Toward Language in Action: Agency-Oriented Application of the GRASAC Database for Anishinaabe Language Revitalization^{*}

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Abstract: Under the direction of Ruth Phillips, GRASAC (Great Lakes Research Alliance for the Study of Aboriginal Arts and Culture) is a worldwide collaborative research consortium composed of indigenous community members, museum professionals, and academic researchers. This article discusses a project that explored the potential of GRASAC's database to support language revitalization. The authors video recorded interviews with two beadworkers in the Anishinaabe language. Applying andragogy theory to the natural approach to language acquisition, the team processed the video into content rich video clips with a focus on the domain specific vocabulary of beadwork that is relevant to the heritage items in the GRASAC database. The team applied an agency-oriented approach to software development by systematically testing five use cases for uploading the language data into the GRASAC database. The collaborative process revealed unexpected results at the intersection of language and culture revitalization, and recommendations for applying new technologies to develop new techniques for promoting indigenous language acquisition.

[Keywords: *language revitalization; translating (language); language documentation; second-language acquisition; endangered languages; collaboration; Anishinaabe; language acquisition theory; beadwork; database.* Keywords in italics are derived from the American Folklore Society Ethnographic Thesaurus, a standard nomenclature for the ethnographic disciplines.]

Introduction

One sunny afternoon during the summer of 2009, core members of the Great Lakes Research Alliance for the Study of Aboriginal Arts and Culture (GRASAC) held a series of community consultation workshops at the Ojibwe Cultural Foundation (OCF) on Manitoulin Island. Their purpose was to simultaneously train Anishinaabe community members on the GRASAC Knowledge Sharing tool (GKS) and gather their feedback on user interface design, functionality, and future development directions (Figure 1).¹ Dr. Mary Ann Corbiere was among the workshop participants. When asked what language component she would like to see developed within the GKS, she replied “language in action,” which she defines as language that is used in a natural segment of speech rather than what may be taught in standard language instruction environments. Clearly Corbiere envisioned the potential of the GKS as a tool that could support

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second language instruction. This article discusses a project that built upon several GRASAC members' independent initiatives in museum collections research, language instruction, and database design, to systematically explore the potential of the GKS to support language revitalization.

Figure 1: Members of GRASAC work with Anishinaabe language instructors at training and consultation workshops at the Ojibwe Cultural Foundation (OCF), June 2009. Photo by Alan Corbiere.

Under the direction of Ruth Phillips, GRASAC is a worldwide collaborative research consortium composed of indigenous community members, museum professionals, and academic researchers (Phillips 2011, 290).² It is now common for museums to work together with source communities (originating communities for heritage items now in museum collections) to reunite indigenous peoples with their cultural heritage and to give them curatorial voices (Peers and Brown 2003, 2). Increasingly, museum professionals and scholars are turning to technology to facilitate these objectives. Technology has opened the door to new opportunities for access to heritage items in collections. Digital Cultural Heritage (DCH, original digital collections) and “digital repatriation” (return of digital reproductions of heritage items) help restructure social relations, classificatory systems, types of access, and forms of ownership (Geismar 2012, 267). Members of source communities prefer the terms “digital repatriation” or “digital circulation” over “virtual repatriation,” which seems to misleadingly suggest a fake kind of actual return. Digital repatriation is not intended to replace the actual transfer of ownership entailed in physical repatriation (Bell, Christen, and Turin 2013, 5). Rather, it facilitates “image and text repatriation, returning to originating communities information about their history and cultural achievements” (Phillips 2011, 287-8). Moreover, “visual repatriation” can be a stimulus and inspiration to the revitalization of living art traditions (Willmott 2013).

Digital heritage projects encompass fine art, history, and anthropology museums, as well as archives and libraries, with some of the most prominent examples focused on European, North African, and Asian cultures (Fresa 2013, 34). A 2009 study estimated that the European Digital Cultural Heritage (DCH) sector invested approximately € 80 million annually (Fresa 2014, 108). In the context of the multinational *Europeana* heritage domain, Antoine Isaac and colleagues (2013) and Antonella Fresa (2013, 108-9) emphasize a need for interoperability among contributing institutions, and a need to close the gap between institutional DCH producers and DCH researchers. Costis Dallas (2007, 5) elaborates that this gap stems from digital curation practices that focus on the preservation priorities of archivists over the knowledge production needs of researchers. The lack of communication between archival and research stakeholders in digital curation can thus result in the “reduction of archives into unfit for use ‘data mortuaries’” (Dallas 2007, 5). To avoid this pitfall, DCH producers must also take into account different “interpretive communities” who interact with digital collections and exhibits. The sustainability of DCH depends upon producers’ ability to “capture the evolving perspectives of use and interpretation, applicable to digital information now appraised and curated for future ‘fitness for purpose’” (Dallas 2007, 12). For language revitalization, David Nathan (2015, 53-7) delineates a set of ten criteria designed to evaluate how successfully a digital archive can “provide language resources to those who can gain value from them,” or what he calls “designated communities.” This project explores methods of language data creation and online presentation in order to meet the needs of the specific designated community of Anishinaabemowin adult language learners.

Digitization projects centered on indigenous cultural heritage are less in danger of becoming “digital silos” because they are characterized by collaboration among museum professionals, university researchers, source community members, and technology developers throughout all project phases. For example, the Distributed Systems Technology Center of the University of Queensland collaborated with the National Museum of the American Indian to develop DCH software to be used at locally controlled Indigenous Knowledge Centers (Hunter 2005, 116). The Reciprocal Research Network (RRN), a project based in the Museum of Anthropology at the University of British Columbia, similarly brought together academic researchers, First Nations advisors, and student software developers in a team that employed an “agile software development model” that allows information flow between clients and developers (Phillips 2011; Rowley 2013, 23).³

In contrast with the mainstream DCH focus on interoperability, indigenous DCH collaborative teams have often sought local solutions above interoperability due to the widely divergent culturally specific heritage management needs of indigenous peoples. For example, Kimberly Christen’s (2008, 21) Mukurtu website and database project involved academic researchers and Aboriginal community members working alongside database technicians and website designers to produce a digital archive and user interface in conformity with cultural protocols for complex kin-based access restrictions. At the Penn Museum, Timothy Powell partnered with Larry Aitkin, Anishinaabe “wisdom carrier,” and Nyleta Belgarde, dean of White Earth Tribal College, to create an interactive web environment based on principles of Anishinaabe worldview. Powell and Aitkin (2011, 259) reflect on how the *animikii* (Thunderbird) spirit actively participated in the team’s process through a pictograph on birch bark in the Penn Museum collection that had been incorrectly identified as a “fish.” Anishinaabe digital heritage projects must take into account reciprocal social relationships among human and other-than-human persons.

