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Connectivity and ICT Integration in First Nations Schools: Results from the Information and Communications Technologies in Schools Survey, 2003/04

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Johanne Plante
Statistics Canada

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Introduction

In this age of the information society, information and communications technologies (ICTs) have become everyday tools for living, learning and working. Nearly every facet of our economy and society has been touched by ICT. These days, ICT in education has become a priority for governments, educators, businesses and policy makers, in an effort to close the digital divide and to monitor how well equipped students are with the skills necessary to succeed in today's technology-savvy workplace.

Substantial investments have been made over the past several years to acquire hardware and software for schools, as well as to connect elementary and secondary schools and classrooms to the Internet. However, to realize the full benefits of this investment in education technology, it takes much more than installing the hardware and software. Still, it is critical that schools have the necessary infrastructure available if ICT is to be integrated into the learning environment.

Infrastructure includes the different components of ICT that make up the underlying foundation of a connected school, such as the number of computers and their characteristics. **Reach** refers to the degree to which teachers and students have access to the ICT infrastructure.

The Information and Communications Technologies in Schools Survey (ICTSS) was designed to build a comprehensive database on the state of ICT infrastructure and access in elementary and secondary schools across Canada, including First Nations schools. Developed by the Government of Canada's SchoolNet Program, in cooperation with the SchoolNet National Advisory Board, and Statistics Canada, the focus of the 2003/04 ICTSS was the measurement of ICT infrastructure and ICT reach.

Using data from the ICTSS, this report will provide information on ICT infrastructure and reach in First Nations schools who returned their questionnaires (i.e. *responding* First Nations schools) in Canada.

Results from the First Nations portion of the ICTSS

Results presented in this report are based on 154 questionnaires out of the 588 questionnaires that were mailed out to First Nations schools in April 2004 as part of the First Nations portion of the ICTSS (a return rate of 26%). Results should be seen as presenting the answers and opinions provided by principals of the *responding* schools and not as representative of First Nations schools overall.

The frame for the First Nations portion of the ICTSS was based on pre-identified First Nations schools on the main ICTSS frame and refined with the aid of information received from Industry Canada, Indian and Northern Affairs Canada, and First Nations Regional Management Organizations.

Little information was available on the nature of schools who did not return their questionnaires. More information would have been needed to identify “out-of-scope” records, to derive a true non-response rate, and to determine the nature of the corresponding bias. Although the response rate could not be calculated, the return rate of 26% for First Nations schools suggests a high non-response occurrence for the survey. As a result of the potentially high non-response rates associated with such a small population, and the lack of information available to define the in-scope population, data for First Nations schools have not been weighted and thus, have not been adjusted for non-response.

It is important to note that First Nations schools in Quebec are not included in this report.

While it is not possible to provide full information on possible response bias for these schools, it is worth noting that available information does show that the responding schools reflect a variety of rural and urban schools, as well as of elementary and secondary schools.

Information on whether a school was urban or rural was available for all schools in the mailout. Based on this information, the rate of return for rural schools was lower than that for urban schools. While urban schools might be over-represented in the reported data (compared to mailed questionnaires), rural schools still made up 74% of respondents (compared to 85% of the mailed questionnaires).

For about three-quarters of the mailout, information is also available on the level of the school (elementary, secondary, or elementary/secondary mixed). For this portion of the frame, the information shows that elementary schools might be slightly over-represented in the reported data (42% of respondents, but 38% of the mailed questionnaires). At the same time, elementary/secondary mixed schools might be under-represented (47% of respondents, but 50% of the frame). There is no notable difference in the proportion of secondary schools (about 10%). This shift between elementary and mixed schools may be a reflection of the lower rate of return of rural schools’ questionnaires.

While the first ICTSS report released in June 2004 covered all elementary and secondary schools in Canada, this second report concentrates on First Nations schools. Information on First Nations schools was collected from April to June 2004 and refers to the 2003/04 school year. The survey respondents were the school principals who provided both the data available to them as well as their views on ICT. In some cases, however, principals may have consulted or involved others in their responses.

Analysis will be performed for five of the six First Nations SchoolNet Regional Management Organizations (RMOs): Atlantic (Prince-Edward-Island, Nova Scotia, New-Brunswick and Newfoundland and Labrador), Ontario, Manitoba, Saskatchewan/Alberta and British Columbia. No analysis will be performed for Quebec given the low return rate for that region. Comparisons will also be made between responding First Nations schools and rural elementary and secondary schools across Canada.

Since results presented in the following analysis are based on all responding schools within a region, any claims by RMO should be made with caution as the characteristics of the responding schools (e.g., rural, urban, small, large) may vary considerably from one region to the next. It is worth also noting that, given the small sample size, comparisons with more specific profiles of schools between the different Regional Management Organizations (RMOs) was not possible (e.g. comparing rural schools across RMOs).

First Nations SchoolNet program

Computers and Internet access are important tools for creating stimulating learning environments. Recognizing the challenges that First Nations schools may face in accessing and applying these technologies, Industry Canada created the First Nations SchoolNet program.

Six non-profit Regional Management Organizations work with Industry Canada to deliver the program to First Nations schools: Atlantic, Quebec, Ontario, Manitoba, Saskatchewan/Alberta and British Columbia.

The first section of the report briefly profiles the First Nations schools who participated to the survey. Section two presents a profile of the current ICT infrastructure in responding schools. It includes information on the number of computers available to students and teachers for educational purposes; their characteristics (i.e. desktops, laptops, operating systems and processor speeds); and the average amount of time devoted per computer each month for ICT technical support.

Section three offers a snapshot of school connectivity. It looks at the number of Internet-connected computers available to students and teachers for educational purposes, the types of connections used to access the Internet, the proportion of schools with an intranet or a website, as well as the presence of videoconferencing technology.

The fourth section documents students' and teachers' access to the available ICT infrastructure (computers, Internet-connected computers and software). The analysis examines the availability of computers outside of regular school hours, presence of e-mail accounts and online courses.

Section five summarizes the views of the principals regarding the ability of teachers to use ICT effectively for learning purposes.

Challenges to using ICTs in schools are addressed in section six, while section seven summarizes and offers concluding remarks.

1. A profile of responding First Nations schools

This section briefly describes the schools who participated in the ICTSS survey. This will help in the interpretation of findings presented throughout the report.

