

APPLIED COMPUTER TECHNOLOGY IN CREE AND NASKAPI LANGUAGE PROGRAMS

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ABSTRACT

After an introduction to the parameters for the application of computer technology in Cree and Naskapi language programs, it will be shown that the deliberate and structured introduction of these technologies to indigenous language programs can facilitate indigenous language stabilization and development. Using first-hand accounts from within Cree and Naskapi language communities as case studies, both the successes and frustrations associated with computers for language work will be described, and recommendations made for the future use of computer technology in these projects.

INTRODUCTION

The Naskapi and East Cree languages are members of the Algonquian language family in North America, and form a part of the Cree-Montagnais-Naskapi dialect continuum (MacKenzie, 1980), stretching across the central Canadian sub-arctic woodlands from the Labrador coast to the Rocky Mountains.

The Naskapi community of Kawawachikamach (population c. 780), located near Schefferville, Quebec, is organized as a politically and administratively distinct First Nation. The only other dialect of Naskapi (Mushuau Innu) spoken at Utshimassits (Davis Inlet) on the Labrador coast, will not be treated in this paper.

The nine communities of East Cree speakers, located in northwestern Quebec from the eastern coast of James Bay and Hudson's Bay inland, range in population from 300 to 3000. Although united both politically and administratively, these nine communities represent two distinct Cree dialects, with additional inter-community lexical and phonological variations.

These Cree and Naskapi communities share not only related languages, but also similarities in culture, traditions, and physical environment. However, despite these similarities, the use of computer technology for language maintenance has taken a very different path within each group. In both areas Cree or Naskapi is the first language of all, including children. The primary second language is English, with some provision for French. Both Cree and Naskapi use similar syllabic orthographies. This use of syllabics has had a unique influence on the development of applied computer technology used in their language programs.

SYLLABIC ORTHOGRAPHIC SYSTEM

The orthographic system is based upon the syllabic system innovated by James Evans, a Methodist minister serving the Ojibwa and Cree in Ontario and Manitoba from the 1820's to the 1840's (Murdoch, 1981). Evans was an avid philologist whose desire for an easy-to-learn "shorthand" method of writing these Indian languages provided the initial framework of the syllabic writing system. In the fall of 1841, while lodged at Norway House in Manitoba, he produced, after planning and experimentation, the first syllabic chart and some hymns in Cree. After some relatively minor changes, syllabics became the basis of the writing systems used today by the Cree, Naskapi, Ojibwa, and Inuit.

The system is referred to as "syllabics" because for the most part each character stands for a single syllable: a consonant-vowel pair. The shape of the character represents the consonant onset of the syllable, while the orientation of the character represents the vowel peak of the syllable. Characters for consonant syllable codas, consonant clusters, and stand-alone vowels make up the rest of the syllabic repertoire (Cree Regional Authority, 2001).

For the first 100 years following its innovation, the syllabic orthography was written conventionally by hand and painstakingly copied, or reproduced by means of custom-made typefaces and presses, usually located some distance from the communities, often overseas in England. This meant that the later stages of language material production could not involve Native speakers. Eventually, syllabic typewriters were made available to the Cree and Naskapi communities, and Native speakers themselves began to be involved firsthand in the production of documents in syllabics. Because mastery of syllabic typing required the memorization of a unique keyboard layout, with every key or combination of keys representing a character, only a minority of speakers became typists.

COMPUTERS AND SYLLABICS

In the 1970s, mainframe computers began to be used extensively by university linguists for lexicography. The words and definitions that had been transcribed on thousands of cards were input by assistants unfamiliar with the language. Data entry of the East Cree and Naskapi lexicons at the university was expensive and time-consuming, requiring the employment of programmers with little knowledge of linguistics, let alone aboriginal languages (MacKenzie, Whiskeychan, Salt, Blacksmith, & Louttit, 1987; MacKenzie & Jancewicz, 1994). Cree and Naskapi words were entered using a roman orthography and then converted to experimental syllabic scripts in the final printout. Unfortunately, all this took place far from the Native communities where these written materials would be used, making proofing difficult.