Founded in 2005, GRASAC began with a small group of individuals affiliated with universities, but soon grew to include members representing museums and indigenous cultural organizations. Its members aimed to create methodologies for multi-vocal and democratized knowledge creation through digital circulation and collaborative research. To realize the first method, Heidi Bohaker took the lead in designing a multimedia database to help members of Great Lakes source communities to reunite with aspects of their heritage that is largely held in remotely located museums and archives. Accordingly, the first iteration of the GRASAC Knowledge Sharing tool (GKS3) consisted of a relational database of “Heritage Item” records based on Dublin Core fields supplemented with custom fields to accommodate the goal of uniting multiple forms of heritage such as material arts, literary works, archival documents, two-dimensional artworks, and photographs (Phillips 2011, 291).⁴ To realize the second method, GRASAC developed a methodology for collaborative collections research conducted in museums by teams that included all three of GRASAC’s constituencies, as well as experts in multiple academic disciplines. This resulted in the creation of data-rich records that stand in stark contrast to the typically data-starved records of most museums, as well as digital repositories that harvest data from multiple institutions. GRASAC members’ intellectual contributions motivate institutions to contribute to the GKS even though they may be constrained by legal contracts with their donors and other factors. Due to the sensitivity of content for both indigenous and institutional contributors, the original GKS3 was a members-only password protected site (Bohaker, Corbiere and Phillips 2015, 45-6, 52-3, 55).

Figure 2: Results of 2009 community consultation survey question showing which of the GKS development options the workshop participants in all four groups (youth, artists, K-12 teachers, and language instructors) would like to see GRASAC pursue.

In 2009, with software development and collaborative data entry methodologies well under way, the next challenge was to explore data retrieval applications of the GKS3 among source community members. Having recently launched the GKS3 in 2008, the purpose of the 2009 workshops was to test its usability and usefulness among Anishinaabe community members in four anticipated user group categories: youth, traditional artists, K-12 teachers, and Anishinabemowin language instructors (Willmott 2009; Willmott and Migwans 2010). The aggregated results of the workshop at OCF, and another one undertaken at the Little Traverse Bay Band of Odawa (LTBBO), show that the highest number of participants desired GRASAC to create an indigenous language module (39%) followed by a collaborative projects module (29%), a biography module (29%), and “more multi-media options” (26%). The next highest ranked priorities were to “develop a publicly accessible GRASAC website” (23%) and a maps module (23%) (Figure 2; Willmott and Migwans 2010). Qualitative responses for ideas for the language module included desire for heritage item names in indigenous languages, audio recordings of different dialects, audio recordings of oral histories, and translations of historical documents into indigenous languages.

In the fall of 2009, Heidi Bohaker and Willmott began working with the contracted Idéeclinc Inc. to develop the Projects Module in a custom modified Drupal (an open source content management system) platform.⁵ While the projected Biography Module has never been implemented, in 2011 Bohaker and Phillips directed Idéeclinc Inc. to begin developing a new Language Module, joined with the Heritage Item and Projects modules, in a new GKS4 built solely on the Drupal platform. Simultaneously, Alan Corbiere changed his position from Director of the Ojibwe Cultural Foundation to Anishinaabemowin Language Revival Coordinator at M’Cheeging First Nation. In this role, Corbiere began developing materials for second language instruction using multi-media tools to create rich Anishinaabe target language input for learners in a variety of contexts. When, in the spring of 2014, anthropology and computer science major Alex Taitt received National Science Foundation funding to conduct fieldwork on language revitalization, Willmott seized the opportunity to build a collaborative team to test the GKS4’s capacity to develop digital approaches to Anishinaabe language revitalization.⁶

With two considerations in mind, the results of the community consultation surveys and the goals of language revitalization as expressed by Alan Corbiere and Mary Ann Corbiere’s goals, Taitt and Willmott established as their project goal an exploration of the application of multi-media language input to forging meaningful links between the Heritage Item and Language Item modules in the GKS4. This approach to DCH development is an example of what Costis Dallas (2007, 2;12) refers to as an “agency-based perspective” that employs “event-centric methods” to measure the “fitness for purpose” of the software. The methodology accordingly entails “a process of active ‘questioning’ of systems by future communities of use” (Dallas 2007, 12); in this case, indigenous language instructors.⁷ Willmott and Taitt employed use case methodology to test specific goal-driven activities in the context of the GKS4. Linked as it is to specific user activities in relation to system functionality (Ma and Chang 2008, 843), use case methodology not only provided a protocol for testing language instruction applications in the software, but also guided choices during the data collection and analysis processes.

During the fieldwork phase of the research, Taitt, Alan Corbiere, and Mary Ann Corbiere audio and video recorded several interviews with Anishinaabe first language speakers that have been

archived at the OCF, where they will be available in perpetuity for multiple purposes. Following Taitt's and Mary Ann Corbiere's labor-intensive and complex data analysis process, Willmott and Taitt designed a series of use cases to test applications within the GKS4 of the multimedia data envisioned as rich language input for second language acquisition.⁸ Because the GKS4 was as yet in the process of development, these use cases were simultaneously testing the software prior to its release to GRASAC user communities. Although the testing status of the new GKS4 prevented positive results of use cases dealing with the new Language Module, the use case that involved attaching multimedia language input to existing Heritage Item records produced both promising results and best practice recommendations for new directions in digital second language instruction.

