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Documenting Linguistic Knowledge in an Inuit Language Atlas
Documenter les connaissances linguistiques dans un atlas en langue inuit

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Résumé de l'article

Dans la société inuit actuelle, la forme traditionnelle de transmission orale de la langue s'affaiblit avec la disparition des locuteurs âgés et l'érosion du langage. La documentation de la langue est une composante essentielle de sa conservation et de sa revitalisation. Dans cet article, nous présentons « l'Atlas de la langue inuit au Canada » (*Atlas of the Inuit Language in Canada*), projet pilote multimédia cartographique en ligne, dont l'objectif est de contribuer à protéger et à renforcer la vitalité des dialectes inuit par la documentation de leur vocabulaire. La principale composante de l'*Atlas* est une base de données multi-dialectale de mots écrits et parlés. Nous discutons du rôle des dictionnaires dans la documentation de la langue, exposons les caractéristiques de l'*Atlas*, explorons l'intérêt qu'il pourrait présenter pour les différents types d'usagers, en particulier ceux qui apprennent la langue, et indiquons les directions que pourra prendre ce projet d'Atlas à l'avenir.

Documenting Linguistic Knowledge in an Inuit Language Atlas

Kumiko Murasugi[i] and Monica Ittusardjuat[ii]

ABSTRACT

The traditional method of orally transmitting language is weakening with the passing of fluent Elders and language erosion in contemporary Inuit society. Language documentation is a vital component of language maintenance and revitalization. In this paper we present a pilot online, multimedia cybercartographic *Atlas of the Inuit Language in Canada*, the goal of which is to help protect and strengthen the vitality of Inuit dialects through the documentation of their words. The main component of the atlas is a multidialectal database of written and spoken words. We discuss the role of dictionaries in language documentation, introduce the features of the atlas, explore the appeal of the atlas to different types of users (in particular, language learners), and present future directions for the atlas project.

RÉSUMÉ

Documenter les connaissances linguistiques dans un atlas en langue inuit

Dans la société inuit actuelle, la forme traditionnelle de transmission orale de la langue s'affaiblit avec la disparition des locuteurs âgés et l'érosion du langage. La documentation de la langue est une composante essentielle de sa conservation et de sa revitalisation. Dans cet article, nous présentons « l'Atlas de la langue inuit au Canada » (*Atlas of the Inuit Language in Canada*), projet pilote multimédia cartographique en ligne, dont l'objectif est de contribuer à protéger et à renforcer la vitalité des dialectes inuit par la documentation de leur vocabulaire. La principale composante de l'*Atlas* est une base de données multi-dialectale de mots écrits et parlés. Nous discutons du rôle des dictionnaires dans la documentation de la langue, exposons les caractéristiques de l'*Atlas*, explorons l'intérêt qu'il pourrait présenter pour les différents types d'usagers, en particulier ceux qui apprennent la langue, et indiquons les directions que pourra prendre ce projet d'Atlas à l'avenir.

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I was born when we, as family groups, still lived in our traditional winter camps in igloos and sod houses where there were no stores, churches, or schools. The great outdoors was our school. Everybody spoke Inuktitut: my parents, my grandmother, my aunts and uncles. Everybody spoke to a baby up to about two or three years of age in baby talk: *anaana* for mother, *ataata* for father, *amaama* for suckling milk from the mother's breast, *apaapa* for eating. These were easy for the baby to repeat. The child was included in the daily activities of the family.

The mother would do many things, such as sew, cook, tend the *qulliq* (oil lamp), care for her child, and take care of others' needs such as giving tea or bannock when they came to visit. In the process, the child was given first-hand knowledge about these activities, and learned the language at the same time by talking about them. When the child learned to sew, for instance, the mother would show her what she was doing and explain every step, then the child would keep trying it until the mother was confident that she was doing the best that she could while being coached in the process.

In those days we did everything as a family. We would go camping to fish and hunt for seals, go walrus hunting in the summer, and caribou hunting in the fall. My father would show me how to wait at an *aglu* (seal hole), telling me not to move my feet because the seals could hear every move you made. He would kick some snow into the hole and explain that when the water starts to bob up and down, that meant the seal was coming close and to expect to see the head come out. You were told to get your *unaaq* (harpoon) or your *niksik* (hook) ready to strike. You were shown how to fish with your *aulasaut* (jigging hook) and how to catch a fish with a *kakivak* (three-pronged fish spear). Your father carefully instructed you because it was a matter of survival to feed the family and also for your own skills so that you would be able to provide for your family.

— Monica Ittusardjuat

In traditional Inuit society, language was learned naturally in context through oral communication. As with other forms of Indigenous knowledge, mastery of language relied primarily on oral transmission, careful observation, family ties, community events, and subsistence activities (Krupnik 2005). This traditional method of orally transmitting linguistic knowledge is disappearing for many reasons: the passing of Elders who have intimate knowledge of the Inuit language and traditional culture; language loss among residential school survivors; limited schooling in the Inuit language; the pervasive economic and social influence of English and French in the daily lives of Inuit; lack of funding and resources to promote Inuit language and culture; and decreasing levels of language competence among Inuit youth (Tulloch 2004; Andersen and Johns

2005; Allen 2007; Dorais 2010; NTI 2011; TRC 2015). Concerted efforts are being made at all levels—individual, community, regional, and territorial—to combat the effects of language shift and erosion within the Inuit community, and to lobby for better protection of the Inuit language (Tulloch 2004). The main strategies involve promoting and encouraging greater language use among current speakers, in addition to creating new speakers through efforts such as immersion and bilingual education programs, community language classes, master-apprentice programs, immersion camps for youth, improved teacher training methods, programs, materials and curricula, and research on language-related issues (Andersen and Johns 2005).