Later, as computers became more portable, linguists were able to bring equipment to the communities, and in some cases Native speakers were able try their hand at keyboarding in their own language. The technology was for the most part still beyond the reach of the Native people whose language it would serve.

Indeed, the practical use of any non-roman script on a computer remained an elusive goal. At first, an entire alphabet had to be designed and "hard-coded" into the microprocessors, as part of the computer hardware. Another method was to modify the output device (the screen or the printer) somehow, often by physically replacing the conventional roman characters with syllabics. It was not until the later 1980s, with the simultaneous development of the IBM Personal Computer (PC) and the graphical user interface (the Apple Macintosh and Microsoft Windows operating systems) that it became possible to produce a "software" solution to the problems of using syllabics on a computer.

SIL International, formerly known as the Summer Institute of Linguistics, has had a legacy of providing technological support to field linguists working in minority languages. Their computer programmers developed a series of tools that made it possible for linguists, using a personal computer in the field, to define and use their own character sets in the MS-DOS family of operating systems (Reitz, 1988). The appearance of these software tools coincided with the PC's introduction to the Native communities.

In 1988, SIL linguist Bill Jancewicz arrived in the Naskapi community and was asked to assist in developing a means of typing and printing Naskapi syllabics. The Band Office (the seat of community authority in Native communities in Canada, equivalent to municipal government) had acquired its first PC a year earlier to be used for accounting and general word-processing. Using the software tools provided by SIL, he produced a word processing system for syllabics and trained the office employees in its use. By 1989 the Band Office was regularly producing Naskapi language materials. That same year the Naskapi School and the Naskapi Development Corporation also acquired their first PCs, and the syllabic word processing system was installed on these computers as well. The Naskapi computer users were

trained to open, type, save and print documents in syllabics, using a system that allowed the roman equivalent of syllabic spelling to be typed on a standard English keyboard, thereby eliminating the memorization of a different keyboard layout.

Because Bill was residing in the community and learning to speak Naskapi himself, technical support was always close at hand. As with any new technology, the syllabic word processing system had to go through a number of refinements and improvements, but at each step, backward compatibility was implemented, so that the Naskapi community was able to maintain a growing corpus of digital language materials.

The system itself remained simple, if not crude, consisting of a plain-text editor that could produce either roman text or syllabics. Screen fonts were bit-mapped characters formed on an 8 x 8 or 8 x 16 pixel grid, while printouts were accomplished by either downloading 8 x 8 or 24 x 24 bitmapped syllabic fonts to a 9-pin or 24-pin dot-matrix printer, or by instructing the computer to print the text information "graphically," that is, as if it were a bit-mapped "picture." Naskapi files were saved in plain-text format, and could be archived and read by any MS-DOS-based computer. The syllabic characters themselves were "mapped" to their roman spelling, each consonant-vowel pair in the syllabic repertoire represented in text as English consonants and vowels.

As computers and software became more sophisticated, the syllabic system was continually upgraded. Laser printers provided a much higher resolution for reproducing printed material, and bit-mapped syllabic character sets were developed for this technology, painstakingly "drawn" in various typesetting point sizes. Even though syllabic fonts of this type take up considerable disk space, and it could take several minutes to download and print one page of text, the result at higher resolutions was far superior to the earlier dot-matrix printout. The proofs for the first edition of the Naskapi Lexicon were produced by this procedure in 1993 in the offices Development Corporation in northern Quebec (MacKenzie & Jancewicz, 1994).

In 1994, PCs utilizing Microsoft Windows, the graphical user interface that was beginning to enjoy widespread acceptance for business applications, became available in the Native communities. One important facet of this development was the implementation of TrueType font technology. Among other benefits, these fonts could be "scaled," that is, displayed and printed in various point sizes, with the same font data being used for both the screen and printer. Further, Windows provided a "WYSIWYG," or "What You See Is What You Get" environment. True publishing capabilities were now available on the desktops of Native speakers.