First Nations schools who returned their questionnaires were predominantly small, rural and either elementary or mixed elementary and secondary schools.

Of all responding First Nations schools in Canada, about half were classified as elementary schools (49%), followed by mixed elementary and secondary (36%) and secondary schools (15%) (Table 1). While a majority of responding First Nations schools in Atlantic (74%), Ontario (55%) and in British Columbia (59%) were classified as elementary schools, a large share of responding schools in Manitoba (63%) and in Saskatchewan/Alberta (57%) were classified as mixed elementary and secondary schools. The largest proportion of secondary schools was found in Ontario with 27% of responding schools in that Regional Management Organization (RMO).

Rural schools accounted for nearly three-quarters of all responding First Nations schools. The largest proportion of urban schools was found in British Columbia with 47% of all responding schools in that RMO, followed by Ontario and Atlantic with 32% respectively.

About 60% of responding First Nations schools were classified as small schools, followed by medium (20%) and large schools (18%). The largest proportions of medium and large schools were found in Manitoba (70%) and Saskatchewan/Alberta (68%) (most of these schools were classified as mixed elementary and secondary schools, i.e they had more than 60 students).

Table 1
Percentage of responding First Nations schools by characteristic, 2003/04

	All responding schools	Elementary	Rural	Small
	Percentage			
All responding schools	100.0	49.3	73.7	61.2
Atlantic	12.5	73.7	68.4	84.2
Ontario	28.9	54.5	68.2	72.7
Manitoba	17.8	29.6	96.3	29.6
Saskatchewan/Alberta	18.4	32.1	89.3	32.1
British Columbia	22.4	58.8	52.9	82.4

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

School characteristics

The school instructional level is classified as **elementary** if the school offers grade 6 and under or a majority of elementary grades and **secondary** if the school offers grade 7 and over or a majority of secondary grades. For the purpose of this analysis, schools offering a combination of elementary and secondary grades are referred to as **mixed**.

The size of the school is based on the number of students enrolled, by instructional level, as shown in the distribution below.

	Elementary	Secondary	Mixed elementary and secondary
Small	Less than 200 students	Less than 300 students	Less than 60 students
Medium	200 to 350 students	300 to 700 students	60 to 200 students
Large	More than 350 students	More than 700 students	More than 200 students

The location of the school is defined as either rural or urban. **Rural** schools are located in rural areas and small towns (RST) or within the rural fringes of a larger centre (census metropolitan areas (CMAs) or census agglomerations (CAs)). **Urban** schools are located in a CMA or CA, but not in the rural fringe (Statistics Canada 2003).

2. ICT infrastructure in responding First Nations schools

If schools and teachers are to be effective in integrating ICT into the learning environment, then having the necessary infrastructure or plan to acquire and maintain the infrastructure is the crucial first step.

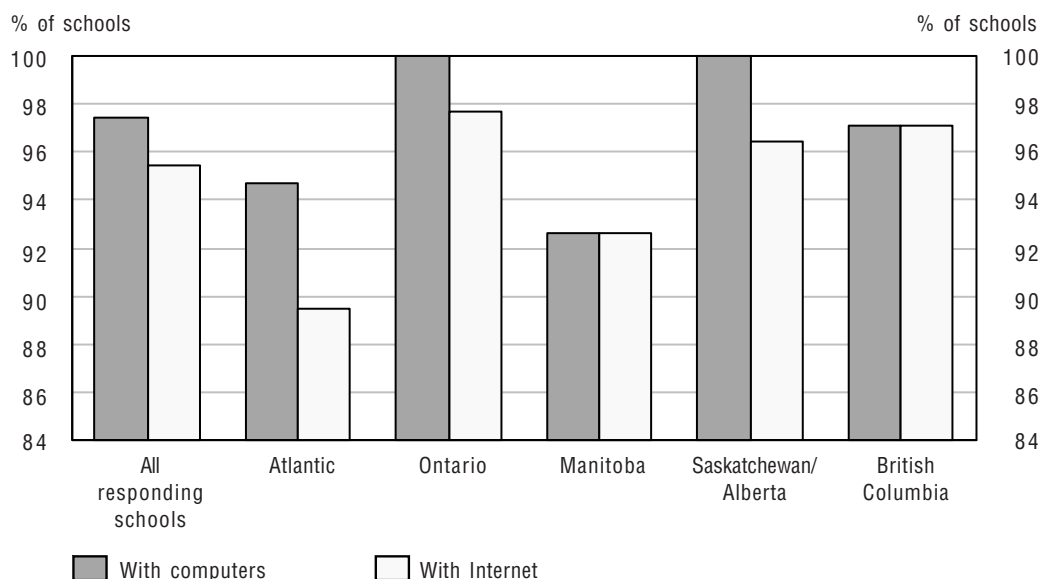
The foundations of ICT are present in responding First Nations schools.

With a few exceptions, virtually all responding First Nations schools had computers (97%) and were connected to the Internet (95%) during the 2003/04 school year (Figure 1). Some First Nations schools may have decided, for various reasons (cost, technical reasons or others), not to have such technology.

The proportion of responding schools with computers ranged from about 93% in Manitoba to all schools in Ontario and Saskatchewan/Alberta, while the proportion of First Nations schools with Internet-connected computers ranged from about 90% in Atlantic to about 98% in Ontario.

Figure 1

Proportion of responding First Nations schools with computers and Internet-connected computers by RMO, 2003/04



Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

The ICTSS asked school principals whether or not the school or school board/district/territory has a written technology plan that provides details about hardware and software acquisition, upgrading and replacement.

While most principals reported having computers and Internet in their schools, only a few of them (14%) reported having a technology plan for ICT acquisition, upgrading and replacement of hardware and software. The proportion of responding First Nations schools with such a plan fell well below the proportion (62%) reported by the other rural elementary and secondary schools across Canada (Statistics Canada 2004a).

2.1 Availability of computers for students

Computerization is widespread in responding First Nations schools with both desktops and laptops being used in the learning environment.

According to principals of responding First Nations schools, the majority of school computers being used for educational purposes during the 2003/04 year were desktops (96%). Laptops and notebooks were used to a lesser extent (4%) in the learning environment.