Another crucial aspect of language maintenance and revitalization is documentation of the existing language to prevent further loss. Written documentation of the Inuit language includes dictionaries, glossaries, grammars, teaching materials, and journal articles. There are also audio and audiovisual recordings of Inuit Elders that allow us to hear and see the language used in context.

In this paper we present a pilot cybercartographic *Atlas of the Inuit Language in Canada*, the goal of which is to help protect and strengthen the vitality of Inuit dialects through the documentation of their words. A cybercartographic atlas is an online, interactive, multimedia platform for presenting information from different sources in various formats; these include maps, tables, graphs, timelines, photographs, sound files, and videos (Hayes, Pulsifer and Piset 2014). Important aspects of cybercartography are the centrality of the atlas user and the collaboration of specialists from different knowledge areas in the atlas creation process (Taylor 2005). The main component of the *Atlas of the Inuit Language of Canada* is a multidialectal database of written and spoken words. It contains information that resembles what is found in traditional dictionaries, but the multimedia format allows us to add videos showing the words in context, and to present the database information in different modules for different users.

In the following sections we discuss the role of dictionaries in language documentation and revitalization, and explore how multimedia opens up new possibilities for preserving linguistic knowledge. We then introduce the multidialectal lexical database that is the main component of the Inuit language atlas, with a discussion on the importance of documenting dialects in both traditional and modern contexts. We explore how the atlas appeals to different kinds of users, and can accommodate various types of language learners. The final section presents future directions for the atlas project.[1]

1. We are reporting on the work completed in our first year of a SSHRC-funded project involving partnerships between Carleton University, the University of Toronto, and seven Inuit partner organizations. A pilot version of the atlas may be viewed at inuktutlexicon.gcrc.carleton.ca.

Inuit language dictionaries

> Dictionaries represent the most tangible product of a language documentation, the one most readily understood by laypersons, and most appreciated by the speech communities themselves. It is thus no surprise that dictionary-making has probably the longest tradition of any activity in language documentation.
>
> — Geoffrey Haig, Nicole Nau, Stefan Schnell, and Claudia Wegener, Introduction to *Documenting Endangered Languages: Achievements and Perspectives*

Dictionaries play a vital role in language revitalization and maintenance. They document traditional vocabulary that is being lost by younger generations of speakers, and are an important resource for language teachers and learners. They can be used as a reference for curriculum development in bilingual and immersion programs; as a tool for developing and recalling vocabulary, both general and specialized; and as a resource for standardized spelling (Frawley, Hill and Munro 2002; Hinton and Weigel 2002; Rice and Saxon 2002). Developing a dictionary can become a community activity, with speakers working collaboratively with lexicographers to create a product that addresses the needs of the community (Frawley et al. 2002). Moreover, from a cognitive perspective, the lexicon documented in dictionaries "can provide a powerful resource for understanding how speakers have organized the kaleidoscope of their experience into concepts" (Mithun 2001: 37).

Dictionaries have been developed in collaboration with Inuit for many Canadian Inuit dialects. In the 1980s, dictionaries and grammars for the three main languages spoken in the Inuvialuit region of the Northwest Territories were published: Kangiryuarmiutun (Lowe 1983), Uummarmiutun (Lowe 1984a), and Siglitun (Lowe 1984b; 2nd ed. 2001). Bilingual dictionaries for other Inuit dialects followed, such as Jeddore (1976), Schneider (1985), Andersen, Kalleo and Watts (2007), Angulalik (2012), and Briggs, Johns, and Cook (2015). Although not always explicitly stated, an important factor in developing these dictionaries was to document and preserve the Inuit language. For example, in the introduction to his Siglitun dictionary, Lowe states, "Let's finally hope that the energy and effort that has been put into the creation of this dictionary will contribute to reinforcing the status of Inuvialuktun for the Inuvialuit and that Siglitun will still be spoken many years from now" (2001: xi).

Print was the standard dictionary format universally until the computer was introduced as a tool for editing and analysis in the 1980s, an innovation that led to the publication of electronic dictionaries a decade later (Svensén 2009: 437). Some examples of online dictionaries currently available for the Inuit language are Spalding's (1998) multi-dialectal dictionary (www.inuktitutcomputing.ca/Spalding/index.php) and the Virtual Museum of Labrador's Inuttut Dictionary (www.labradorvirtualmuseum.ca/home/inuttut_dictionary.htm). The online lexical

database in the pilot atlas goes a step further than these electronic dictionaries by using multimedia to capture the use of words in context. Context is vital in teaching and learning language, as language is highly contextual. As Tagalik (2009–2010: 6) observes, "Elders will continually point out [that] you cannot build an igloo by reading a book." In the following sections we describe the atlas's goal of documenting dialects, the content and organization of the lexical database, and the role of the atlas in transmitting linguistic knowledge.

An online multidialectal lexical database

The main component of our Inuit language atlas is a multidialectal database of written and spoken words. While the atlas contains information that resembles what would be found in a printed or online bilingual dictionary, the interactive, multimedia format of cybercartography permits much more than simply printed words and meanings. The *Atlas of the Inuit Language in Canada* has many of the benefits associated with electronic dictionaries: audio files with pronunciations; information linking (cross-referencing); different user interfaces; different types of search and sort functions, and potential integration with other reference works (Frawley et al. 2002; Jackson 2002; Svensén 2009). One of the great advantages of online dictionaries is their capacity to be continuously updated, an enormous benefit given that dictionaries have been described as incomplete, open-ended works in progress, and as unfinished products without a "true end point" (Hinton and Weigel 2002; see also Frawley et al. 2002; Atkins and Rundell 2008; Svensén 2009).