About the time this technology became available in the community, Bill Jancewicz was retained as the resident linguist for the Naskapi Development Corporation. He developed a Naskapi TrueType font designed in collaboration with the Naskapi readers and writers. Computer programs that could convert older Naskapi texts already keyboarded in Naskapi syllabics into the TrueType font encoding were developed as well.

Concurrently, SIL participated in the release of a keyboarding utility now known as Keyman that allowed the programming of custom keyboard input for various languages and character sets (Durdin & Hosken, 1994). The original Naskapi keyboarding system was adapted to Windows and TrueType using this utility, allowing Naskapi who were already trained to use the older MS-DOS system to easily move to a Windows computer without having to learn a new keyboard layout. As more Windows-based computers came into the community, more and more Naskapi were trained to use them to produce language materials.

Since 1984, when the Apple computer company introduced the Macintosh, a computer with a graphical user interface and publishing capabilities had been available. However, the decision to use either Macintosh or IBM compatible PCs was often made independently of language-related concerns. In the Naskapi community, some Apple computers were purchased for the Naskapi School in the 1990s for

educational purposes. The resident linguist developed yet another TrueType font for the Macintosh, and eventually Naskapi educators began to produce curriculum materials using this equipment.

The Cree School Board, on the other hand, was advised that Macintosh computers were preferred for multilingual word processing, and initially purchased Macintosh computers for Cree language personnel, providing the basis for all their language production work in the Cree communities. The approach to keyboarding in Cree was different than Naskapi, because it was constrained by commercial vendors rather than an "in house" font developer. The Cree keyboarding system was loosely based upon the old syllabic typewriter keyboard layout. Because of the logical layout of the Cree syllabic chart, each row of the typewriter keyboard could be arranged to represent one of the vowels, and thus be somewhat easier to remember than a random layout: the resulting keyboard was based partly on the syllabic chart and partly on the sound of the characters. This meant however, that a completely different keyboard layout had to be memorized by the Native speakers who would be typing their language; in many cases, new key-caps or labels were glued to the keyboard. During the mid-1990s, the commercial font vendor changed the layout slightly, so that key sequences had to be re-learned, and moreover, texts that were typed in the older font could not be displayed in the newer font. These setbacks were inevitable however, since the use of syllabics on computers was such a new, groundbreaking yet ad-hoc technology, and there was as yet little collaboration between language programs.

COMPUTERS AND RESOURCE PEOPLE

In the Naskapi community, the presence of a locally-based linguist specializing in the language with some programming ability has obviously helped to integrate computers into language work. Since 1988, the resident linguist has maintained all of his own language learning materials and language data on computer. He has also provided the local technical support that is needed in a small, isolated community, especially with regard to the esoteric development of computer programs that allow syllabic word processing. While it is not impossible to use computers in Native language work without a full-time, on-site computer resource person, it has been an obvious asset to have such a person available to provide training and technical support.

During the 1990s, several non-Native teachers attempted to improve the educational opportunities for students to learn to read and write the Naskapi language. As this was linked to the realization of the importance and efficiency of using computers to produce materials, the Naskapi curriculum development department was formed. This approach, whereby key teachers in the school are seen as important catalysts for Naskapi language material development and computer use (Jancewicz, 1998) has unfortunately not been consistently maintained from year to year.

In contrast, the Cree School Board, an educational organization that has had notable success in implementing Cree language education in the school system (Burnaby, MacKenzie, & Bobbish-Salt, 1999a, 1999b; Burnaby & Mackenzie, 2001), has achieved this without continuous on-site computer support. The Cree commitment to Cree as a language of instruction, not just as a subject, came about through an explicit vision incorporated in Board policy, which led to administrative and pedagogical support, adequate budget allocations, and on-going staff training (Grand Council of the Crees, 1997). Over the past 30 years, Dr. MacKenzie has assisted in the production of lexicographic, orthographic, and grammatical material, encouraging the Cree language workers themselves to maintain data and produce materials (MacKenzie, 1992). To this end, the Board originally retained the services of non-Cree-speaking computer professionals to assist them with technical matters relating to the Macintosh machines found most efficient for producing syllabic materials. The irregular availability of a linguist familiar with both Macintosh systems and syllabic orthographic issues was found to be unsatisfactory. A recent administrative decision obliged Cree language workers to switch to Windows-based computers. The linguist from the Naskapi community was contracted to provide training in word processing in Cree, and in the use of use computer database programs to maintain and revise the lexicon. While this situation may

