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## **DEVELOPING STATISTICAL LITERACY IN YOUTH: STATISTICS CANADA'S EDUCATION OUTREACH PROGRAM**

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### **ABSTRACT**

Statistics Canada's Education Outreach Program allows the Agency to play an active role in improving the statistical literacy of Canadian students.

The Program is based on two pillars: an interactive website which offers access to free online information, learning tools and resources specifically designed for the education community and a network of education representatives who work in the Agency's regional offices providing expertise and support at a grassroots level. The Education Outreach Program is a direct benefit to the Canadian educational community: one that is now more informed about Canada and Canadians.

**KEYWORDS:** Statistical Expertise; Statistical Literacy; Statistical Resources.

### **1. A GROWING APPETITE FOR DATA AND DATA SKILLS**

In our knowledge-based society and economy, the average Canadian is confronted with figures on a daily basis and is asked to form judgments based on the story they tell. Data have become ubiquitous. We live in an environment where data are everywhere. Graphs, charts, rates, percentages, probabilities, averages and forecasts are part of our everyday life. People are becoming accustomed to seeing the results of surveys reported in the daily press, incorporated in messaging by advertisers, mentioned by political and social analysts and used by economic forecasters.

It is important that citizens are able to take these ever-present data, understand what is being presented and use them appropriately for real life, decision-making applications.

The Canadian educational system recognizes that the skills to understand and use numbers must be part of the learning outcomes for children in virtually every grade. In this context, statistical literacy has been defined as the ability to:

- understand and interpret statistical data;
- critically evaluate statistical information and data-related arguments;
- use the information in context of daily life; and
- discuss or communicate one's reactions (Smith, M. 2002).

New and rigorous math curriculum in Canadian schools dictates that young Canadians learn how and when to apply data and understand when to challenge the veracity of the numbers. This will help students develop the skills they need to succeed in the new knowledge based economy, a benefit to our youth- future citizens and entrepreneurs- and in the long term, our nation.

“All graduates should be ‘good consumers of quantitative information’...they ought to be able to understand statistics...[be able to] ...read a report that contains statistical analysis. They ought to

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be familiar with the logic that goes along with quantitative analysis even though they may never be mathematicians or statisticians.”

John Waterhouse, Academic Vice President, Simon Fraser University

Statistics Canada, the nation's statistical agency, has long acknowledged that it should be active in supporting the development of such skills. Teaching the fundamentals of statistics however, is not the role of a national statistical organization. That is what teachers do. As the nation's statistical agency, we have a role to play. That role is to ensure that data and information are provided in a physically and intellectually accessible form to students and teachers to support the teaching and learning efforts not only in statistics proper but in all subjects. And further, it is in our own interest to provide the resources to demonstrate how to analyze statistical information to use in actual problems and projects in the school setting.

Students are future users of our statistics and respondents to the many surveys we undertake which rely on the willing co-operation of citizens. Investing in their interest in statistics is planting the seed of our ongoing relevance and viability as the national statistical organization.

## 2. THE GENESIS OF EDUCATION OUTREACH AT STATISTICS CANADA

Statistics Canada is a learning organization —by virtue of its mandate to collect, compile and distribute information about Canada and Canadians. Not only is there a strong commitment to continued education within the organization but for some time now, Statistics Canada has fostered an environment that promotes the sharing of its considerable expertise with the education community.

Several factors came together in the mid to late 1990's that paved the way for the development of Statistics Canada's Education Outreach Program which focuses on K-12 students and teachers.

First, there was a growing appetite for information among the general public and an ever expanding use of data for prediction and decision making. Charts and graphs were being increasingly used in the media, in advertising and in polls. Inquiring minds wanted to know more!

Second, Industry Canada our federal partner, through their SchoolNet program, linked all Canadian schools (16,500) to the Internet and helped provide them with computers. This expanding Internet technology presented an opportunity for a broad and affordable access platform into the schools. Not only could we now distribute large amounts of data online for a small incremental production cost, but we could also incorporate innovative and interactive measures that would permit us to actually share the agency's intelligence. This is something we could not do in the past with print publications alone.

At the same time, new curricula in schools across the nation introduced statistics and probability as one of the four key teaching strands in math. Starting in kindergarten with fundamental data discovery, students now move to sophisticated data applications that require, by Grade 12, a solid understanding of the concepts and processes used in data analysis.