Anishinaabemowin Language and Culture Revitalization

Anishinaabe (plural Anishinaabeg) is an autonym used by the Ojibwa and other Algonquian-speaking nations located in the Great Lakes region, as well as their Western counterparts on the American Plains and Canadian Prairies. Each of these nations refers to their language as *Anishinaabemowin*. *Ethnologue*, an online dictionary of global languages, provides metadata for seven different regional dialects of "Ojibwa," some of which have additional listings for sub-dialects within them.⁹ Three of these regional dialects overlap in the Manitoulin Island and Lake Huron North Shore region with which this study is concerned ("Central," "Eastern," and "Ottawa") in a regional variation known as Nishnaabemwin. Victor Golla (2007, 67) notes "Nishnaabemwin is an emergent language, [a] fusion of Ottawa and Eastern Ojibwa, having a couple thousand speakers." This highly complex composition of regional and dialect variations of Anishinaabemowin, as well as its state of flux, creates challenges for those involved with its revitalization. Although first language speakers are able to easily navigate their way through and around even nuanced variations (Noori 2007, 135), second language learners can easily become confused by the plethora of vocabulary, grammar, and pronunciation choices. While taking Anishinaabemowin classes in the 1990s, for example, Willmott remembers instructor Alex McKay, who is a first language Northwestern Ojibwa speaker, regaling the class with humorous stories of cross-dialect misunderstandings. More language learning took place, however, in a subsequent class with Maanii (Ojibwe version of Mary) Wemigwans, who stuck consistently to instruction in Central Ojibwa.

Using the Expanded Graded Intergenerational Disruption Scale (EGIDS), and based on data largely collected before the 1990s, *Ethnologue* classifies "Central" and "Eastern" Ojibwa as "threatened," which is distinguished by "face-to-face communication within all generations, but it is losing users."¹⁰ "Ottawa," however, is given the EGIDS designation of "shifting," meaning that the "child-bearing generation can use the language among themselves, but it is not being transmitted to children" (Lewis, Simons, and Fennig 2016). As Anishinaabe historian and linguist Anton Treuer (2001, 5) remarked, "we're not losing our language, our language is losing us." Anishinaabe language professor Margaret Noori (2013, 119) elaborates this idea in the observation that "true transfer from one generation to the next occurs when students become daughters, nieces, grandchildren, best friends, and young women on their own choosing to use, or not to use, a fragile ancient language." In contrast with the *Ethnologue* classifications,

however, both Treuer (2001, 5) and Noori (2013, 134) note that the average age of the last generation of first language speakers is now older than the child-bearing years.

As Ehattesaht Chinehkint (Cha chom se nup, Heekuus and Brand 2013, 187-8) and Tagish (Hennessy and Moore 2007, 189-91) elders observed, the age of first language speakers can be directly related to the suppression of indigenous languages in residential schools (in Canada) and boarding schools (in the United States). In the US, although Collier's Indian Reorganization Act of 1934 called for supporting indigenous language and culture in the schools, these new policies were unevenly implemented in both boarding and day schools (Fortunate Eagle 2010, xvi). In Canada, school language policies similarly varied. However, there has been "neither a piece of federal statutory legislation nor an overarching federal policy for the recognition and revitalization of Indigenous languages" (Galley 2009, 243). By the 1960s, it seems likely that indigenous language fluency had diminished to the extent that punitive policies were obsolete. For example, only 34 percent of the former residential school students who Elizabeth Graham (1997, 22) interviewed in the 1990s spoke their native language upon entering the school. Immersed in the Toronto Native community in the 1990s, Willmott often heard adult Anishinaabeg lamenting that their residential school survivor parents refused to speak Anishinaabemowin with them because they had learned to regard it as a liability. This evidence suggests that the *Ethnologue's* classifications for the Ojibwa language are outdated and overly optimistic. Treuer (2011, 4) notes emphatically that "language and culture loss are among the biggest concerns today in Ojibwe country." Language loss continues despite the fact that Anishinaabe communities have been actively engaged in language revitalization programs in earnest since the 1990s. The *Endangered Languages* website classifies Southwestern and Eastern Ojibwe as "Endangered," and Ottawa as "Severely Endangered."¹¹

According to the *Ethnologue* Language Cloud, both "threatened" and "shifting" categories are "in trouble...but it is possible that revitalization efforts could restore transmission of the language in the home."¹² Anthony Woodbury (1998) observed that in environments of language shift, dimensions of cultural expressions and shared cultural histories can also begin to shift. If language shift continues, it can pose a threat to the vitality of the entire culture. This is in part because indigenous worldviews are embedded in indigenous languages (Noodin 2014, 14-5; Treuer 2001, 5). Language shift also has consequences for the stability of indigenous societies due to unequal power structures in the politics of identity. Margaret Noodin (2014, 15) explains that "blood, land and language can be viewed as mediums of continued warfare...the language is a source of history and a means of survival." Among scholars, there is a growing awareness of the importance of preserving indigenous knowledge, such as songs, dance, art practices, and stories (Hunter 2005). Among Anishinaabeg however, there is not as much the need for preservation of traditional arts as there is for reconnecting art practices with indigenous language discourses in relevant vocabulary domains. Community art practices are thriving, but they are doing so on a parallel course from language revitalization initiatives.

Globally, language revitalization and preservation programs and tools aim to combat these dangers to cultural survival.¹³ Anishinaabe language revitalization efforts in the Central and Eastern Ojibwa regions for the past thirty years have often concentrated on childhood language immersion programs that deliver cultural lessons in Anishinaabemowin. Organizations such as the Waadookodaading Ojibwe Immersion Charter School in Wisconsin and the

Anishinaabemowin Curriculum Development Project Committee of the Wikwemikong Heritage Organization (WHO) have produced instructional materials for childhood language immersion programs that are “by and for the Anishinaabe people” (Noori 2013, 127). While these initiatives are vital to language recovery, the fact remains that fluency loss continues at an alarming rate. In this context, Alan Corbiere (2014) noticed there are a growing number of adult second language students today. Recognizing that the needs of these adults differ significantly from those of immersed children, he has begun developing instructional materials based on principles of andragogy (i.e. adult learning) (Gordon 2009, 19-23) and the natural approach to language acquisition (Richards and Rodgers 2001, 178-91). He developed a prototype methodology in a series of video recordings of first language speakers doing and explaining traditional cultural activities such as gathering and preparing birch bark, as well as discussing birch bark heritage items in a workshop sponsored by the Recovering Voices program at the National Museum of Natural History (NMNH). For the purpose of language instruction within an online environment, Alan Corbiere (2014) recommends that the video clips must: (1) align the resources with the learners’ objectives (capitalize on interest in “culture”), (2) be accessible through the use of social media such as YouTube, (3) give ample time for the learner to listen at his or her own pace, and (4) employ natural versus scripted speech. Additionally, each video should be captioned with transcriptions of the Anishinaabemowin, and accompanied by a complete transcription and selected vocabulary list with English translations.