The proportion of desktop computers used for educational purposes varied only slightly by RMO, from about 95% in Ontario to 97% in Atlantic, Manitoba and British Columbia. There was little variation in the proportion of school laptops and notebooks between RMOs – the proportion of such computers in responding First Nations schools varied from 3% to 5% across the different regions.

Computers were available for teachers and students use in responding First Nations schools.

With, on average, 42 computers for 154 students, there was roughly one computer in responding First Nations schools for every 3.5 students (Table 2). The median number of students per computer in First Nations schools, as reported by principals who returned their questionnaires, ranged from about 2.8 students per computer in British Columbia and Ontario to about 4.8 in Manitoba. The typical number of students per computer for First Nations schools located in rural areas (3.5:1) was about the same as that for schools located in urban areas (3.4:1).

While the typical number of students per computer in rural First Nations schools (3.5:1) was similar to the one observed in rural elementary and secondary schools across Canada (3.8:1), there were fewer students per computer in responding First Nations schools located in urban areas (3.4:1) than in other urban schools in Canada (5.4:1). This difference may, however, be attributable to the fact that urban First Nations schools are generally smaller than the other urban schools across Canada.

Certainly the student-to-computer ratio by itself does not convey much information about the actual functionality and use of the equipment, but serves as an indicator of the existing ICT infrastructure and its availability in a given school (Statistics Canada 2001).

Table 2

Access to computers in responding First Nations schools by RMO, 2003/04

	Average number of computers	Average number of students	Median student-to-computer ratio
All responding schools	42	154	3.5
Atlantic	32	112	3.9
Ontario	41	139	3.4
Manitoba	68	293	4.8
Saskatchewan/Alberta	51	183	3.8
British Columbia	24	63	2.8

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

2.2 Computer operating systems and processing speeds

The quality of the ICT infrastructure currently available in schools is one way to assess the capability and usefulness of computers and their applications for the learning environment. Principals of First Nations schools were asked to indicate the proportion of their school computers that were running on new or recent operating systems, as opposed to older operating systems.

Responding First Nations schools were equipped with the most recent technology.

During the 2003/04 school year, about half (47%) of the responding First Nations schools had the majority of their computers running on the most recent operating systems, ranging from 40% in Manitoba to 56% in Saskatchewan/Alberta (Figure 2). By comparison, only one-quarter of the elementary and secondary schools located in rural areas in Canada had the majority of their computers running on the most recent operating systems (Statistics Canada 2004a). Depending on the instructional level, however, many of the computer applications available in schools may not necessarily require the latest operating system in order to be useful learning tools.

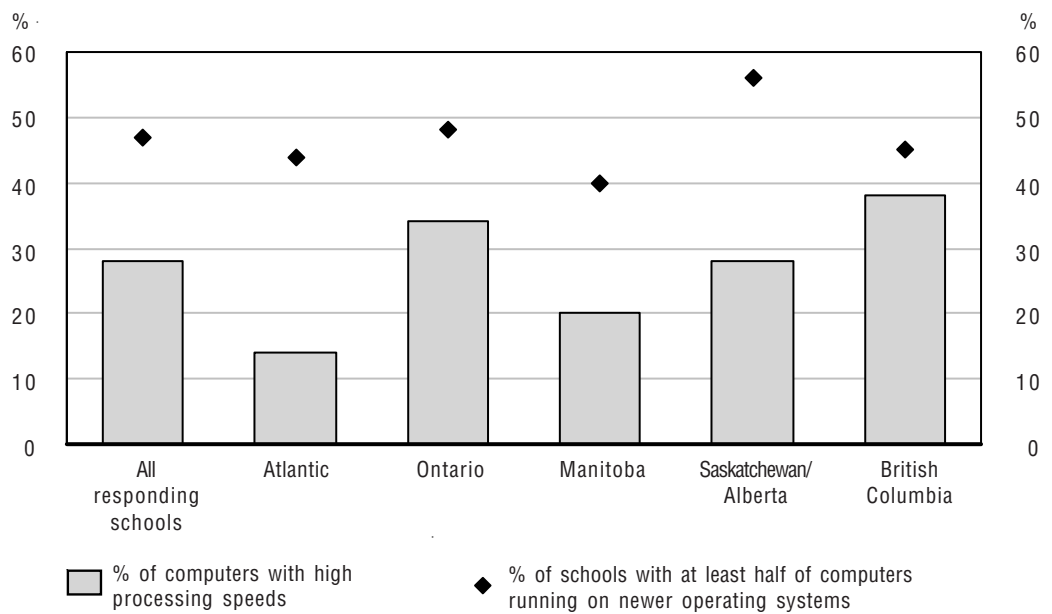
Similar to what was observed in rural elementary and secondary schools across Canada (51%), computers equipped with medium processor speed (i.e. 233 MHz to 1.4 GHz) represented the largest share of computers present in responding First Nations schools (47%). The proportion of computers with such technology ranged from 35% in Saskatchewan/Alberta to 57% in Atlantic.

While 16% of the computers in rural schools across Canada were equipped with high processor speed (i.e. 1.3-3.8 GHz), about 28% of the computers in responding First Nations schools were equipped with the most recent technology. The proportion of computers with high processor speed ranged from 14% in Atlantic to 38% in British Columbia (Figure 2).

As reported by principals who returned their questionnaires, about 23% of the computers in First Nations schools were equipped with low processor speed (i.e. 66-233 MHz), ranging from 19% in British Columbia to 29% in Atlantic and in Saskatchewan/Alberta. This compares to about 32% in elementary and secondary schools located in rural areas across Canada (Statistics Canada 2004a).

Processor speeds were measured in Megahertz (MHz), with each MHz representing one million cycles per second (the number of times the computer processor is able to perform a task). Processor speeds were categorized as either low (66-233 MHz), medium (233 MHz to 1.4 GHz (Gigahertz)), or high (1.3 GHz to 3.8 GHz and sometimes higher).

Figure 2
School computer operating systems and processor speeds in responding First Nations schools by RMO, 2003/04



Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

2.3 Technical support in responding First Nations schools

Principals of First Nations schools were also asked how much time was spent on maintenance and technical support for ICT infrastructure per month. Similar to what was observed in rural elementary and secondary schools across Canada, about 12 minutes per computer in responding First Nations schools were dedicated to support and maintenance each month (Table 3). While schools with a majority of low processor speed computers reported only about 4 minutes of support and maintenance per month per computer, between 16 and 17 minutes of technical time per computer per month were dedicated to schools with medium or high processor speed computers. The amount of time spent on technical support increased with the computer processor speed, something that may be explained by the fact that higher-end computers are capable of supporting a wider range of applications and uses, thereby requiring more time for upgrades and technical maintenance. It may also be that the presence of faster computers reflects the general ICT environment in these responding First Nations schools; schools with more money for higher-end computers may also have more money to support and maintain the infrastructure (Statistics Canada 2004a).