For instance, the statistics and probability strand at an elementary school level identifies the following outcomes:

- With assistance, kindergarten and Grade 1 students (approximately 6 years of age) collect, organize and analyze data based on first-hand information.
- By Grade 4, students assess and validate the data collection process.
- Starting in Grade 5, students develop and implement a plan for the collection, display and interpretation of data to answer a question.
- In Grade 8, students (approximately 13 years of age) should be able to evaluate and use measures of central tendency and variability.

Who better than Canada's National Statistical Agency to support the pedagogical lead in these outcomes! (Ryan, R. 2001) These concepts are at the core of Statistics Canada's knowledge and expertise. By establishing Education

Outreach, Statistics Canada was able to develop a program to manage the transfer of data, information and knowledge to over 6 million Canadian students and teachers, while actively engaging the enormous education market in a cost effective manner.

"It is important that our young people know the wide- ranging kinds of info available to them through the work of Statistics Canada. It is equally important that they learn how to find this information, become comfortable and competent using it and to understand the issues raised by it."  
Executive Director, B.C. School Trustees Association

### **3. THE CHALLENGE OF REACHING CANADIAN STUDENTS**

In Canada, Education is a provincial undertaking with different curricula and learning environments in each province.

To approach this large but regional market, the Education Outreach Program was structured on two pillars: online resources that harness technology for mass distribution, and a network of champions that leverages Statistics Canada's human resource and expertise. The primary target market for Education Outreach is students- over 30% of the access to the Statistics Canada web site is by students searching for information to help in their assignments. Statistics Canada needed to engage Canadian teachers and provide them with support in order to connect to relevant curriculum and reach students in their classroom activities.

### **4. THE LEARNING RESOURCES PORTAL**

The first pillar of Education Outreach is Learning resources on [www.statcan.ca](http://www.statcan.ca). It is an important portal, with three separate entrances designed specifically for students, teachers and the post secondary community. It brings together a vast array of useful resources: teaching tools, data and information to support curriculum, online advice through the educator's discussion forum, the "Ask an Expert" feature where students get response to questions. Over 150 lesson plans in every school subject are listed by level and created in a standard format to help save time for teachers. This site is not just about data distribution, but rather, it's an interactive site where we provide and receive advice, where we offer the opportunity to hear back from our 4,000 users per day. Teachers can also sign up to receive an electronic bi-monthly bulletin direct to their desk top that keeps them plugged into everything that is new on the site.

Two key products on the Learning resources site put Statistics Canada expertise online in a way that marries content and support: E-STAT and Statistics: Power from Data!

#### **4.1. E-STAT: a Dynamic Research Tool**

E-STAT offers education institutes free, unlimited use and access to Statistics Canada's entire data warehouse for social and economic data (Cansim II) as well as Census data (up-to-date and historical). It is estimated that one would have to click for 42 years, day and night, to get through the massive amounts of data contained in the Cansim and Census databases. In order to categorize and make the information user friendly to students, we created a special E-STAT interface. Students and teachers can easily find subjects of interest on Canada's economy, land, people and government. They have quick access to articles, data and dynamic mapping and graphing. Over 9,500 Canadian schools are registered to use E-STAT. Features include the user guides, tutorials, the E-Stat forum, a moderated service where educators discuss how they are applying E-Stat in class, the Help and Frequently Asked Questions, and the "Contact E-STAT" button.

Students can access over 500 articles from popular Statistics Canada publications such as Canadian Social Trends. E-STAT is a very powerful data presentation tool. On a topic like immigration, for example, students can map recent data from the 2001 Census at different levels of geography, right down to their own neighborhood. Or they can use data covering several years to create a graph that illustrates historical trends in immigration.

## 4.2. Surveys from Start to Finish

Statistics Power from Data! Is an online modular training package that covers all aspects of surveys, from collection to measures of central tendency, to interpretation and analysis. Lesson plans, a glossary of terms, case studies and examples are included. Each of the 13 modules is independent and links to supporting resources. Creating this product was a huge undertaking- two years in the making that included comments and editing by many areas of our organization. If you study all modules, you will have a good rudimentary understanding of what a statistician does. In fact, while we created this online learning package because of demand from high school students, we are now discovering that our own Statistics Canada employees are finding this a helpful refresher.