The technical platform of the Inuit language atlas is the Nunaliit Cybercartographic Atlas Framework developed by the Geomatics and Cartographic Research Centre (GCRC) at Carleton University. Nunaliit is "an interactive data management platform for collecting, relating, presenting, and preserving information … with the ability to connect information and present narratives that put the information into context" (Hayes et al. 2014: 129). The cybercartographic framework allows words in the Inuit language atlas to come alive by presenting them in context through audio files, video files, photographs, and drawings.

Preserving dialects

The goal of the atlas's multidialectal database is to help protect and strengthen the vitality of Inuktut dialects[2] through documentation of their words. Dialects are lost when speakers mix and merge dialects due to social, economic, or geographic mobility, or transfer to a more dominant dialect or another language

2. We use the term *Inuktut* to refer to all the Inuit dialects spoken in Canada. Inuit Tapiriit Kanatami (ITK), the national Inuit organization representing the approximately sixty thousand Inuit in Canada, passed a resolution in favour of adopting the term *Inuktut* at their board of directors meeting in April 2016.

altogether (Tulloch 2006). As Tulloch notes, dialects are valued by their speakers because they provide a sense of regional identity. They allow comfortable and effective communication with those who share their dialect, conservative dialects in particular being a symbolic and practical link to the past. Most importantly, dialects provide a sense of regional identity. The display of lexical information in the atlas reinforces the uniqueness and importance of each dialect, and also raises awareness of the similarities and differences among them by facilitating cross-dialectal comparisons. Tulloch suggests that dialectal awareness, tolerance, and mutual intelligibility can strengthen an endangered language by maximizing the number of speakers of the language overall through the use of its dialects.

Eleven Inuktut dialects (or subdialects) are represented in the atlas to date: Uummarmiutun, Sallirmiutun, Inuinnaqtun, and eight dialects of Inuktitut—Natsilingmiutut, Kivalliq, Aivilik, North Baffin, South Baffin, Nunavik, Nunatsiavut, and Rigolet. Each dialect in the atlas is equal to the others in terms of privilege, accessibility, and exposure, regardless the number of its speakers or geographic location. This is especially significant for the Inuit regions in the Northwest Territories, western Nunavut, and Labrador, where the language is most endangered. In 2011 the percentage of Inuit able to conduct a conversation in Inuktut was 20.1 per cent in the Inuvialuit region and 24.9 per cent in Nunatsiavut, compared to 99.1 per cent in Nunavik and 89 per cent in Nunavut (Langlois and Turner 2014). Even within Nunavut there are differences in the vitality of dialects, with only 10 to 12 per cent of Inuit living in western Nunavut communities having Inuinnaqtun as their mother tongue (Nunavut Bureau of Statistics 2010).

The Inuit language atlas also provides a unique opportunity to document severely endangered and extinct dialects that receive little attention in current revitalization and promotion strategies, which focus on maintaining and strengthening dialects that have a realistic chance of survival. Dialects such as Rigolet in northern Labrador, with only a handful of fluent speakers (Dorais 2010), have a place in the atlas alongside more dominant dialects. The Nunaliit framework allows dialects to be added with little production cost, thus easily accommodating the traditional knowledge revealed by ancestral language varieties even if the knowledge is incomplete. One such example is Hebron, which became extinct when its speakers were relocated in the 1950s (Evans 2012), and which we plan to add to the atlas in the future.

The online format makes it feasible to include multiple dialects in one database. Multilingual and multidialectal dictionaries are difficult to create in printed form because of the complex and user-unfriendly structure required to present and access such masses of information (Svensén 2009).[3] Because of the

3. An exception is Fortescue, Jacobson, and Kaplan's (2011) comparative dictionary of ten languages and dialects from the Eskimo-Aleut language family and Aleut cognates. It is an impressive work (720 pages) primarily for use as a reference by Eskimologists and linguists.

flexibility in presenting electronic data in the atlas, the user is able to select only relevant or desired information and avoid the visual and cognitive overload associated with too much printed information.

Database content and organization

In this first stage of the atlas project, we are working out the contents and organization of the lexical database from technological, linguistic, and user perspectives. Issues under consideration include the types of linguistic information to present, technological structure and features, procedures for inputting data, and modules for presenting and accessing database information.

Each entry in the lexical database consists of the following information:

a. **Inuktut word**. If the same word form is used in multiple dialects, each occurrence will appear as a separate entry in the database. This is because information in fields such as Dialect and Source will necessarily differ across dialects. Information in other fields such as Definition and Notes, as well as links to audio and video files, may or may not differ.
b. **Dialect** that the word belongs to.
c. One- or two-word **English equivalent**. This is used as the reference point for entries from all dialects.
d. **Semantic** category (e.g., body parts, birds, seasons).
e. **Grammatical** type or classification (e.g., singular noun, plural noun, verb).
f. **Definition**, if more than the English gloss is required. Dialect-specific information can be displayed here.
g. **Source** (e.g., dictionary, consultants).
h. Additional **notes** associated with the word.
i. Whether or not it is a **traditional** word.
j. Links to its **pronunciation**, with the International Phonetic Alphabet (IPA) transcription to be added.
k. Links to **videos** of Elders explaining or demonstrating the meaning and use of words.