For the RMOs, time spent per school computer per month ranged from about 6 minutes in Atlantic to 19 minutes in Manitoba (Table 3). The same positive relationship emerged between time devoted to technical support and maintenance of computers, and processor speed.

Table 3

ICT technical support time in responding First Nations schools by RMO, 2003/04

	Minutes per computer per month (median)
All responding schools	12
Atlantic	6
Ontario	16
Manitoba	19
Saskatchewan/Alberta	12
British Columbia	7

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

3. School Connectivity

Most computers in responding First Nations schools were connected to the Internet.

In 2003/04, computerization and Internet connectivity were widespread: about 95% of responding First Nations schools were connected and 82% of school computers were used to access the Internet for educational purposes (Table 4).

Table 4

Access to Internet-connected computers in responding First Nations schools by RMO, 2003/04

	Average number of Internet-connected computers	Average number of students	Median student-to-Internet-connected computer ratio
All responding schools	35	154	4.5
Atlantic	25	112	4.7
Ontario	36	139	3.9
Manitoba	51	293	6.4
Saskatchewan/Alberta	45	183	4.4
British Columbia	19	63	3.6

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

There is an important distinction, however, between the proportion of schools with Internet-connected computers and the proportion of Internet-connected computers in a given school. In general, the proportion of schools connected to the Internet is higher than the proportion of school computers connected to the Internet for each RMO (Table 5).

As reported by principals who returned their questionnaires, more than eight computers out of ten in First Nations schools were connected to the Internet in 2003/04, ranging from 75% in Manitoba to 88% in Saskatchewan/Alberta.

Table 5

Internet-connected schools and computers in responding First Nations schools by RMO, 2003/04

	Percentage of schools connected to the Internet	Percentage of computers connected to the Internet
All responding schools	95	82
Atlantic	90	80
Ontario	98	87
Manitoba	93	75
Saskatchewan/Alberta	96	88
British Columbia	97	79

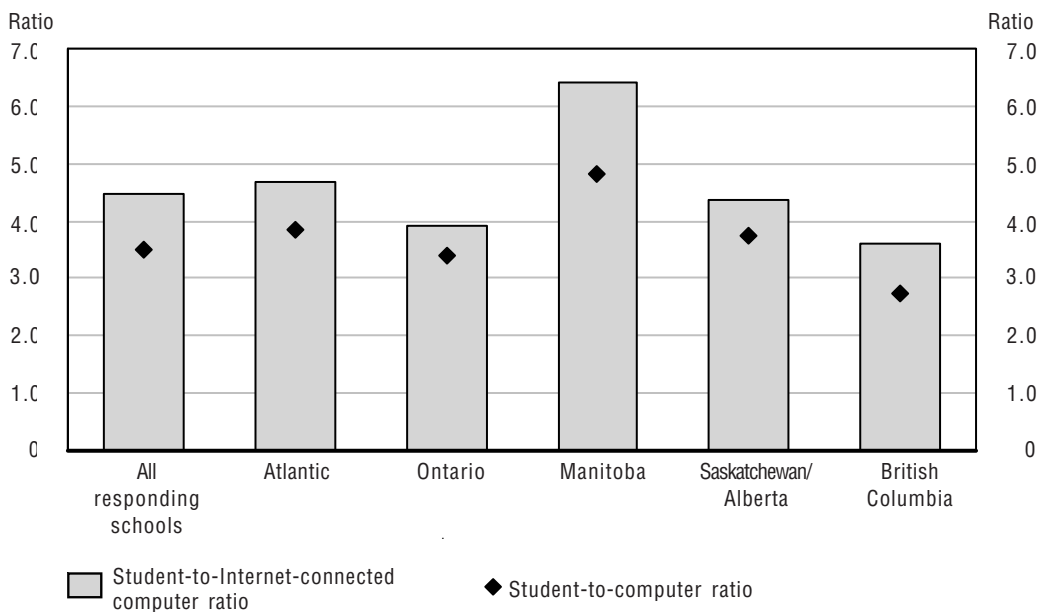
Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

Despite a lower proportion of Internet-connected computers in responding First Nations schools (82%) than in rural elementary and secondary schools in Canada (92%), this compares favourably to the nearly 55% of Canadian households that regularly used the Internet from home in 2003 and the 78% of private sector enterprises that reported being connected to the Internet that same year (Statistics Canada 2004b, 2004c).

By examining the proportion of Internet-connected computers in a school, relative to the proportion of students, a more direct assessment of connectivity is possible. As there were about three students for every computer, there were slightly more students (4.5) per Internet-connected computer, since not every computer used for educational purposes was connected to the Internet (Figure 3). The smaller the difference between the two ratios indicates that the proportion of connected computers is approaching the proportion of computers.

As reported by principals who returned their questionnaires, the median number of students per Internet-connected computer in First Nations schools ranged from about 4 students per computer in British Columbia, Ontario and Saskatchewan/Alberta to about 6 in Manitoba.

Figure 3
Student-to-computer and student-to-Internet-connected computer ratios (median) in responding First Nations schools by RMO, 2003/04



Source: *Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.*

For the purpose of this study, broadband includes the following types of connections: cable modem, high-speed line (Integrated Services Digital Network (ISDN) or Digital Subscriber Line (DSL)), T1 line, optical fibre, fixed wireless (terrestrial) devices. Satellite connections can also be considered as broadband technology, depending on their speed and bandwidth.

High-speed Integrated Services Digital Network (ISDN) lines operate over standard telephone wires and fiberoptic circuits, using a bandwidth that is typically slower than the most common broadband technologies (cable and DSL).

A single ISDN line can handle up to eight devices, including a PC, telephone, fax and video, with any two devices operating simultaneously. ISDN penetration is extremely low in Canada. With Digital Subscriber Lines (DSL), the user is connected all the time and the telephone line is available for calls. The T-carrier system offers a direct link to the Internet, however T1 lines are more expensive and are generally for business use (Statistics Canada 2004a, Veenhof, Neogi and van Tol 2003).