be an improvement, the absence of an on-site specialist with expertise in linguistics, computer systems and syllabics has resulted in an emphasis on the production of reading material only, rather than foundational linguistic or lexical database material. Although resource people are now available by telephone and e-mail, they are still located great distances from the communities and are not present to provide routine guidance.

COMPUTERS AND ABORIGINAL PEOPLE

In the Naskapi community, computers were introduced gradually, due to the initial expense, the relevance to the needs of the community, and the difficulty of providing adequate training. The first computers were purchased and deployed for purposes other than the production of Native language materials so that Naskapi computer users became familiar with them, and non-users grew accustomed to the presence of a computer in the workplace.

At both the Naskapi Nation and the Naskapi Development Corporation offices, the promotion of written materials in Naskapi has been mandated. This has resulted in the establishment of a number of ongoing language projects: the translation into Naskapi of all official business of the administrations, a lexicon, a grammar, a history, a monthly newsletter, legends and stories, and Bible translation. Both offices retain several full-time employees involved in language work, all of whom have eagerly adopted computers for their drafting and production work. As the number of projects increased (and funding became available) additional personnel were hired to translate and development language materials and were trained to use the computers; in every case, without exception, their ability to read and write the language improved.

Of course, part of this increased ability must be attributed to a greater exposure to and practice in reading and writing Naskapi, which became their full-time job. There is also evidence that increased levels of confidence in literacy are directly related to the use of computers for their own language. In two separate cases, the Naskapi responsible for office language work had already been employed for a number of years prior to the acquisition of computers. Their ability in reading and writing was observed to be adequate, but unremarkable. Following the introduction and continued use of computers, both employees noticeably improved in their reading and writing ability, as well as in linguistic confidence.

Although most Naskapi employees were initially quite uneasy with having to use a computer in their work, this discomfort diminished rapidly after some basic training, and as their familiarity and confidence with computers increased. Using a computer for mother-tongue language work raises speakers' assessment of the worth of their own language, as well as provides an avenue for sharing their work and ideas through reproduction and publication.

Because of employee turnover, many individuals in the Naskapi community have been trained in basic syllabic word processing. Even for those no longer employed in language work, this initial training has made a great difference in their own literacy, language skills, and confidence. Thus, courses in adult literacy in syllabics, usually rather difficult to deliver, might well be presented as "computer courses" in that includes basic syllabic keyboarding, with spelling and grammatical training as well.

Although the school at Kawawachikamach has had a number of computers available for student and teacher use since the early 1990s, these were seldom used in the teaching of the Naskapi language. Owing to a lack of vision, direction, or ambition, it does not appear that this situation will change any time soon. This is unfortunate, even though there appears to be a great deal of potential for increasing confidence in first language skills of students and teachers alike by using computers. Regrettably, the situation shows no sign of changing in the foreseeable future.

On the other hand, the youngest primary school students are now benefiting from a new focus on Naskapi language literacy. Through the establishment of the curriculum department, sophisticated computer publishing equipment was put in the hands of a few Naskapi-speaking staff, who are then able to bring a

project from conception to production completely "in-house." Unfortunately, while these materials are prepared by speakers knowledgeable in the culture, there is currently no full-time curriculum specialist on hand ensuring the pedagogical appropriateness and effectiveness of the small amount of materials produced.