Increasingly, projects around the globe seek to address indigenous language and heritage loss through innovations in technology. By 2004, Patrick Eisenlohr (2004) had already published a comprehensive literature review of “Language Revitalization through New Technologies.” Since then, the number of initiatives has continued to grow, and now includes regional language research centers,¹⁴ best practice models and tools,¹⁵ international multilingual language repositories,¹⁶ regional multilingual language repositories,¹⁷ and a proliferation of websites dedicated to the revitalization of specific languages or groups of languages (Hennessy and Moore 2007; Holton et al. 2007). There are even several online language revitalization initiatives specifically dedicated to Anishinaabemowin (Noori 2007, 133-7; Ojibwe People’s Dictionary; Powell and Aitken 2011).¹⁸ Because GRASAC focuses on regional cultural heritage that includes a variety of indigenous cultures and languages, however, the GKS Language Module must be designed to include multiple languages. In its development stage, the GKS4 Language Module is populated with two relatively complete dictionaries, one Corbiere and Valentine’s Nishnaabemwin dictionary with regional variation (Mary Ann Corbiere and Valentine 2016) and the other covering English-Cayuga and Cayuga-English (Froman et al. 2002).¹⁹

Fieldwork and Analysis Methods

Collaboration was central to all phases of this project. It was made possible by the networks woven within the GRASAC research community. The ability to facilitate research that is interdisciplinary, cross-sector, and geographically dispersed is one of GRASAC’s most important accomplishments. As Laura Peers and Alison Brown (2003, 8) note, investment in building relationships of trust between museums and source communities must occur before successful partnerships can take place. GRASAC provides and sustains a social environment of trust out of which collaborative research can proceed expediently toward commonly recognized

goals. Moreover, regardless of the research outcomes, valuable lessons can be learned from the collaborative process itself.

Team members collected data in two phases: collaborative collections research at the Missouri History Museum (MHM) and interviews in Anishinaabe communities in Ontario, Canada. At MHM, Willmott and Taitt worked with Adriana Greci Green of GRASAC to document and analyze thirty heritage items from the Great Lakes in the MHM collection.²⁰ These items included clothing, moccasins, bandolier bags, accessories, and a variety of other miscellaneous items. Simultaneously, Taitt created GKS records for MHM heritage items that Willmott had studied with GRASAC members Carolyn Gilman and Sherry Farrelle Racette in 2010. Both the 2010 and 2014 collaborative collections research sessions were audio recorded. Following through an idea initially proposed by Greci Green, Taitt pioneered a methodology for indexing audio data for inclusion in GKS heritage item records (Taitt 2014). In addition, the spring 2014 MHM research set up a framework for delineating and analyzing the cultural domain of beadwork for linguistic study. Because this domain is prevalent within the GKS, the perspectives of Anishinaabemowin speakers who are also beadworkers provide a much-needed bridge between historical and contemporary Anishinaabe community art practice. At the same time, it is fruitful for exploring the potential of the GKS to integrate Anishinaabemowin into discourse surrounding heritage items.

A synergy of research questions arising spontaneously in the MHM sessions formed the basis for the interviews with Anishinaabe beadwork artists in the next phase of research, which employed methods associated with applied linguistics and ethnography (Coffin, Lillis, and O'Halloran 2010, 5-6). The primary goal of these interviews was to produce language in action audio and video documentation of Anishinaabemowin in the specific cultural domain of traditional beadwork arts. To achieve this purpose, Willmott and Taitt developed an interview guide for semi-structured interview questions about the artists' own beadwork practice. We asked about how they learned to do beadwork, what symbolism and motifs they use in their own contemporary artwork, and names or phrases they may have learned about processes associated with beading. To gain contemporary perspectives on historical pieces in the MHM collection, Taitt also created photo elicitation prompts of selected and annotated images of heritage items in the MHM collections.²¹ Photo interviewing methods, first developed by John Collier and Martin Collier (1986, 99-115), have many advantages for heritage and language revitalization. They evoke "personal narratives" and "deeper elements of human consciousness than do words" (Pink 2007, 84). They are useful for relearning forgotten knowledge and skills, as well as piecing together fragmented historical narratives and cultural identities (Peers and Brown 2003, 6). Moreover, they create a mutual dialogue (Pink 2007, 8) that draws the interviewees into the collaborative collections research process that began with the heritage item at the museum. This fulfills the goal of visual repatriation at the same time as it enriches the knowledge available to academic researchers and museum professionals (Peers and Brown 2003, 6).

During the fieldwork phase, Taitt worked closely with Mary Ann Corbiere and Alan Corbiere, both experts in Anishinaabe language instruction. Alan Corbiere made arrangements for the interviews with Anishinaabemowin-speaking beadwork artists in and around Manitoulin Island: Wanda Ozawanimiki of Sagamok First Nation, and Mary Pheasant of Wikwemikong First Nation. Alan Corbiere, or his student Warren Corbiere, recorded the interviews with both audio

and video equipment, while Mary Ann Corbiere conducted the interviews in the Nishnaabemwin regional variation. Taitt took still photos and helped guide the photo elicitation portion with the annotated images in a Powerpoint presentation on her laptop. During the first part of the interviews, Ozawanimiki and Pheasant introduced the team to some of their own artwork, and demonstrated techniques of working on different kinds of pieces (Figure 3). During both portions of the interviews, Mary Ann Corbiere strove to keep the conversation in Anishinaabemowin, not English.

Figure 3: Wanda Ozawanimke (left) discussing beadwork techniques during an interview with Mary Ann Corbiere (right) at her home in Sagamok, Ontario. Photo by Alex Taitt.

Like the fieldwork, analysis took place in multiple phases. Before Taitt left Manitoulin Island, she and Mary Ann Corbiere went through the hours of recorded footage creating an index of the data. The indexing method was based loosely on the one that Taitt developed for the MHM audio data. Unlike a word-for-word transcription, indexes summarize the main points of a data section by pulling out key themes, exemplar quotes, and other important components (Taitt 2014). While this process can seem laborious, in our case, it was more efficient than proceeding directly to a full translation. Additionally, since Taitt is not an Anishinaabemowin speaker, it was critical that she had all data at least loosely translated into English while still working face-to-face with Mary Ann Corbiere. After Taitt returned to Southern Illinois, she and Willmott worked out the second phase of indexing. Taitt recorded the rough version of the indexed data into a spreadsheet with additional fields to further draw out the themes in the cultural domain of beadwork arts (Figure 4). Then, roughly following Alan Corbiere's methodology, she drew up a list of key terms in this domain to be translated into Anishinaabemowin. Given the experimental nature of the methodology, components were constantly adjusted to produce the most efficient tool for the

collaborative needs of the project. Once the indexed spreadsheet was complete, the data was ready to be prepared for entry into the GKS4 database.