Each entry is a record consisting of the information fields listed above, with any field in (a) to (h) being a potential source for sorting. Sorting words by semantic category (or semantic / lexical field) is a useful alternative to sorting alphabetically. While an alphabetical listing is convenient for quickly locating words in a list, this is true only for those who are accustomed to the English alphabet order. In Inuktut the Romanized version of the syllabic alphabet is "i-u-a-pi-pu-pa … " rather than "a-b-c … " Perhaps the greatest disadvantage of the alphabetic system, Roman or otherwise, is that "it presents an atomistic view of the vocabulary, treating each word in isolation … and making few of the connections that exist between words" (Jackson 2002: 146). In a bilingual dictionary where there may not be a one-to-one correspondence

between words in the two languages, organizing words semantically becomes crucial, for example with kinship terms (Hinton and Weigel 2002). The challenge with a semantic format, of course, is determining the relevant categories and the words that belong to them. Semantically organized word lists are clearly essential in the glossaries of specialized terminology published by the Inuit Cultural Centre, Nunavut Arctic College, and the Government of Nunavut (e.g., ICI 1987; Sammons 1994; Allen 1995; Government of Nunavut 2014). The online atlas allows words to be organized both alphabetically and thematically, or a combination of both, without requiring additional storage space.

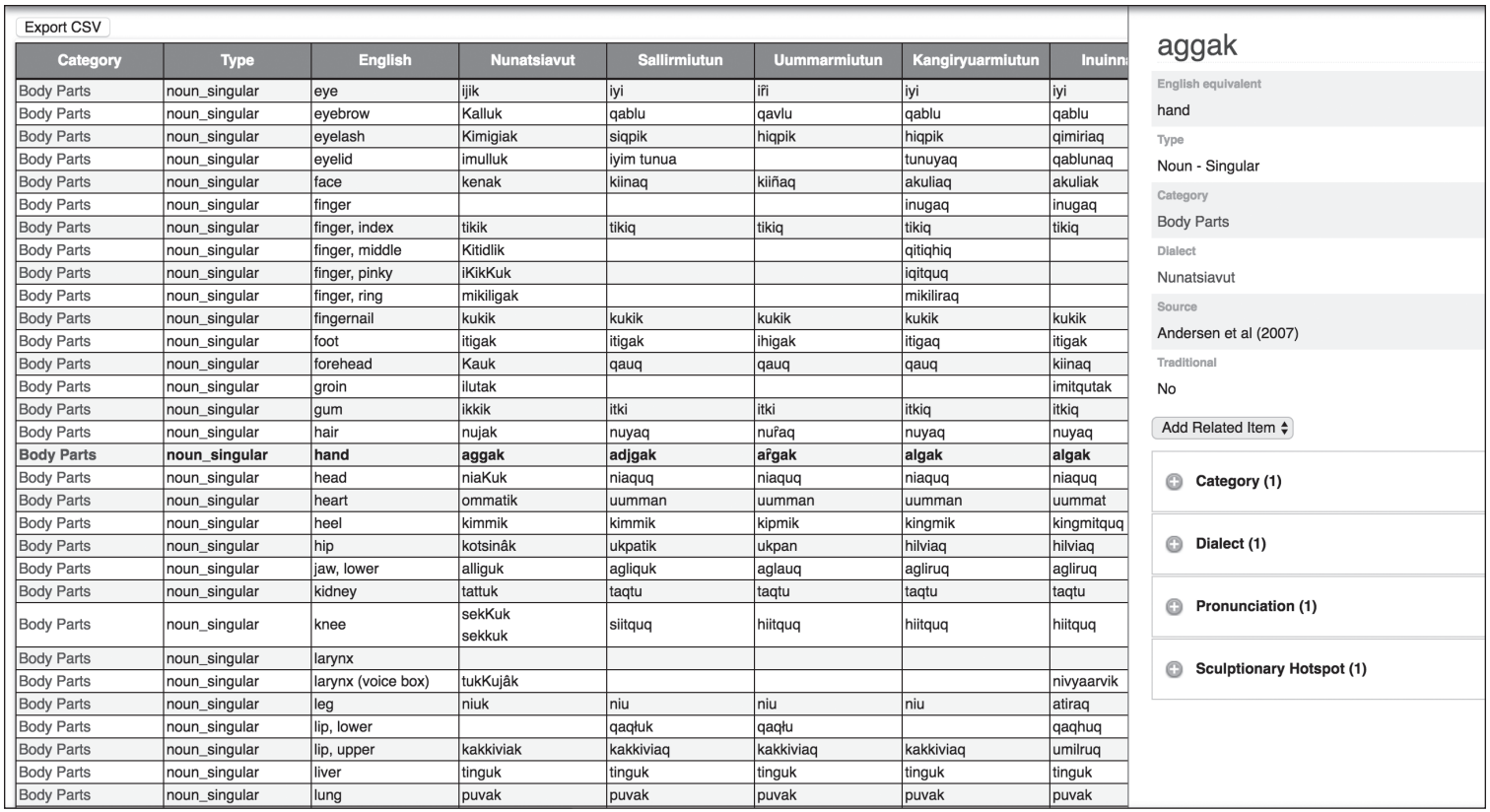
Modules

The atlas database and accompanying information can be accessed in different formats, or modules. Modules fulfill one of the key objectives of a cybercartographic atlas, which is to "encourage knowledge sharing and critical reflection along a variety of interrelated dimensions," including historical, geographical, social, and cultural domains (Pyne 2014: 246). Presenting the database information in different modules allows the atlas to address the needs and capabilities of different types of users. The interactive format allows them to choose the information they wish to learn about in ways that appeal to them.

There are currently four modules in the database: Word list, Dialect Chart, Sculptionary, and Community Map. Words can be added and edited in the Word List or Dialect Chart modules. In the Word List, each row displays an Inuktut word along with the information in b to h above. In the Dialect Chart, each row displays the same Inuktut word in different dialects (Figure 1), facilitating comparisons of word forms across dialects. Clicking on a particular word in either module brings up additional information on that word, along with links to accompanying photographs and videos.