In contrast, members of the Cree Programs unit of the Cree School Board, beginning with minimal support for computer use, have provided sufficient pedagogically-appropriate materials in Cree in all subjects making instruction solely through the medium of Cree a reality from pre-kindergarten up to Grade 8. At present, several hundred Cree speakers work as full-time curriculum developers, pedagogical consultants, and elementary teachers without recourse to English or French. On the other hand, outside the educational sector, the use of written Cree has received little more than lip service.

COMPUTERIZED PROJECTS

Over the last two decades, the role of computers for language development projects has become increasingly important. Both the Cree and Naskapi Lexicons were begun prior to the introduction of computers in the communities, but were completed and are currently under revision using *Shoebox* linguistic database software developed by SIL specifically for lexicography in minority languages. In these communities, it is now the speakers themselves who maintain and revise their own lexical databases, as well as creating curriculum materials.

Archival analog language tapes have been acoustically enhanced and transferred to CD-ROM in order to prevent the further deterioration of this irreplaceable data. By means of computers, this material can be edited, transcribed, analyzed, copied, and distributed by resource persons and Native language workers, then reproduced for distribution on audio CDs to be played on local radio and used in education.

By using computers for text analysis, Native speakers and linguists are able to facilitate the compilation of much-needed grammatical reference material. Bible translation projects, again computer based, have had an positive impact on vernacular church life, by providing the written Scriptures in contemporary language, involving Native speakers in complex language work and providing ongoing employment to local translators. While in some language communities it may be supposed that such an emphasis on the production of religious texts may limit the use of Native language literacy in secular community institutions, the Cree and Naskapi cultures treated in these case studies traditionally do not draw a sharp distinction between the secular and spiritual in their day-to-day life. The technical expertise gained by local speakers involved in the production of religious texts has always had a positive effect on the quality and accuracy of secular materials they also produce. Indeed, the meticulous checking procedures developed for religious texts have been broadly applied to all areas of Native literature production, including secular and pedagogical work. Still, the exclusive use of translated religious texts as literacy material certainly does not provide a broad enough range of text genres. For this reason, it is important that many kinds of contemporary and archival Native-authored texts be used for literacy instruction and exposure. Computers are routinely used to produce administrative and historical documents, as well as articles in newsletters and notices. Obviously, these communities could benefit from an increase in the production and distribution of Native-authored materials of all genres.

DIFFICULTIES AND DRAWBACKS

As computers were introduced to these communities, isolated solutions to the problems of using syllabics on these computers were developed for each community and for each type of computer. Thus, independent solutions for the Naskapi and Cree syllabic orthographies using either Windows or Macintosh systems were being developed concurrently and as a result were completely incompatible with each other. At the same time, other Native groups across Canada were developing their own syllabic systems for computers or depending on commercial contractors to develop these systems for them. There

were literally dozens of syllabic encoding systems, and more were developed with each passing year. This situation, with the potential for incredible fragmentation and incompatibility, was replicated around the world in many other languages (e.g., Greek, Russian, Hebrew, Chinese, Cambodian) that did not use a standard roman character set.

The Unicode Consortium, which was formed to address this problem, developed a method of encoding every possible glyph used in each of the world's writing systems that would work on all computer operating systems (The Unicode Consortium, 2001). While the decisions as to the specific encodings required were made in the mid-1990s, the computer software industry has been slow to adopt the Unicode standard, and has only recently begun to gradually introduce Unicode support.

The relatively recent requirement to provide multilingual language processing on the Internet and the World Wide Web has focused attention on the need for the Unicode standard, but the computers and applications, which will make the wholesale switch to Unicode practical, are not yet in place. Currently, for the Cree and Naskapi communities, computers can adequately carry out complex word processing and desktop publishing jobs, but cannot readily share their data with unlike computers or unlike syllabic systems. For the time being, this difficulty has been overcome by maintaining careful inventories of the specific encoding schemes used by the various computer platforms and syllabic systems, which are then used to develop conversion programs. For example, the Cree School Board is currently producing all of its new curriculum material on Windows computers running Microsoft Word using the Cree font developed by Bill Jancewicz while the commercial publisher for these materials uses Macintosh equipment. Because of this, a programming procedure had to be developed to convert the Windows formatted material for the Macintosh platform. When Unicode is finally supported by the relevant applications and computer operating systems, this kind of conversion will be unnecessary. However, for now, "work-arounds" such as these will have to be employed.