Integration of Language Audio and Visual Content into the GKS Database

Technically, there are four possible ways to add linguistic data to the GKS4: (1) add thematic portions of linguistic data as new audio and/or video Heritage Item records (akin to oral history entries), (2) add Anishinaabemowin terms as new audio and/or video Language Item records

	A	B	C	D	E	F	G
1	Correspond	Record Codes	Track	Start Time	Type	Vocabulary	Indexed Data
2	1		WO_1	0:00	ELI	Beadwork, necklace, applique, loom,	MaryAnn (MA) explain what she has been asked--> 9 years old started, aunt taught her to make necklace, mother started as well, another aunt taught how to make w/loom and later how to do applique beadwork
3	2		WO_1	1:13	ELI	Leather, regalia	Harder to work with leather, she does this mainly now—makes regalia. Also makes things for herself
4			WO_1	1:38			Eagle--> she wears, and tie
5			WO_1	1:58			Sets are different colored but matching, everything same color
6	3		WO_1	2:25	ELI	Cloth, leather, color,	How she chooses which color regalia to wear? Whatever she feels like. Most other regalia made of cloth, leather is for more traditional? 'If I am lead dancer, will wear blue eagle outfit'—always asked to dance at various powwows,
7	4		WO_1	3:01	ELI	moccasins	people ask her to make them moccasins
8			WO_1	3:35			How/why did you start doing this? Likes working w/ hands, stays busy, and enjoys it

Figure 4: A section of the indexed data spreadsheet.

(akin to creating a new “dictionary”), (3) add audio and/or video clips to existing Heritage Item records, and (4) add audio and/or video clips to existing Language Item records.²² To test these options, the team pursued a dual strategy: first, attempting to match the word list of relevant Anishinaabemowin vocabulary to existing Language Items; and second, creating segments of language in action video that could be used in conjunction with any of the four methods of GKS integration.

For the sake of research expediency and the desire to prioritize the intrinsic instructional value of the materials, we had to whittle down the hours of interview footage to key portions that could be useful to second language acquisition in the cultural domain of beadwork arts. While Willmott and Taitt selected themes relevant to the GKS4 environment, Mary Ann Corbiere identified the precise portions of data to be prepared as representative pieces of language in action. Alan Corbiere advised on ideal segment length for audio and video clips. He recommended keeping clips at a length that allows for enough detail to preserve the natural context of language use, but not too long for an adult second language learner to lose interest. Jon Blommaert (2010, 182) notes that context is “what creates meaning, what makes it (mis)understandable to others.” Consequently, mere terms without context would be meaningless and therefore inadequate for language acquisition. Alan Corbiere also found, however, that language students had difficulty engaging with clips of ten to twelve minutes without line-by-line translations. To provide a more

accessible format, Willmott, Taitt and Mary Ann Corbiere opted for shorter segments of two to three minutes. Additionally, once the clips were selected, Mary Ann Corbiere delivered both a full Anishinaabemowin transcription of each segment and a word-for-word English translation.

While Mary Ann Corbiere was processing the translations, Willmott and Taitt began identifying specific ways to integrate the linguistic data into the GKS4 for language revitalization purposes. Use cases emerged inductively through the combination of technical possibilities and hands on data manipulation. We knew from a protocol developed by GRASAC member, Lisa Truong, that the GKS3 had the capability to upload video files (Bohaker, Corbiere, and Phillips 2015, 52). At the outset, the possibilities seemed endless. In reality, however, the process was often challenging due to design issues and technical bugs in the unfinished GKS4. Despite these setbacks, Willmott and Taitt conceived five use cases: (1) add video and audio files to existing Language Item records to illustrate language in action examples of key vocabulary terms in the domain of beadwork art, (2) create new Language Item records and add video and audio files for the same purpose, (3) add video files to existing Heritage Item records for the purpose of stimulating artistic revival through simultaneous language revitalization and visual repatriation, (4) create new Heritage Item records of interviewee's artwork and add corresponding audio and video clips to close the gap between historic and contemporary beadwork practice, and (5) create Heritage or Language Item records for video or audio clips of traditional teachings, and then use the Relate Item function to associate them with illustrative examples in the GKS4.

Both of the use cases in the Language Item Module involve an attempt to add depth and breadth to the cultural value of its dictionary structure. The adult second language student is envisioned pursuing language acquisition through study of key terms. This application of andragogy is not consistent with the theoretical underpinnings of the natural approach in which students must be exposed to language in action as a means of naturally "acquiring" language, rather than deliberately "learning" it through the study of vocabulary and grammar (Gordon 2009, 28). Whereas vocabulary acquisition has its own merits for other purposes, to better align the dictionary structure with the tenets of the natural approach, it would be productive in the future to explore the GKS4 Projects Module to compile thematic "lessons" just as a teacher would for use in a classroom. A model may be found in the Online Cree Dictionary project in which Mary Ann Corbiere, Alan Corbiere and Rand Valentine are participating that integrates multiple dialect dictionary functionality with a Lesson Plan unit.²³

Taitt and Willmott began testing applications in the GKS4 database by attempting to implement Use Case 1: add video and audio files to existing Language Item records. We quickly encountered challenges in dealing with dialect variations. Working from Mary Ann Corbiere's translated transcript, we searched for English terms to find their Anishinaabe equivalents in the online Ojibwe People's Dictionary (OPD) published by linguist John Nichols.²⁴ This was in part necessary because the GKS4 has no English dictionary search function. We found many differences between terms in these two dictionaries, and vocabulary missing from both. The term "bandolier bag" is a good example (Figure 5).²⁵ Searching for this term exactly, the OPD finds only "aazhooningwa'on." Turning to published dictionaries, however, John Nichols and Earl Nyholm (1995, 142) give "gashkibidaagan" or "aazhoningwa'igan." Richard Rhodes (1985, 541) gives "gashkibidaagan" for the English term "pouch," while the OPD gives "gashkibidaagan" as

“bag with closeable top: a tobacco bag, a pipe bag, a satchel.” Although one OPD speaker gave “bandolier bag” as a translation for “gashkibidaagan,” this did not enter the English dictionary,