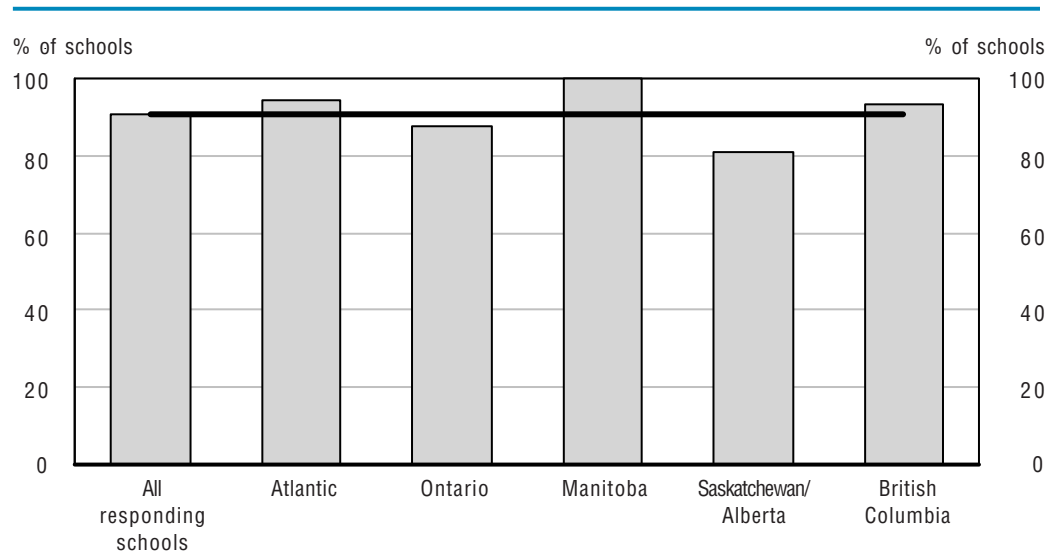
3.1 Type of Internet connection

Different technologies have different performance over the Internet. Therefore, some technologies have limitations for the applications that can be used. For example, broadband connectivity enables greater use of multi-media education applications integrating images, text, data and sound, while dial-up access is mostly useful for e-mail, chat and modest browsing.

An overwhelming majority (91%) of responding First Nations schools used “broadband technologies” to access the Internet, ranging from 81% in Saskatchewan/Alberta to all schools in Manitoba (Figure 4, Table 6). This was the case for 65% of Canadian households that regularly used the Internet in 2003¹ and 66% of private sector enterprises that use the Internet (Statistics Canada 2004b, 2004c).

Figure 4

Percentage of responding First Nations schools using broadband to access the Internet by RMO, 2003/04



Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

Most responding First Nations schools used satellite connection to access the Internet.

Satellite connection was the most popular method to access the Internet for a majority of responding First Nations schools during the 2003/04 school year, ranging from about 50% in Ontario and British Columbia to 92% in Manitoba. High-speed (ISDN/DSL) (20%) and cable modem connections (13%) also placed high among the most popular methods to access the Internet (Table 6).

While most responding First Nations schools are using broadband connections to access the Internet, these types of connections are not always available in every geographical area and the cost of providing broadband services in rural or remote areas is typically higher than in urban areas due to a smaller customer base spread over greater distances. This may explain why about 20% of all responding First Nations schools are still using dial-up connections to access the Internet.

During the 2003/04 school year, dial-up access was used by 38% of the responding First Nations schools in Saskatchewan/Alberta, 24% of schools in Atlantic and 18% of those in Ontario.

Table 6

Percentage of schools by type of Internet connections in responding First Nations schools by RMO, 2003/04

	All responding schools	Atlantic	Ontario	Manitoba	Saskatchewan/Alberta	British Columbia
	Percentage					
Dial-up access	18	24	18	x	38	x
Broadband technologies	91	94	88	100	81	93
Cable modem	13	x	25	x	x	20
High speed line (ISDN/DSL)	20	41	28	x	x	17
T1 Line	8	41	x	x	x	x
Optical Fibre	x	x	x	x	x	x
Fixed wireless	5	x	x	x	x	x
Satellite connection	56	x	50	92	65	53
Unknown type	4	x	x	x	x	x

x Estimates suppressed to meet confidentiality requirements of the *Statistics Act*.

Note: Percentages may not sum to one hundred since schools may have more than one type of Internet connection.

Source: *Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.*

3.2 Intranet and website use in responding First Nations schools

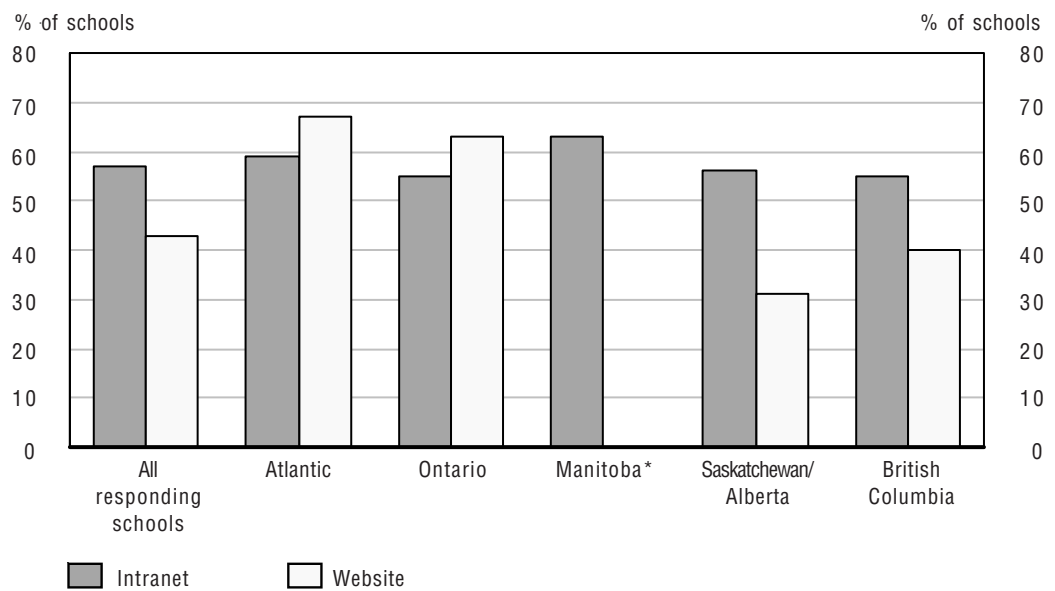
Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols (Statistics Canada 2003c).