## 5. SHARING STATISTICAL EXPERTISE

Perhaps the most visionary part of Education Outreach is the second pillar, our human support component. Our network of champions includes 5 dedicated regional education representatives who provide training, coaching and knowledge at a grassroots level. From the west to the east coast, from north to south, they keep their finger on the education pulse, understand the different curricula and environment in every province and territory and know where Statistics Canada data and expertise fit. They work with regional associations and organizations that support educators such as teachers' federations, ministries of education, curriculum and IT consultants. They get our message out by leveraging resources and by creating and nurturing relationships with teachers that in turn work with their peers, passing on information on behalf of Statistics Canada. They are visible and present in the community at conferences and teacher professional development days.

The Statistics Canada regional education representatives also provide workshops and distribute the Learning with Canadian Information broadsheet to over 20,000 pre-service teachers at about 60 Faculties of Education across Canada and to 40,000 in-service teachers each year.

It is through our regional education representatives that we are able to partner in interesting and beneficial initiatives. Requests for partnership with provincial education ministries and organizations like this are unprecedented by any other federal department. Some important examples include:

- Professional development of teachers using new media.

In Ontario, Statistics Canada offers 4 online learning courses, in conjunction with the Ministry of Education, the Education Network of Ontario and the Toronto District School Board, that allow teachers to acquire credits towards recertification while learning about using Statistics Canada data.

In Nova Scotia, the Ministry of Education has created teacher training videos that show how Statistics Canada information is being used with students. These videos have a distribution network of over 350 schools in Nova Scotia alone.

Through ABEL, the advanced broadband enabled learning project, in conjunction with CANARIE, Statistics Canada is providing online teacher training, in real time, which goes out to schools across Canada. This Internet training is also archived for future reference.

- Initiatives in curriculum development and inclusion in new textbooks

Over 50 new textbooks host Statistics Canada data or direct students to our website. One text book publisher has posted a subset of Statistics Canada micro data on their website. Students are directed from their text book to visit the site and use a password to access the micro data. This is a truly innovative example of blending analogue and digital technology.

As participants in the working group that actually created the new Grade 12 course on Data Management in Ontario, the province with over 30% of students and teachers in Canada, Statistics Canada was successful

in actually getting its resources written into the curriculum. Students are required to do a major research project using data. Statistics Canada benefits greatly from this new course.

Two other Education Outreach initiatives put our entire department's expertise to good use: the Classroom Outreach and the Expert Speakers programs. These initiatives allow over 175 Statistics Canada employees to get involved in supporting teachers and students on a weekly basis.

### **5.1. Working Directly with Students**

The Classroom Outreach program leverages employee knowledge at the primary school level. This program in the Ottawa-Gatineau area encourages and supports employees to work up to two paid hours per week in local classrooms, assisting teachers and helping kids. This school year alone, Statistics Canada has contributed over 5,000 hours and close to \$300,000 of resource into local schools. The program is as rewarding for the employees as it is for the kids. Everyone is learning! Our employees are trained before they go into the schools. These employees are making a difference to education in the community.

The Expert Speakers program, aimed at intermediate and high schools, allows our subject matter specialists to provide classrooms with real-life expertise, answering questions, doing presentations and helping with statistical projects. Thousands of students benefit from hearing first hand about topics such as health, international trade, environment, how to complete a survey or simply what a mathematician does. We are just now in the process of digitizing some of these speakers so that students across Canada can benefit. A video and presentation of our most senior Expert Speaker, Canada's Chief Statistician, Dr. Ivan Fellegi, discussing emerging social issues of interest to youth, has been released through the Learning resources web site.

## **6. THE FUTURE OF EDUCATION OUTREACH**

Statistics Canada's Education Outreach is a great success. Users tell us so. The program is flourishing and has demonstrated results far beyond our expectations. We know we are making a difference.

The most encouraging results of Education Outreach are the testimonials and feedback we receive from teachers who are applying Statistics Canada resources to benefit with students.

Teachers observe that students who normally perform poorly do much better in a project oriented environment using real life data applications. Students are motivated and understanding concepts and methods faster. This is knowledge sharing at its best!

### **6.1. Broadening our Horizons**

Statistics Canada continues to explore ways to pass on our knowledge, to encourage statistical literacy.

As new technologies and new partnership opportunities emerge, Statistics Canada will participate.

For example, the Learning resources team at Statistics Canada is tagging relevant information by education standards to ensure that it will be included in learning object repositories used to create online learning courses in Canada.

Statistics Canada is also involved in leading the Canadian component of Census at School, an international statistical literacy project that allows students to gather relevant information about their lives to be used in classroom activities. Through this project and through our liaison activities with other statistical agencies we are able to garner new perspectives on activities in international statistical literacy.

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