Figure 5: Bandolier bag made with loom woven motifs on front panel, strap and tabs descending from bottom. (Courtesy of Missouri History Museum, St. Louis; 1953 102 0005; Photo by Cary Horton)

so it could not be found through an English word search. This example illustrates inconsistencies in not only spellings, but also in actual words and their English translations.²⁶

This experience immediately recalled questions regarding how to incorporate the variety of dialects into the GKS first discussed at the 2009 OCF workshops. Additionally, as Rand

Valentine (2015) pointed out, there is regional and dialect variation in domain specific terminology. Noori (2013, 135) further suggests that domain specific terminology varies almost on an individual basis. One solution proposed in 2009 was to deal with these variations at the level of individual speakers. This is precisely the strategy employed in the “multi-dialect process” used by the *Ezhichigeyang Project* of the Waadookodaading Ojibwe Immersion Charter School in Wisconsin (Treuer 2011, 5-6). The Waadookodaading team, however, did not confront the challenge of entering their word list into an online database. In theory, entering Anishinaabemowin data into a relational database such as the GKS should enable more powerful and refined analysis of linguistic patterns. In practice, however, in order to achieve this potential the GKS would benefit from a Biography Module to record linguistic contributors’ demographic and geographic information, as well as their domains of traditional knowledge. Lessons could be learned from two online dictionaries containing Ojibwe linguistic data link recorded speech to individual speakers and their regions of origin. One of these is the Ojibwe People’s Dictionary, and the other is the Algonquian Language Atlas.²⁷ The latter is much more robust of the two in providing the biographic data in a popup box, and the regional data in a map interface.

The work of collecting and analyzing cultural domain-specific vocabularies is so vast that it is ongoing (Treuer 2011, 8). In the cultural domain of beadwork art, we found both Anishinaabemowin terms yet to be recorded in existing dictionaries and conversely that there were instances in which there were no Anishinaabe words for certain concepts. Both Ozawanimike and Pheasant did not know some Anishinaabe words that suited their thoughts, so they resorted to using English loan words. These were mostly technical terms such as names of beads (“cut glass,” “seed beads,” “luster beads,” “silver-lined beads”) or specific techniques (“applique beadwork,” “loop technique”). Were these “lost” Anishinaabe words, or were they terms for cultural adaptations that beadworkers learned originally in English? The study of English “loan words” in indigenous languages crested during the mid-twentieth century acculturation studies trend (Dozier 1956; Lee 1943; Voegelin and Hymes 1953). It has now fallen out of favor in the current thrust towards language revitalization.

Although it is beyond the scope of the present study, it may be useful to examine loan word practices in terms of both “language loss” and “language choice.” *Emeritus* Anishinaabemowin professor Shirley Williams (in Noodin 2014, 3) calls for the creation of new words to describe aspects of contemporary culture. Perhaps the same is needed to backtrack to terms for selectively adopted colonial imports, such as “cut beads,” that have since been incorporated into traditional arts practice. Willmott and Taitt realized that, despite the absence of a Biography Module, introducing the biographical approach to dialects was probably the best way to incorporate new linguistic data into the GKS4. Because this entailed creating new GKS4 “dictionaries” for every speaker, they turned attention to Use Case 2: create a new Source Record and add Language Items to it. This was not possible, however, because at that time the GKS4 did not have the existing linguistic data cross-referenced with a table of Source Records, nor did it offer users the option to create new Source Records cross-referenced with their collections of new Language Item records. That function is in development at the time of writing.

Next, Willmott and Taitt considered Use Case 3: add video files to existing records in the Heritage Item module. In the framework of the natural approach for adult second language students, the purpose of this use case is to provide “comprehensible input” in the target language

that is just beyond that of the students' current level of proficiency (Larson-Freeman and Anderson 2011, 103). The content and length of the clips are designed to help carry students over the bridge between merely learning vocabulary and grammar, on the one hand, to language fluency on the other. This use case is a better match with the natural approach to language acquisition than was adding video files to Language Items because it enables students to become immersed in the moment on the screen, which gives them a better understanding of the cultural and linguistic context simultaneously. According to andragogy theory, the relevance of the repatriated visual heritage for adult beadworkers should promote a holistic response to the language that resonates with life experience and increases language acquisition motivation (Gordon 2009, 21). Visual aids have a special role in the natural approach as context-rich natural language stimuli (Richards and Rodgers 2001, 183). In the related task-based approach, technology is similarly effective in delivering rich language input that helps students develop "interlanguage," a combination of the first and target languages that speakers create while moving from vocabulary building to fluency (Whyte 2014, 5;13). Given these advantages, it is not surprising that existing Anishinaabemowin instruction websites already employ similar video content approaches (Noori 2007; Powell 2007). Likewise, simultaneous with the beadwork domain project, Alan Corbiere and GRASAC project manager, Kate Higginson, applied this approach to uploading to the GKS4 a video of Anishinaabe elder Ted Toulouse demonstrating how to tap a maple tree, and then used the Relate Heritage Item feature to relate the video to a birch bark *makak* (traditional birch bark container) containing maple syrup (i.e. Willmott's and Taitt's Use Case 5).

Building upon Truong's existing protocol for video clips in the GKS3, Willmott and Taitt expected a reasonably seamless application of Use Case 3. Production of these video clips was a longer process than expected, however. The main problem was determining and executing the file length. Mary Ann Corbiere made the final decisions on clip length for acquisition of fluency in domain specific vocabulary. She and Taitt had to coordinate, across a distance of more than a thousand miles, the precise beginning and ending points of each clip to make sure the Anishinaabemowin phrases were not cut off. Meanwhile, on the purely practical side, Taitt worked on file editing strategies. The clips needed heavy file compression because, for the duration of the project, the GKS4 only accepted files that are 2MB or less. At this file size, a lot of the visual and audio quality is lost, and users cannot make the video full screen.