About two-thirds of responding First Nations schools had an intranet, but fewer had a website.

As reported by principals who returned their questionnaires, about 60% of all First Nations schools had an intranet (i.e. networks that connect computers within schools), ranging from 55% in Ontario and British Columbia to 63% in Manitoba (Figure 4). This compares to about 69% for elementary and secondary schools located in rural areas across Canada (Statistics Canada 2004a).

While about 63% of rural elementary and secondary schools in Canada had a website during the 2003/04 school year, about 43% of the principals who returned their questionnaires reported such technologies in their First Nations schools (Figure 5). The proportion of schools with a website during the 2003/04 school year ranged from 31% in Saskatchewan/Alberta to 67% in Atlantic.

Figure 5
Percentage of responding First Nations schools with intranet, website by RMO, 2003/04



* Estimate for website suppressed for Manitoba to meet confidentiality requirements of the *Statistics Act*.
 Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

3.3 Videoconferencing technology

Videoconferencing technology allows two or more people at different locations to see and hear each other in real time and share computer applications such as Internet pages, library catalogues, documentation and software aids, including presentations.

Results from the ICTSS showed that about one out of every five responding principals of First Nations schools reported having such technology in their schools. This compares to 8% for rural elementary and secondary schools across Canada.

Videoconferencing technology also helps to reduce the barriers of distance and isolation experienced by schools in rural and remote areas, enabling access to educational applications that may not have otherwise been possible. About 63% of the responding First Nations schools in Atlantic and 33% of them in Ontario had videoconferencing technology during the 2003/04 school year.

A video conference system requires audio-visual equipment – monitor, camera, microphone and speaker – as well as a means of transmitting information between sites. Broadband and satellite connections are ideal, but also carry huge expenses.

Responding First Nations schools with videoconferencing technology accessed the Internet through broadband.

Among the most popular methods to access the Internet for responding First Nations schools with videoconferencing technology were satellite connections (44%), high speed line (ISDN/DSL) (33%) and T1 line (30%). While 19% of the First Nations schools with such technology used a dial-up telephone line to access the Internet, this may have limited the capabilities of the videoconferencing system.

While about 45% of principals reported that videoconferencing technology was used in their schools for professional development and training for staff, collaboration between students in different locations and staff meetings, about 31% of principals reported that such technology was either used as a primary mode of delivery for courses or as a supplement to other modes of delivery (e.g. face-to-face and asynchronous online²).

4. Access to computers, software and the Internet

The belief that the educational use of computers and the Internet may provide an enriched learning environment for students, as well as a useful pedagogical resource for teachers is generally widespread. Whether it is the location of computers or the availability of educational software and the Internet, access to ICTs is critical.

4.1 Location of computers

Most computers in responding First Nations schools were located in classrooms and computer labs.

Similar to what was observed in rural elementary and secondary schools across Canada, most computers in responding First Nations schools were located in classrooms (47%) and computer labs (39%). Libraries and other locations shared the remaining number of computers (14%).

The proportion of computers located in classrooms ranged from 38% in Saskatchewan/Alberta to 57% in Manitoba, while the proportion of such technologies in computer labs was ranging from 29% in Manitoba to 52% in British Columbia.

4.2 Student access to the Internet

In general, students have access to the Internet at school. Unless the Internet is also accessible at home or in some other public location, completing homework activities that require the use of the Internet or specialized educational software may be problematic. Making the Internet accessible outside of regular school hours allows students who may not otherwise have access to this technology to use this resource for school-related activities.

Access to the Internet in responding First Nations schools was similar to that of rural elementary and secondary schools across Canada.

During the 2003/04 school year, a majority (59%) of principals in responding First Nations schools reported that their schools provided students with *frequent access* (often to always) to Internet-connected computers *during school but outside of instructional hours* (lunch hours or breaks), ranging from 53% in British Columbia to 68% in Atlantic (Figure 6). About 60% of principals of elementary and secondary schools located in rural areas across Canada reported providing such technologies to their students during this period (Statistics Canada 2004a).

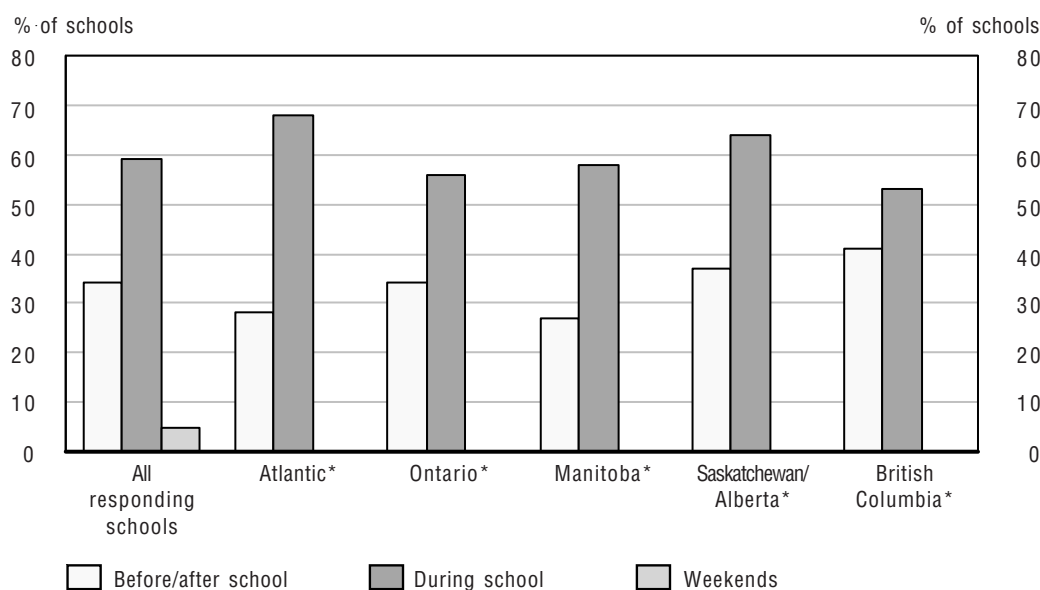
About a third (34%) of principals in responding First Nations schools also reported providing their students with *frequent access* to Internet-connected computers *before and/or after school* (ranging from 27% in Manitoba to 41% in British

Columbia) (Figure 6). This compares to 41% for rural elementary and secondary schools in Canada.