The Sculptionary module presents words belonging to the semantic category of body parts in an interactive visual format. The sculpture in Figure 2 consists of "hotspots" that are connected to words in the database. After selecting a dialect from a menu, the user can hover over the hotspot to hear the word pronounced, or click on it to see all the information associated with that word. Figure 2 shows the result of selecting the Inuinnaqtun dialect and clicking on the sculpture's hand. Carleton's Geomatics and Cartographic Research Centre is working on a general module where hotspots linking to words in a database can be applied to any visual image. In the future, words for birds, animals, and plants, for example, will be accessible by clicking on drawings and photographs.

By including photographs and drawings, the atlas provides Inuit artists with an opportunity to showcase their art. The artwork could be created by well-known artists, such as Nelson Takkiruq (Figure 2), or be drawings sent in by schoolchildren on a particular theme, such as animals. The appeal of visual images is that they can represent the meaning of a word more realistically than its written form.



Export CSV

Category	Type	English	Nunatsiavut	Sallirmiutun	Uummarmiutun	Kangiryuarmiutun	Inuinn
Body Parts	noun_singular	eye	ijik	iyi	iři	iyi	iyi
Body Parts	noun_singular	eyebrow	Kalluk	qablu	qavlu	qablu	qablu
Body Parts	noun_singular	eyelash	Kimigiak	siqpik	hiqpik	hiqpik	qimiriaq
Body Parts	noun_singular	eyelid	imulluk	iyim tunua		tunuyaq	qablunaq
Body Parts	noun_singular	face	kenak	kiinaq	kiiñaq	akuliaq	akuliak
Body Parts	noun_singular	finger				inugaq	inugaq
Body Parts	noun_singular	finger, index	tikik	tikiq	tikiq	tikiq	tikiq
Body Parts	noun_singular	finger, middle	Kitidlik			qitiqhiq	
Body Parts	noun_singular	finger, pinky	iKikKuk			iqitquq	
Body Parts	noun_singular	finger, ring	mikiligak			mikiliraq	
Body Parts	noun_singular	fingernail	kukik	kukik	kukik	kukik	kukik
Body Parts	noun_singular	foot	itigak	itigak	ihigak	itigaq	itigak
Body Parts	noun_singular	forehead	Kauk	qauq	qauq	qauq	kiinaq
Body Parts	noun_singular	groin	ilutak				imitqutak
Body Parts	noun_singular	gum	ikkik	itki	itki	itkiq	itkiq
Body Parts	noun_singular	hair	nujak	nuyaq	nuřaq	nuyaq	nuyaq
Body Parts	**noun_singular**	**hand**	**aggak**	**adjgak**	**aŕgak**	**algak**	**algak**
Body Parts	noun_singular	head	niaKuk	niaquq	niaquq	niaquq	niaquq
Body Parts	noun_singular	heart	ommatik	uumman	uumman	uumman	uummat
Body Parts	noun_singular	heel	kimmik	kimmik	kipmik	kingmik	kingmitquq
Body Parts	noun_singular	hip	kotsinâk	ukpatik	ukpan	hilviaq	hilviaq
Body Parts	noun_singular	jaw, lower	alliguk	agliquk	aglauq	agliruq	agliruq
Body Parts	noun_singular	kidney	tattuk	taqtu	taqtu	taqtu	taqtu
Body Parts	noun_singular	knee	sekKuk sekkuk	siitquq	hiitquq	hiitquq	hiitquq
Body Parts	noun_singular	larynx					
Body Parts	noun_singular	larynx (voice box)	tukKujâk				nivyaarvik
Body Parts	noun_singular	leg	niuk	niu	niu	niu	atiraq
Body Parts	noun_singular	lip, lower		qaqłuk	qaqłu		qaqhuq
Body Parts	noun_singular	lip, upper	kakkiviak	kakkiviaq	kakkiviaq	kakkiviaq	umilruq
Body Parts	noun_singular	liver	tinguk	tinguk	tinguk	tinguk	tinguk
Body Parts	noun_singular	lung	puvak	puvak	puvak	puvak	puvak

aggak

English equivalent
hand

Type
Noun - Singular

Category
Body Parts

Dialect
Nunatsiavut

Source
Andersen et al (2007)

Traditional
No

Add Related Item

Category (1)

Dialect (1)

Pronunciation (1)

Sculptionary Hotspot (1)

Figure 1. Dialect Chart module.

However, they are best suited to concrete words such as body parts and animals. Other multimedia formats, most likely videos, will be used for words associated with abstract domains such as cognition (e.g., thoughts, memories).

The fourth module is the Community Map, which displays a map of over fifty communities in Arctic Canada (Figure 3). There are fifty-three officially recognized communities in Inuit Nunangat, but we have added other locations when local Inuit inform us of dialects heard in settlements that are now abandoned. One example is Hebron in Nunatsiavut, whose population was relocated to various communities further south along the Labrador coast in the 1950s (Evans 2012). In the Community Map module, communities are linked to the dialects spoken there, providing another way to access the database information. This module presents information in a format that is more typical for a cybercartographic atlas, where maps are used as a unifying framework (Hayes et al. 2014).