Subsequent to Taitt's experiments, the GKS4 file size was increased to 20MB and Alan Corbiere uploaded several video clips as Heritage Items. At this file size, however, users without high speed internet experienced distracting delays in streaming. Despite their shortcomings, these findings lend support to Alan Corbiere's hypothesis that adding videos with culture and language rich content to Heritage Item records creates a synergy of subjective sensory experience that enhances motivation for language acquisition and artistic revival. User workshops of the finished GKS4 software, however, are needed to confirm the theory. Moreover, better coordination among collaborators and design developers would make it possible to implement Alan Corbiere's suggestion that the GKS4 integrate YouTube or Kaltura videos to overcome issues of file size and formatting. Indeed, existing language revitalization websites already employ this strategy (Dobrin and Holton 2013, 149; Noori 2013, 134).²⁸ With additional funding and project personnel, it may be possible to utilize the language annotation tool, ELAN, and its more accessible user interface, Annex, to process and display rich language content through links to

the GKS records (Nathan 2015, 67-8). Finally, like the use cases with the Language Items, for language instruction Use Case 3 would benefit from the additional step of compiling Heritage Item records with related linguistic video content into a GKS4 Project so that instructors could create lesson plans and users could easily find content that interested them.

Use Case 4 involved creating new Heritage Item records for Ozawanimke's and Pheasant's original beadwork pieces. Technically, there are two ways to implement this: (1) create Heritage Item records based on video clips of discussions surrounding each work, or (2) create Heritage Item records based on still photographs of each work with video clip enhancements. The interview, however, was not organized around the artists' individual pieces, and neither did we obtain the kind of detailed and systematic photographic documentation that we normally do for heritage items in museum collections (Willmott 2014). Upon reflection, the latter option would be more consistent with, and therefore interoperable with, existing data in the GKS. Further exploration of this use case will therefore have to wait for a time when appropriate photographs can be obtained to form the basis of GKS4 Heritage Item records.

Figure 6: Detail of “spirit beads” on a bandolier bag as it appeared in the photo elicitation portion of Mary Pheasant’s interview. This may form the basis for a GKS4 Heritage Item record of a video clip on the “spirit bead” teaching. (Courtesy of Missouri History Museum, St. Louis; 1953 102 0005; Photos by Cory Willmott; Composite image by Alex Taitt)

Use Case 5, to create thematic video clips of Anishinaabemowin in a specific culture domain could potentially bring the user experience full circle by incorporating language and heritage together with indigenous traditional knowledge (ITK). Alan Corbiere’s video project with Ted Toulouse, for example, brings new insight into Anishinaabe ways of understanding maple syrup activities in relation to both practical traditional life-ways and oral histories and legends. In the domain of beadwork arts, Willmott and Taitt considered creating a Heritage Item record for a

clip in which Mary Pheasant pointed out a “spirit bead” in the beadwork on one of the mid-nineteenth century bandolier bags in the MHM collection (Figures 5 and 6). In Anishinaabemowin, she imparted the teaching that Anishinaabe beadwork artists incorporate random beads into their work to convey the idea that we should be humble because as humans we are never perfect. She also suggested that some beadworkers use random beads as “signatures” to mark their work. On a more practical side, she notes that sometimes it was just too dark to see the colors.

Conclusion and Recommendations

Eschewing interoperability in favor of individually tailored digital environments, indigenous heritage projects require greater investment in custom design, while this same trait makes them particularly susceptible to becoming “digital silos” that serve none of their originators’ needs (Fresa 2014, 111). Kimberly Christen’s (Bell, Christen, and Turin 2013, 1-2) initiative to systematically examine what happens to digital heritage “After the Return” has focused attention on issues of long-term community access and use. Initial findings point to the need for ongoing collaboration in which academic and museum project members work with source communities to provide training on the software (Christen 2008, 24) and to develop uses of digital archives that mesh with existing indigenous educational initiatives (Shannon 2015, 83).

This project responds to these findings by exploring different ways that multimedia technologies can potentially be used to promote adult second language acquisition through the Language Items, Heritage Items, and Projects Modules in the GKS4. Despite the challenges faced with the beta-testing phase of the GKS4, and the hurdles associated with developing a productive workflow among collaborators, we were able to identify, if not test, at least five use cases for application of the GKS4 to Anishinaabe community-driven language revitalization initiatives. In addition, the knowledge of both Wanda Ozawanimki and Mary Pheasant is now preserved and can be used to benefit Anishinaabe communities and other linguistic projects beyond the present one, and even beyond GRASAC. Most importantly, the development and testing of use cases for the GKS4 demonstrates the value of collaborative processes for generating unanticipated new knowledge. Project findings regarding the use of loan words in the culture domain of beadwork arts, for example, reinforce the growing awareness of the need for fine tuned and specific biographic data associated with all Anishinaabemowin data, as well as the urgency for collecting and cross-referencing culture domain specific language in action recordings.

Additionally, the project team developed new methodologies for recording and analyzing linguistic data relevant to heritage items in museum collections. These methods address the concerns of digital circulation projects that strive to produce linguistic and cultural heritage knowledge in integrated digital environments, thereby bridging the gap between language and heritage revitalization. The application of an agency-oriented approach with use case methodology moves software testing beyond simple and isolated technical functionality to the exploration of how software performs to meet the needs of anticipated users and uses. It thereby answers the question, “Can this software do what users need it to do?” rather than simply, “Is this software behaving the way I—the designer—expected it to?” Use case methodology enables collaborative stakeholders to provide feedback on how the software can improve to meet their

use needs. In these particular use case scenarios, we found that index spreadsheets allow for the inductive and collaborative identification of vocabulary in culture specific domains even when not all team members are fluent in the indigenous language.

The project team found that, while the GKS4 has a high potential to deliver rich target language input and inspire motivation for second language acquisition, we were not able to fully implement these potentials while the GKS4 was in its development stages. The success of the RRN depended upon an agile development process between stakeholders and software designers in which participants could quickly and clearly see the results of their feedback in the implementation of changes (Rowley 2013, 38). Projects modeled after the RRN also emphasize that inclusion of collaborators throughout the software design process is critical to their success (Shannon 2015, 72). Although GRASAC has had consultants and collaborators in the software development process (Bohaker, Corbiere, and Phillips 2015, 51;56), adoption of an agency-oriented approach to software development may provide a model for even more effective engagement between indigenous GRASAC members and GKS software designers to ensure “fitness for purpose.”

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Notes

1. Anishinaabe (plural Anishinaabeg) is an autonym used by the Ojibwa, and other Algonquian-speaking nations located in the Great Lakes region, as well as their Western counterparts on the American Plains and Canadian Prairies. Anishinaabe may also be used as an adjective to modify nouns. *Anishinaabemowin* (the Anishinaabe language) is “the language of the Three Fires Confederacy, a political construct that has shifted in use over time” (Noodin 2014, 6).