Similar to what was observed in rural elementary and secondary schools across Canada (5%), a small proportion of principals of First Nations schools reported providing their students with *frequent access* to such technology *during the weekend* (5%) (Figure 6).

Figure 6

Percentage of responding First Nations schools providing students with frequent access to Internet-connected computers outside instructional hours by RMO, 2003/04



* Estimates for “frequent access on weekends” suppressed to meet confidentiality requirements of the *Statistics Act*.

Note: Frequent access includes Internet-connected computers that were often to always available outside instructional hours.

Source: *Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.*

4.3 Student access to software

Most students of responding First Nations schools had access to a number of software applications, including word processing, Internet browsers, educational drill and practice programs, spreadsheet and database programs, e-mail software, presentation software and graphic programs (Table 7).

Across RMOs, student access to word processing software and Internet browsers varied only slightly - more than 90% of the responding First Nations schools in all RMOs provided their students with these software. Educational drill and practice and spreadsheet and database programs were also popular across the different RMOs - about eight schools out of ten provided their students with some access to these software applications.

Table 7

Percentage of schools by type of software accessible to students in responding First Nations schools by RMO, 2003/04

	Word processing	Internet browsers	Educational drill and practice	Spread-sheet and database	E-mail software	Pre-sen-tation software	Graphic programs
All responding schools	95	95	85	82	75	72	68
Atlantic	95	90	79	78	68	79	68
Ontario	98	93	78	82	81	73	73
Manitoba	93	96	89	85	72	59	58
Saskatchewan/Alberta	96	100	89	82	79	80	56
British Columbia	93	94	91	83	70	71	79

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

4.4 E-mail accounts

Although e-mail is one of the most common uses of the Internet today, and 75% of responding principals reported that their students had access to e-mail software (ranging from 68% in Atlantic to 81% in Ontario), the majority of students were not provided with an e-mail account by the school. Slightly less than 90% of responding First Nations schools reported providing e-mail accounts to fewer than 25% of their students.

A large majority of schools in all regions (about 80% of the schools in Ontario, 90% in the Atlantic, Saskatchewan/Alberta and in British Columbia, and all schools in Manitoba) provided e-mail accounts to less than 25% of their students during the 2003/04 school year. Regardless of whether or not the school provided e-mail accounts, students may still have had access to Internet e-mail software – such as Hotmail – to access personal e-mail accounts.

4.5 Online courses

Online courses can be an effective alternative when courses are not available at the school or the course cannot be offered due to a lack of resources or teachers. Some online courses, for example, may be offered to prepare students for a particular school program, such as second language immersion, university or college.

This option is useful where certain prerequisite courses for university or college programs are not available at the school. Similarly, schools in rural or remote areas may use online courses more frequently, particularly for very specific subject areas that may not be readily available to students in class.

Overall, 14% of the responding First Nations schools reported having students participating in online courses, ranging from 19% in Saskatchewan/Alberta to 28% in Ontario. This compares to about 20% in elementary and secondary schools located in rural areas across Canada (Statistics Canada 2004a).

5. Teachers and technology

Teachers are one of the most important factors affecting the extent to which ICTs are adopted and implemented at school. Education policymakers are increasingly aware of the need to make teachers feel comfortable using ICTs and to encourage them to integrate ICTs into their lesson plans.

While about 67% of the other elementary and secondary schools located in rural areas reported having a policy for the appropriate use of ICT by teachers during the 2003/04 school year, this was the case for 27% of responding First Nations schools (Statistics Canada 2004a).

5.1 Teacher skills

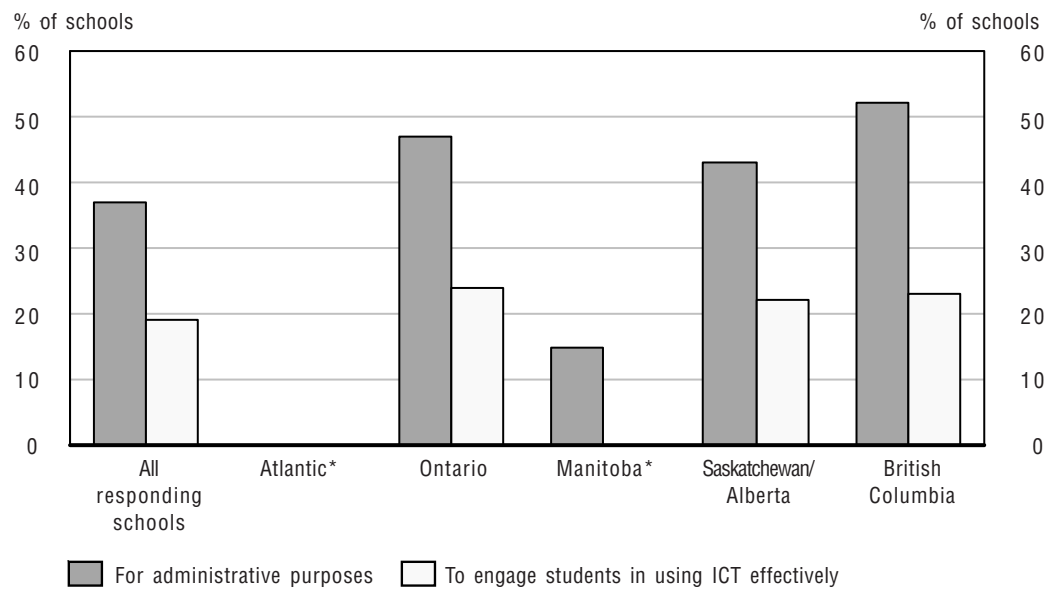
There is some evidence that although teachers are using ICT in the classroom, they may not always feel that they are using it in the most effective and efficient way (O’Haire 2003). From the ICTSS results, it would seem that this view is shared by school principals.