Traditional and modern linguistic knowledge

The documentation of words and meanings is critical, as words are being lost from one generation of speakers to the next. The Inuit language atlas provides an important and necessary space for collecting, storing, and transmitting traditional words before they disappear. Such knowledge allows us to understand recorded stories, songs, and oral traditions, and thus provides "a window into the culture of the past" (Tulloch 2004: 15). In the second stage of the atlas project we will add videos of Elders describing, explaining, or demonstrating traditional uses of words, thereby transmitting their knowledge of language and culture. Video recordings capture features of oral traditions such as tone of voice, facial expressions, and gestures that print media cannot (Kroskrity 2002), and thus can recreate more effectively traditional methods of language transmission.

Two types of words are in danger of being lost: words that have undergone change in form and / or meaning, and words that are known only to older speakers because they portray concepts that are no longer relevant to younger generations. The first type of word loss is a natural process of linguistic change, and is the reason why the Inuktitut spoken in eighteenth-century Labrador is different from the language heard there today (see Dorais 1980). Similarly, there are words used by Elders that differ in form from those currently used by younger speakers. An example is the plural form Elders use in words such as *tulukkat* (ravens), *nutaqqat* (children), *amaqqut* (wolves), and *amiqqat* (fish scales), in contrast to the more contemporary plural forms *tulugait, nutarait*, *amaruit*, and *amirait*.

The second type of word loss is the result of changing cultural traditions. As Tagalik (2009–10: 6) notes, "loss of language occurs rapidly with loss of context. As Inuit today have less time and access to the cultural experiences that underpin their language, there is a decrease in understanding of the concepts

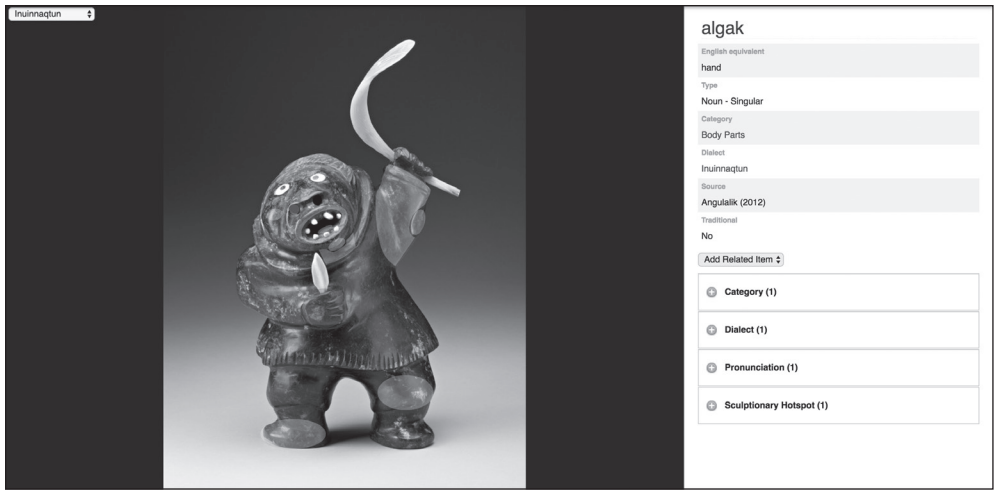


Figure 2. Sculptionary module. The sculpture is by the Gjoa Haven artist Nelson Takkiruq (1930–1999). Permission to use the image in the atlas was granted by Canadian Arctic Producers and Dieter Hessel (photographer).

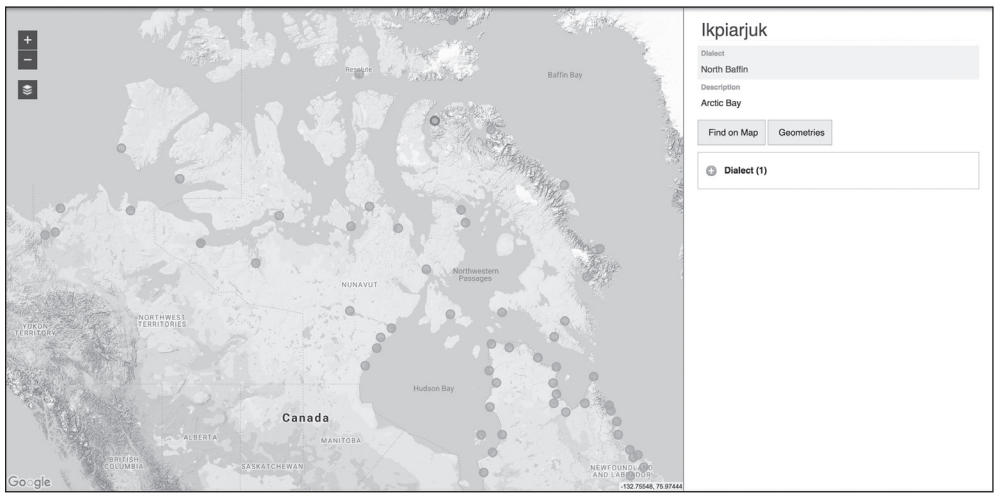


Figure 3. Community Map module.

linked to words and the relevance of the word itself as it relates to the cultural experience." These include words associated with fishing and hunting (e.g., seal, walrus, and caribou), the various parts of a tent, and setting up, lighting, and tending the *qulliq* (oil lamp). The atlas database has great potential to preserve and transmit traditional knowledge, since words encompass all facets of culture and being.

The documentation of traditional Inuktut words is an important part of the Inuit language atlas, but the atlas database is structured to document modern words as well. In this way, the database is both contemporary, describing current language, and diachronic, describing language development over a longer period of time (Svensén 2009). In fact, the majority of the words are those in current usage. However, traditional words and their contexts receive special attention in order to document them as fully as possible while they are still part of the speakers' knowledge. Traditional words are given the label "traditional," which will be used to create a separate module consisting only of traditional terms. In this way, those words can be viewed alongside their modern equivalents (if they exist) in one module, or as a separate topic of study in another.

