose of the Building Life Skills research project[1] was to assess the effect of a series of LTS workshops on student and teacher attitudes toward science and science teaching. As well, it was designed to assess the workshops' effect on the development of a positive science culture in school and to assess the effect of a series of hands-on science activities on the development of life skills or employability skills in students.

Methodology

Over the course of a year (September 2000 to April 2001), a total of 60 LTS workshops were delivered in four Ontario elementary schools. Each school received 15 workshops, covering 13 topics, targeted at the kindergarten, Grade 2 and Grade 5 levels—five workshops for each grade.

- Two schools received workshops from September to December (fall hosts), while the other two received workshops from January to March (winter hosts).
- As well, a control group of classes (receiving no workshops) in three of the schools provided comparative control data (participating classes).
- In all, 21 classrooms (12 host and 9 participant) were involved in the study—with data being collected from 23 teachers and their students.

Findings

The research project found that LTS workshops have a positive effect on student and teacher attitudes toward science and the development of life skills among students exposed to this approach to science.

1. Teacher attitudes toward teaching science improved at all grade levels: improvements were most noticeable among kindergarten teachers, those who had no professional development in science, and those with moderate teaching experience who had been in their present schools for several years.
2. Teachers, especially those in the lower grades, developed more confidence in teaching science when the LTS workshops came into their schools.
3. Student attitudes and information about science improved noticeably following the LTS workshops, and at least some of these improvements were sustained over time. The most pronounced impact on student attitudes toward science was found in Grades 2 and 5.
4. Student life skills, particularly problem solving and group participation, increased substantially and significantly during the period students were receiving LTS workshops. The effects were most apparent in Grades 2 and 5 students.

1 Derek J. Allison and Patricia A. Allison, "Building Life Skills Through Science Education, Final Report," unpublished report, University of Western Ontario, London, Ontario, August 2001.

Conference Board of Canada; and the Science Coordinators and Consultants Association of Ontario.

Resources

Starting with just 1½ employees in 1991, today the Let's Talk Science team includes approximately 20 full-time staff, more than 20 part-time facilitators and associates, and hundreds of volunteers all across Canada.

More than 80 per cent of LTS's resources are dedicated to program delivery and research and development activities. ▶

- The LTS portfolio of programs, workshops, research and advocacy initiatives are financed through a number of revenue streams, including corporate donations, foundations and program fees. In 1999–2000, operating revenues were derived from the following streams:
  - ✔ foundations (39%);
  - ✔ corporations (34%);
  - ✔ program fees and registration (19%);
  - ✔ individuals, universities, communities and others (4%);
  - ✔ government (4%).
- Year in and year out, LTS allocates the majority of its resources—more than 80 per cent—directly into program delivery and research and development activities. It is through this targeted resource allocation model that LTS has been able to develop, maintain and continually grow its portfolio of science literacy learning programs, workshops and outreach activities.

Keys to Success

LTS makes the pursuit, acquisition and understanding of science literacy fun and relevant. ▶

LTS Programs and Practices

- LTS achieves its greatest impact through the leveraging of its programs.
- By establishing itself as a national organization—with a large geographical scope—that has a niche focus on promoting science literacy through programs, advocacy and research, LTS has gained the support of educators, parents, universities and financial backers from across Canada.
- LTS programs recognize that the world of science doesn't act in isolation from other disciplines or environments.
- LTS programs, research and outreach activities aim to touch as wide an audience as possible, including youth and educators from both the formal and informal education systems, as well as parents, siblings and other members of the community.
- LTS makes the connection between science and everything and anything else in the curriculum.
- LTS brings science to life and the life of science to its learners.
- LTS is passionate about science.
- LTS has programs that work. Through a rigorous process of developing, testing and reviewing, all LTS products are deemed effective by educators, students and the LTS team prior to being offered as part of any learning platform.
- LTS believes strongly in building partnerships with other organizations, learning and education systems, and associations in order to promote science awareness and science literacy across Canada.

LTS Governing Beliefs

- Science and innovation impact the lives of all people.
- It is important to challenge people to think critically in the pursuit of personal and societal growth.
- Today's youth are tomorrow's discoverers.
- It is important to encourage people to become lifelong learners of science in order to appreciate and evaluate the impact of science on everyday life.
- Educators, particularly elementary school teachers, play a pivotal role in the development of a science culture in Canada.

The LTS Way of Learning

- LTS makes the pursuit, acquisition and understanding of science literacy, life skills and knowledge a relevant and fun experience by focusing, in part, on students' feelings and attitudes toward learning.
- LTS goes out of its way to make teachers feel comfortable with their science and science literacy knowledge. SN!! professional development workshops,

LTS programs, workshops and outreach activities are supported by constructivist and experiential learning theories. ▶

for example, demonstrate to teachers that they do not have to be experts in science in order to teach science—teachers are experts in *teaching*.