According to school principals, most teachers in responding First Nations schools do not possess the required technical skills to use ICT for administrative purposes or to effectively engage students in using ICT to enhance their learning.

While most principals (67%) of rural schools across Canada reported that most of their teachers possessed the required skills to use ICT for administrative purpose such as preparing report cards, taking attendance or recording grades, about 40% of principals of responding First Nations schools reported that *more than 75%* of teachers possessed such skills (Figure 7). About half of the principals in Ontario and British Columbia, 43% of them in Saskatchewan/Alberta and 15% of them in Manitoba reported that *more than 75%* of teachers possessed the required technical skills to use ICT for administrative purposes.

Furthermore, slightly less than a fifth (19%) of principals who returned their questionnaires felt that most of their teachers were adequately prepared to effectively engage students in using ICT, ranging from 22% in Saskatchewan/Alberta to 24% in Ontario. This compares to about half (47%) in rural elementary and secondary schools across Canada.

Figure 7
Percentage of responding First Nations schools with more than 75% of teachers possessing ICT skills by RMO, 2003/04



* Estimates suppressed to meet confidentiality requirements of the *Statistics Act*.

Source: *Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.*

6. Challenges to using ICT in responding First Nations schools

The ICTSS asked principals of First Nations schools to indicate to what extent certain ICT-related issues, such as funding for technology, obtaining a sufficient number of computers, and ensuring that computers and peripherals were up-to-date, were perceived as challenges or barriers to the use of ICT in their school.

Financial challenges figure among the most extensive barriers to ICT use for reporting First Nations schools.

Similar to what was observed in rural schools across Canada (64%), about three-quarters of principals of reporting First Nations schools indicated that sufficient funding for technology was an extensive challenge or area of concern, ranging from 56% in Saskatchewan/Alberta to 88% in Manitoba (Table 8). Having enough training opportunities for teachers was cited as an extensive challenge by 52% of responding principals, followed by obtaining sufficient copies/licenses of software for instructional purposes (48%), ensuring up-to-date equipment (46%), obtaining software which is specific enough or adaptable (43%), maintaining sufficient level of ICT in subjects for teachers to provide adequate instruction (40%), and finding enough time in the school's or teacher's schedule for using the Internet (40%).

Other significant challenges included ensuring ICT infrastructure is adequate for telecommunications (37%), obtaining adequate technical support for operating and maintaining computers (36%), ensuring ICT infrastructure has anti-theft and anti-vandalism mechanisms (36%) and obtaining sufficient number of computers (35%).

One out of every four principals who returned their questionnaires also felt that "Obtaining software in the language of instruction" was an *extensive challenge* to using ICT in their school, ranging from 17% in Manitoba to 37% in Ontario.

Table 8

Percentage of responding First Nations schools citing challenges to using ICT by RMO, 2003/04

	Having sufficient funding for technology	Having enough training opportunities for teachers	Obtaining sufficient copies/licenses of software for instructional purposes	Ensuring computers and peripherals are up to date	Obtaining software which is specific enough or adaptable
All responding schools	73	52	48	46	43
Atlantic	63	50	60	40	53
Ontario	80	48	44	40	40
Manitoba	88	58	50	50	46
Saskatchewan/Alberta	56	41	48	41	48
British Columbia	74	65	44	59	35

Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada.

7. Summary and concluding remarks

The 2003/04 Information and Communications Technologies in Schools Survey (ICTSS) collected information from principals to assess connectivity and ICT integration in First Nations schools in Canada. Results from this report are based on those schools who returned their questionnaires. While these schools may not be representative of the target population as a whole, they nevertheless represent an important source of information.

According to ICTSS, the foundations of ICT are present in the responding First Nations schools. Computers are available for teachers and students use in responding First Nations schools and, compared to computers in rural elementary and secondary schools across Canada, a larger proportion of those in responding First Nations schools were equipped with the most recent technology (computer operating systems and processing speeds).

An overwhelming majority (91%) of responding First Nations schools used “broadband technologies” to access the Internet, satellite connection being the most popular method for more than half of responding First Nations schools during the 2003/04 school year.

While most responding First Nations schools are using broadband connections to access the Internet, about 20% of all responding First Nations schools are still using dial-up connections to access this technology. This may be explained by the fact that broadband connections are not always available in every geographical area, and the cost of providing broadband services in rural or remote areas is typically higher than in urban areas due to a smaller customer base spread over greater distances.

However, while information and communications technology (ICT) has provided students with a new learning tool, it hasn’t arrived without a number of challenges.

A majority of responding principals felt that most teachers in First Nations schools do not feel comfortable using ICTs, making it difficult to integrate such technologies into lesson plans. During the 2003/04 school year, about 40% of principals of responding First Nations schools reported that *more than 75%* of teachers possessed the required skills to use ICT for administrative purposes and slightly less than 20% felt that most of their teachers were adequately prepared to effectively engage students in using ICT.

Furthermore, one of the biggest concerns among principals was cost. ICT management has become more complex, putting increased pressure on school administrators. About three-quarters of principals reported that getting sufficient funding for technology was an extensive challenge to the use of ICT in their school.

Related to this, “having enough training opportunities for teachers”, “obtaining sufficient number of copies and licenses for instructional software” and “ensuring that computers and peripherals are up to date” also placed high among the challenges.

Notwithstanding the perceived financial challenges, about 95% of principals of responding First Nations schools either slightly or strongly agreed that information and communications technologies were worth the investment. Furthermore, more than nine principals out of ten agreed that ICT enable the curriculum to be more challenging and enriching and let students go beyond the prescribed curriculum, facilitating an increased knowledge.

ICTSS illustrates that First Nations schools are making substantial progress towards ICT integration: almost all schools now have both computers and Internet access.

Now, more than ever, data on the use and impact of ICT in education would be useful as follow-up. Moreover, issues such as ICT training and development for teachers could be further explored to address the effectiveness of such technology for student learning.

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Endnotes

1. Includes only those households with a high-speed link to the Internet through either cable or telephone connection (Statistics Canada 2004b).
2. Asynchronous online learning refers to a learning event in which people are not online at the same time and cannot communicate without time delay. Examples are self-paced courses taken via the Internet or CD-Rom, Web presentations, videotaped classes, streamed audio/video presentations, Q&A mentoring, discussions groups, and e-mail.

Culture, Tourism and the Centre for Education Statistics

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