Because language is always undergoing change, words that are current today could become traditional knowledge tomorrow. For example, in Kinngait (Cape Dorset) the sound represented by "j" in *takujuq* ("he sees") is changing for some younger speakers from the "y" sound in "yellow" to the "z" in "zebra." If this sound change spreads to all speakers in the community, then the "y" pronunciation documented in the atlas will be a record of how the sound was pronounced in the past. Thus, the atlas will document not only the traditional knowledge of today but also the traditional knowledge of tomorrow. With the capacity to be continuously revised and updated, the database is not static; it is a living document of both traditional knowledge and language change.

Online transmission of language

Different types of users

> There is no doubt that multimedia dictionaries are the wave of the future, despite their enormous technical demands. But even as they perch on the cutting edge, they pose the age-old graphics questions: who is using this dictionary, for what purpose, and how?
>
> — William Frawley, Kenneth C. Hill, and Pamela Munro, "Making a Dictionary: Ten Issues"

The needs and capabilities of the user are central to the design and content of every aspect of a dictionary (Atkins and Rundell 2008: 5). The various ways of accessing and presenting database information in the atlas will appeal to different types of users, including Inuit language experts, linguists, teachers, curriculum developers, learners, and translators. Users can select information specific to their needs: a certain dialect, semantic category, geographic location, word list, etc. Because the Word List contains linguistic information such as number, grammatical category, and semantic class, it will appeal to linguists and others interested in the structure of words. Those who are interested in cross-dialectal comparisons (e.g., linguists, translators, and teachers) can use the Word

List and Dialect Chart, as well as the Community Map when, in the future, it may be used to map the occurrences of words and dialects across the Arctic region (e.g., Junker and Stewart 2011 for the Algonquian language family).

The atlas will also accommodate the requirements of speakers with varying proficiency levels. Basic words in the lexical database are appropriate for Inuktut learners, accompanied by a fun, interactive method of learning such as the Sculptionary. Fluent speakers will likely not access basic vocabulary in their dialect for the meanings, but may retrieve them in order to compare them with similar words in other dialects. Moreover, they could use the atlas to confirm or learn about traditional terminology that they may be forgetting or never learned. Finally, fluent Elders will approach the atlas from a different perspective, that of traditional knowledge keepers passing on their knowledge through this new medium. While they may not be comfortable using computers themselves, most recognize the value of using technologies that youth are comfortable with in order to teach them traditional ways (Gearheard 2005).

The language learner

The atlas is an exciting online tool for language learners, whose needs should be central to the development of any language revitalization resource. The lexicon plays an important role in second-language acquisition. As Gass and Selinker (2008: 449–451) observe, lexical knowledge is crucial for comprehension, and can disrupt communication if not applied correctly in production. Speakers who make grammatical errors can usually still be understood, but using an incorrect word could result in serious miscommunication.

Vocabulary is acquired in stages, from total unfamiliarity to correct semantic and grammatical usage (Paribakht and Wesche 1993). Different strategies have been applied to acquiring vocabulary, such as repetition and rote learning, organizing words in the mind, linking to existing knowledge, seeing examples of meaning, and using words in context (Cook 2016: 76–80). The atlas has great potential as an online vocabulary learning tool. The Sculptionary module, for example, can be used to design an individualized program for acquiring and assessing vocabulary that follows the strategies and natural progression of vocabulary learning. The learner can access a word and its meaning repeatedly until it becomes familiar; the theme-based Sculptionary allows words to be organized and stored in memory in semantic categories, thus establishing links between words that share the semantic feature; and through videos the learner can see examples of the meaning and use of words.

Studies have shown that making use of both text-based and image-based annotations results in better vocabulary learning (Chun and Plass 1996; Chun 2011). Instructional methods that involve both written and pictorial modalities result in better learning outcomes than those that involve only one channel (e.g., visual text alone; Mayer 2003). The atlas promotes a variety of multimedia interactions: written text and word pronunciation in the Word List and Dialect

Chart, written and spoken word with an illustration in the Sculptionary, and a graphic map of communities with their written names on the Community Map. The multiple formats in which information is presented in a cybercartographic atlas allows users to choose the format or combination of formats and modalities they wish to use, based on their learning preferences (Taylor 2014).

Gearheard (2005) claims that the use of interactive multimedia, with links to non-text components and multiple path choices leading to the same information, represents Indigenous language and knowledge more accurately than the written word or linearity of books, and is more closely aligned with how Indigenous people teach and learn. We would claim that with respect to language, multimedia resembles the way all people learn language in a natural setting. For example, in the Sculptionary module the learner "points" to a part of the sculpture's body with the mouse, and then hears the word for that body part spoken. This is precisely how children and second-language learners would discover the names for body parts in normal oral communication. By clicking on a body part, the learner can see text that provides further information on the word as well as links to videos that explain the use of the word in a certain context, thus enhancing the learning experience.