SUGGESTIONS FOR FUTURE DIRECTIONS

Until the complete implementation of the Unicode standard, difficulties can be minimized through inter-organizational collaboration and communication within a language community, by coordinating the purchase and deployment of computer equipment, software, and operating systems; commercial publishers and other service providers should be expected to conform to community preferences. In this regard, it is vitally important to establish community-level language planning and development teams, which can provide the structures needed for intra-community cooperation and collaboration necessary in small language communities with limited resources. Language planning teams can then be responsible for standardization of the orthography and lexicon, spelling reform, and for developing programs for language use within the community. In multi-community language situations, such as the two dialect areas of the Cree communities, there is an additional need for a centralized language planning team in order to provide coordination and standardization. Otherwise, there is a genuine danger that language workers may very quickly deviate from established standards. The language planning team must therefore establish a system of monitoring work produced in widely separated communities.

The authors hope that the dichotomy between "resource people" and "aboriginal people" reflected in the section headings above would become less and less distinct. By all means, steps toward ending this division are being taken in both the Cree and Naskapi communities that will allow technology and Native language literacy to work together to enhance the vitality of these languages. As a growing number of local people gain experience and expertise to become their own resource persons, such a dichotomy will dissolve, and all the vital resources for language development will exist at a community level. However, until this ideal is realized, small language communities such as these must continue to identify and avail themselves of professional and academic resources found outside their communities.

The Online Interactive Cree grammar project conceived by Marie-Odile Junker of Carleton University is a good example of cooperation and integration of resources. She has begun to initiate a collaborative effort that combines and coordinates the efforts of Native language speakers, trained Aboriginal language technicians, computer programmers, commercial software providers, Internet specialists, linguists, and other important resource people toward a common goal of producing Cree linguistic materials on the World Wide Web (Junker, 2001).

Since the SIL International computing department may be relied upon as an ongoing, multilingual software provider, language planners or Native language workers should develop a collaborative relationship with local or regional SIL representatives in order to benefit from their collective linguistic computing expertise (SIL, 2001).

The identification and use of key resource personnel to provide computer support, linguistic consultation and training is still an important consideration when applying computer technology to Native language work. Often it is difficult if not impossible to secure this kind of assistance in remote communities. In such situations, the planning and execution of intensive training sessions and workshops for Native language workers can make up for the lack of full-time, on-site resource personnel.

In any case, adequate and immediate training of new language workers is essential. Refresher courses should also be scheduled for Native language workers on a regular basis in order to upgrade skills and to keep them abreast of new technological developments.

CONCLUSION

Simply providing computers for Native speakers to use in their daily work does little to develop their language skills. In fact, since computer use requires some literacy in a majority language (English or French), Native computer users may find themselves using the majority language more. Computer equipment has to be thoughtfully and deliberately deployed in order for indigenous language user to benefit. First, the equipment has to be matched to the situation, as it is unwise to introduce new computers that are not compatible with existing systems. Any attainable goal for the use of computers must focus on the intended results. The Naskapi and Cree communities are producing stories, curriculum materials, translations, administrative documents, and dictionaries, among other language materials. Software must be developed to appropriately use Native language elements (orthographic system, character set, left or right rendering system, keyboard modifications, etc.). Most of all, the Native speakers who will be expected to use the computers must be adequately trained and have plenty of opportunity to practice. The initial learning curve is sometimes steep, but there is no substitute for hands-on experience.

ABOUT THE AUTHORS

Mr. Jancewicz moved to Kawawachikamach to continue a translation project initiated by SIL. Later he began working at the Naskapi Development Corporation as their resident linguist, responsible for the final editing of the Naskapi Lexicon. He developed computer systems for Naskapi and Cree, and serves as a training and language resource for these languages.

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