- LTS structures its workshop and program learning environments around connected skills concepts (including science literacy and employability or life skills) and makes science learning memorable and relative to a learner's world. This enables educators and students to engage in the knowledge transfer process and the "bigger science picture," rather than simply learning or conducting the task at hand.
- LTS programs, workshops and outreach activities are supported by current learning theories—constructivist and experiential learning theories—and are delivered in a manner that mirrors these theories (e.g., all LTS workshops are hands-on).

Finances and Governance

LTS is run as a business that is focused on and committed to its learning market. ▶

- LTS has a dedicated and objective board of directors. They believe in what LTS is doing, are involved in LTS for the long-haul and are committed to developing science literacy, science awareness and science understanding in Canada. "Our job is not to build LTS into an empire," says Mitchell Baran, LTS board Chair, "but to leverage ourselves—through training and development activities, research, advocacy, and interactive learning experiences—and ultimately to hand over science literacy learning best practices and approaches to other public and private learning organizations."
- The LTS board is committed to instilling in the organization a strong sense of financial responsibility and accountability by insisting that LTS have a business plan, detailed budgets and multiple-year strategy—LTS is run as a business that is focused on and committed to its learning market. The board ensures that money is spent wisely.
- Having a strong group of like-minded supporters and sponsors, who believe in LTS and its work, enables LTS to offer a broad range of programs, workshops, outreach activities, research and advocacy.

Supporters of LTS

National founding supporter: DuPont Canada.

National supporters: Imperial Oil Charitable Foundation, the Natural Sciences and Engineering Research Council and J. Armand Bombardier Foundation.

Program-directed supporters: Petro-Canada, TD Financial Group, RBC Foundation, Hewlett-Packard (Canada), Great-West Life Assurance Company–London Life, Suncor Energy Foundation, the Ontario Ministry of Energy, Science and Technology, Binney & Smith Ltd., Ontario Trillium Foundation, the University of Western Ontario and the University of Windsor.

The LTS Recipe for Success

Let's Talk Science has developed a recipe for science literacy success. Like any good recipe, it requires a proper blending of quality ingredients, careful measuring, attention and dedication.

1. Take a group of dedicated and enthusiastic individuals—scientists, educators and volunteers—committed to raising awareness of science and the importance of science literacy among today's youth.
2. Add to this a mix of hands-on, stimulating and relevant science workshops, programs and activities for children and educators that are developed, tested and proven effective by these dedicated individuals. (Note: for maximum effectiveness make sure that these programs and activities are curriculum-matched.)
3. Throw a dollop or two of life skills into the program mix.
4. Stir in a board of directors, sponsors and funders who are intent on making this mixture of science literacy learning programs as sound, sustainable and interesting as possible.
5. Offer your services across the country—to schools, community groups and associations at no-cost or at superb value.
6. And, voila, you've got a full course science literacy meal that will change the way students and educators learn, understand and apply science.

To date over 500,000 LTS science literacy meals have been served.

The LTS staff see themselves as being ambassadors of science. ▶

Staffing and Volunteers

- LTS is a young-minded and young-at-heart organization made up of a team of employees who see themselves as being, first and foremost, ambassadors of science. These employees are dedicated, high-energy, flexible, creative, passionate, dynamic, entrepreneurial, enthusiastic and opportunity-driven. Each staff member, each facilitator and each associate is committed to developing and following quality processes and standards.
- LTS has an exceptionally large and dedicated volunteer contingent—over 800 strong—all of whom are committed to the LTS mission, programs, workshops and outreach activities. Without this group of volunteers, LTS would not be able to reach as many students and educators as it does.

Challenges

- Informal education sector programs, including LTS programs such as those in the SN!! professional development portfolio, face the challenge of gaining accreditation by provincial teacher governing bodies (in Ontario, for example, the Ontario College of Teachers).[3] With boards of education having a finite pot of money, they more often than not prefer to spend it on programs that are accredited and recognized—regardless of their apparent value or quality. This can limit LTS's ability to reach as many educators (and youth) as possible.
- Volunteer turnover rates in the LTS Partnership Program necessitate that a great deal of time and effort be devoted, on an ongoing basis, to finding, training and retaining graduate science student volunteers.
- Maintaining a national organization and national presence with finite resources requires a well-connected, well-versed, highly communicative and energetic team of staff, volunteers and leaders, who need to be constantly informed and updated on LTS programs, research, policies, projects and day-to-day functions.
- It takes tremendous resources (predominately time and money) to plan, develop, test, prepare and deliver the LTS portfolio of programs, workshops and outreach activities. Program fees and registrations do not cover the costs. As the need and demand for new and existing programs rise, LTS is in a constant state of fund finding. It is a full-time job to identify and secure new sponsors and funders, as well as to retain existing ones.