While this interactive, multimedia platform is more representative of natural vocabulary learning than simply referencing printed dictionaries, the virtual learning environment provides a different experience from the traditional method of language transmission. They differ in two main ways: learner autonomy, and lack of interaction with fluent speakers. The first difference concerns the amount of control the user has over the learning process. Atlas users are active learners, determining which topic to learn about (e.g., body parts or birds, Siglitun or South Baffin dialect), how much information to cover, how much repetition to include, and the duration of the learning session. They are autonomous learners and mindfully engaged in the learning process, important features in a successful learner-based interactive multimedia model for language learning (Watts 1997). Moreover, the atlas can accommodate many types of learners: visual, auditory, tactile, individual, and group (Reid 1987). The atlas is most suited to the visual learner, as most of the information is visually displayed on the computer screen, in the form of written words, images, or audiovisual recordings. Auditory learners will appreciate being able to hear the words pronounced as well as seeing them in text, and watching and listening to the video recordings of Elders using language. The interactivity of the atlas will appeal to the tactile learner, who can progress through the atlas by clicking on the mouse, by scrolling, or by using the keyboard. For individual learners who prefer working alone, the atlas can be a personal learning tool to be accessed at a time and place convenient for them. This would be important for Inuit youth who feel insecure about speaking Inuktut for fear of being corrected by Elders (Tulloch 2004: 276–277). The atlas is likely to be a comfortable platform for Inuit

youth, who are accustomed to online communication, to interact (albeit virtually) with Elders in the language that is "strongly associated with participation in traditional activities and communication with elders, the keepers of Inuit traditional knowledge" (Ibid.: 300). The only type of Reid's (1987) learner that the atlas cannot accommodate is kinesthetic, since learners are sitting in front of a computer and not actively moving around.

The second difference between live and online language learning is that a computer provides no direct interaction between the learner and the teacher. The computer becomes an intermediary between the teacher (e.g., an Elder) and the learner: the Elder records a video explaining a word, and that recorded knowledge is edited, arranged, and stored in the atlas until the learner is ready to access it. Furthermore, this method of accessing the Elder's knowledge is different from the natural teaching method, as it involves answering questions from the researcher about particular words and themes. As observed by Nakasuk (1999: 3) in describing an oral traditions course at Nunavut Arctic College, "as elders are held in great respect, students were not accustomed to subjecting them to long lists of questions."

Negotiated interaction between a language learner and a native speaker (or another learner) has been shown to have considerable benefits for second-language learning and vocabulary development (Long 1996; Gass 1997; Jeon 2007). While such interaction is not possible for an individual atlas user, the Inuit language atlas has the potential to be an educational resource for group learning and interactions in the classroom. Moreover, cybercartographic atlases can play an important role in contributing culturally relevant educational material and learning experiences for Inuit youth in particular (Taylor, Cowan, Ljubicic and Sullivan 2014).

An obvious advantage of online language transmission is the spatial and temporal freedom with which teaching and learning can take place. Videos can be recorded in any place or time that is convenient for the teacher. Learning can occur wherever and whenever students have access to a wired electronic device, including computers, tablets, and cellphones. This freedom, though, is challenged by the potential difficulty in accessing the online atlas. The low bandwidth in many northern communities results in slow and unreliable internet connections. There is also the cost of acquiring and maintaining computer equipment, and the level of computer literacy required to use an online resource (Frawley et al. 2002; Gearheard 2005; Holton 2010; Taylor et al. 2014).

Future directions

The Inuit language atlas is an open-ended work in progress. There is always content to add and technology to modify. Future developments are listed below, grouped into short- and long-term goals.

Short-term goals

- **Semantic categories**. Currently, the categories are Animals, Birds, Body Parts, Colours, Days of Week, Kinship Terms, Months, Numbers, Seasons, Time, and Weather.
- **International Phonetic Alphabet (IPA)**. We will add IPA transcriptions for all words, to be used for linguistic analysis and evidence of language change.
- **Standardized "dialect."** Inuit are currently exploring the standardization of their writing system (Patrick, Murasugi, and Palluq-Cloutier 2018). Once the standard has been developed, it will be added to the atlas as a separate "dialect." The standardized words will eventually replace English as the reference point for all dialects. We can in fact start to add standardized forms even before the system has been completely developed.
- **Community Map**. We will start to develop the Community Map into a dialect map that shows the distribution of written and spoken words across the different dialects and communities.
- **User feedback capabilities**. One of the key features of cybercartography is the collaborative and iterative fashion in which atlases are created, driven by the needs of the users (Hayes et al. 2014). Our project partners and their regional collaborators participate fully in planning the content and design of the atlas, as both co-creators and users. We would like to encourage more user participation by encouraging atlas users to provide feedback on the atlas's content, design, and functions. The ability to provide user feedback is a valuable feature of web-based dictionaries, and one that the Nunaliit framework is well suited to, but, as Svensén (2009: 449) notes, this bottom-up method of dictionary creation could be considered a "potential threat to quality and reliability." On the other hand, Svensén recognizes that in some cases, as with little known languages, it is more likely that the potential contributors are experts in the language.

Long-term goals

- **Grammatical word types**. Our words so far are simple noun roots, but we will add verbs as well. We will need to decide on which forms of the verb to include, such as roots, inflected forms, morphologically complex but lexicalized forms, etc. (see Munro 2002).
- **Phrases**. Phrases such as greetings and simple commands, which demonstrate language in use, are important for language revitalization (Hinton and Weigel 2002).
- **Video transcriptions**. A database of transcriptions of videos will be a valuable resource for teachers, learners, and linguists.

- **Dialect interfaces**. Currently, the user interface is in English. We would eventually like to have an interface in each dialect, so that users can navigate through the atlas in their own dialect.
- **Interface with complete dictionaries**. We envision the atlas being able to interface with other online dictionaries one day.

Conclusion

Ideally, the transmission of the Inuit language from one generation to the next would occur naturally in an environment where it was the primary mode of communication. Unfortunately, the reality is that the number of Inuit who are claiming Inuktut as their first language, or as their home language, is declining. As the traditional methods of language transmission become less viable in contemporary Inuit society, newer methods, such as the Inuit language atlas, could help to reverse the trend of language shift. The atlas has the potential to be an invaluable tool for documenting traditional language, as well as the changing language of today's Inuit.

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