It takes a tremendous resource to plan, develop, test, prepare and deliver the LTS portfolio of programs, workshops and outreach activities. ▶

Innovations

- LTS makes the connections between science and everything else clear, simple and very well understood.
- LTS uses an integrated approach to science learning that blends interdisciplinary subject matter (e.g., arts, history, science and music) into its learning programs, workshops and outreach activities. As a result, the possibilities for project- and inquiry-based learning are not constrained by subject or time allocations.
- LTS is for youth and educators alike. Its programs, workshops and outreach initiatives are able to focus on students or on educators as required.
- LTS extensively tests, evaluates and researches its own program design and delivery components to ensure that a high-quality product is offered. Changes to program design and content are made based on testing and evaluation results.
- By collaborating with universities to deliver the LTS Partnership Program, LTS is able to utilize a team of skilled and knowledgeable university graduate

3 At the time of writing this case study, the Ontario College of Teachers was formalizing the process for accrediting informal education sector programs such as LTS's suite of science literacy programs.

"Let's Talk Science provided a fabulous, concrete science learning and life skills learning experience for all of the children. They talked so much about it—amongst themselves and with the teachers."

—Stephen Szabo, Principal, St. Bernadette Catholic School

student volunteers. Not only does this keep expenses down for LTS, but it also produces better scientists by assisting in the development of their communication skills and their understanding of how science fits with other subjects and the world outside the laboratory. As well, children see the volunteers as role models and mentors.

- LTS is actively involved in a wide variety of community activities and initiatives that other science promotion organizations might not be involved in (e.g., non-science-related assemblies, fairs, camps and community days). This enables LTS to engage more people in the excitement and wonderment of science and to further relay the message that science literacy is an important asset for all people.

Achievements

Awards and Recognition

- The 2000 and 1995 Michael Smith Award (Natural Sciences and Engineering Research Council)—for promoting science education in Canada.
- The 1997 99's Canadian Award in Aviation—for LTS's Amazing Aviators workshop.
- The 1995 Peter F. Drucker Award for Canadian Nonprofit Innovation (Honourable Mention).
- Between 1996 and 2000, Let's Talk Science delivered over 5,000 school workshops and reached over 500,000 youth and educators.

LTS has reached well over 500,000 youth and educators.

Learning Outcomes

- LTS reaches many children and educators (more than 142,000 in 1999–2000) directly or indirectly, through its portfolio of student- and teacher-oriented workshops, conferences and outreach programs.
- LTS breaks down many of the walls to science and science learning for youth and educators by engaging learners in hands-on, constructivist and experiential learning activities.
- Youth from all levels and backgrounds quickly become active participants in LTS programs, eager to develop their science literacy and life skills.
- Generally speaking, students and educators become more enthusiastic about science and more comfortable with science through their involvement in LTS programs—this fact has been documented through LTS's extensive outcomes-based research projects.
- Children's teamwork, problem-solving and critical thinking skills are greatly enhanced through their involvement with LTS programs—this fact has also been documented through LTS's research initiatives.
- Children's ability to retain knowledge is increased through the interactive, hands-on learning approaches used by LTS staff, associates and facilitators.
- LTS enables people of all ages to feel more confident when exploring and searching for answers. They come to understand that an incorrect answer is not necessarily the wrong answer, but that it is one step closer to finding the right answer.

Conclusion

Let's Talk Science's approach to learning is one of intrigue, excitement and enjoyment. Through its portfolio of programs and workshops, LTS gives students and educators an integrated package of science literacy and life skills development tools—tested and proven to be effective—that will help them better appreciate the value and importance of science in today's knowledge-based economy.

LTS shows students and educators that science is everywhere. Science is in their homes, in their schools, in the community, on the bus, and in the movies. LTS also recognizes and shows its learning audience that science literacy is about much more than just science, and that everyone—from the budding computer scientists to the graphic artists and sales clerks—needs a blend of both generic life skills and science literacy skills to succeed or even survive.

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LTS provides a complete skills development model to those youth and educators who engage in the workshops, outreach programs and learning activities by providing hands-on, minds-on collaborative learning opportunities. It also prides itself on knowing that its programs and activities are tested, validated and proven effective—through rigorous in-house and external research and evaluation procedures.

Where LTS really stands out is in how it makes learning exciting, engaging and relevant. For example, students and educators alike can relate to the knowledge transfer that takes place in the Wonders of Weather and Crime Lab workshops, because their learning experience is relevant to what is going on in their personal lives and in the world around them (as seen through newspapers, the Internet, television and radio). LTS presents science in a language and format that is understandable, easily shared and easily talked about. Finally, LTS emphasizes, through its programs and workshops, how science literacy skills, life skills and knowledge can be transferred and applied whatever the context—whether in a science lab, at home, in school, at work or somewhere in the community.

NBEC Publications Relating to Employability Skills Development and Assessment

Employability Skills 2000+

Employability Skills Toolkit for the Self-Managing Learner

Science Literacy for the World of Work

Understanding Employability Skills (April 1999)

The Economic Benefits of Improving Literacy in the Workplace, 206-97 Report

Enhancing Employability Skills: Innovative Partnerships, Projects and Programs, 118-94 Report

Linking Teachers, Science, Technology and Research: Business and Education Collaborations That Work, 144-95 Report

1999–2000 Business and Education Ideabook

1998 100 Best Partnerships IdeaBook

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