2. “About GRASAC and the GKS,” accessed May 12, 2015, <https://grasac.org/about-grasac-and-gks>.

3. Specifically, the RRN team employed the Manifesto for Agile Software Development, accessed May 15, 2015, <http://agilemanifesto.org>.
4. "Dublin Core Metadata Initiative," accessed May 12, 2015, <http://dublincore.org>.
5. "Drupal," accessed May 12, 2015, <https://www.drupal.org>.
6. NSF-REU grant, "Anishinaabe Language and Art Revitalization Through New Technologies," 2014. This opportunity arose in collaboration with Southern Illinois University Edwardsville colleague Dr. Kristine Hildebrandt with whom Alex Taitt worked on a three year NSF "Endangered Languages" grant focused on the indigenous languages of Nepal.
7. Mary Ann Corbiere and Alan Corbiere may also envision the data for additional applications. For example, Mary Ann Corbiere is collecting Anishinaabe words for a comprehensive online dictionary of the Nishnaabemwin regional variation she is compiling with Rand Valentine Corbiere and Valentine (2015). Alan Corbiere may also use the data for more traditional classroom instruction.
8. Shona Whyte (2014, 5) notes that "language learning or interlanguage development depends crucially on input, which is the term used for samples of the target language that learners see and hear, while output refers to the language they produce themselves."
9. *Ethnologue*, "Ojibwa," accessed May 21st, 2015, <http://www.ethnologue.com/language/oji>.
10. *Ethnologue*, "Endangered Languages," accessed June 1st, 2015 <http://www.ethnologue.com/endangered-languages>.
11. "Endangered Languages," accessed May 18, 2015 <http://www.endangeredlanguages.com/#/6/44.774/-79.360/0/100000/0/low/mid/high/dormant/awakening/unknown>.
12. *Ethnologue*, "Eastern Ojibwe in the Language Cloud," accessed May 30, 2015, <http://www.ethnologue.com/cloud/ojg>.
13. "Why Language and Culture Studies," *SIL International*. 2014. Accessed May 14, 2015. <http://www.sil.org/why-language-culture-studies>.
14. *Alaska Native Language Center*, accessed May 18, 2015, <http://www.uaf.edu/anlc/>; *The Center for Advanced Research on Language Acquisition (CARLA)*, accessed June 1, 2016 <http://carla.umn.edu/>; or follow links on the "Other Language Centers" page of the *Center for Language Education and Research (CLEAR)*, accessed June 1, 2016 <http://clear.msu.edu/clear/other-lracs/>.
15. E.g. *EMELD School of Best Practices*, accessed May 18, 2015, <http://emeld.org/school/index.html> ; *GOLD: Isle Metadata Initiative*, accessed May 1, 2015,

<https://tla.mpi.nl/imdi-metadata/>; and *ELAN*, accessed May 12, 2016, <https://tla.mpi.nl/tools/tla-tools/elan/>.

16. E.g. *Open Language Archives Community* (OLAC), accessed May 12, 2016, <http://www.language-archives.org/>; *Endangered Languages Archive* (ELAR), accessed May 12, 2016, <http://www.elar-archive.org/index.php>; *Documentation of Endangered Languages* (DOBES), <http://dobes.mpi.nl/> (Accessed May 12, 2016).

17. E.g. *Endangered Language Alliance* (NYC) (accessed May 12, 2016, <http://elalliance.org/>); *Pacific and Regional Archive for Digital Sources in Endangered Cultures* (PARADISIC) (accessed May 12, 2016, <http://www.paradisec.org.au/home.html>); *The Living Archive of Aboriginal Languages* (LAAL) (accessed June 3, 2016, <http://www.cdu.edu.au/laal/>); *Archive of the Indigenous Languages of Latin America* (AILLA) (accessed June 3, 2016, <http://www.ailla.utexas.org/site/welcome.html>); and the *Algonquian Linguistic Atlas* (ALA), (accessed August 3, 2016, <http://www.atlas-ling.ca/#>).

18. *Ojibwe People's Dictionary*, headed by John Nichols (accessed June 1, 2016, , <http://ojibwe.lib.umn.edu/>)

19. Significant portions of the Nishnaabemwin dictionary have also been published in the *Algonquian Language Atlas* (accessed Aug. 3, 2016, <http://www.atlas-ling.ca/#>), headed by Marie-Odile Junker of Carleton University.

20. MHM curators David Lobbig and Jeff Meyers also provided assistance during the research process, as did Danielle MacDonald, recent Southern Illinois University Edwardsville graduate and MHM intern.

21. The interview questions for this section of the interview arose largely out of discussions between Willmott and Greci Green about beadwork pieces at the Missouri History Museum.

22. In the GKS4, the term “dictionary” is a database field name that refers to a group of Language Item records that are attributed to the same source. Another “dictionary” in the GKS4 is a group of language items that are attributed to the same source. In the advanced search form, users can search all “dictionaries” or select one from a drop down menu. There is no English glossary of nomenclature terms, so users cannot search in English. On the Language Item records, the “dictionary” source is recorded in a field labeled, “Source of term.” At the time of writing, the *Dictionary of Nishnaabemwin* (Valentine and Mary Ann Corbiere 2016) is called the “Algonquian Dictionary 120105” in the search form, and “Mary Ann Corbiere and Rand Valentine, Dictionary of Nishnabewin Database, publication pending (2015)” in the record field.

23. *Online Cree Dictionary*, accessed Aug. 8, 2016, <http://www.creedictionary.com/>.

24. *Ojibwe People's Dictionary*, accessed May 18, 2015, <http://ojibwe.lib.umn.edu>.

25. For a detailed discussion of the terms for “bandolier bags” and other types of bags in Anishinaabemowin vocabularies, see Alan Corbiere (forthcoming).

26. “Bead” is an example of a term used in the interviews that appears in both the GKS4 *Dictionary of Nishnaabemwin* and the Ojibwe People’s Dictionary (OPD). Although the spelling is only slightly different between the two noun entries (mnidoomnens versus manidominens, respectively), this can be confusing for second language learners, especially because additional dictionaries contain further variations. Baraga ([1878] 1992, 24) has “anamieminag” for the English term, “beads, (rosary),” and no term for beads, not rosary. Anishinaabe speakers will recognize the root “min,” meaning “berry,” in all of these, but novices may not. Also, the OPD search for “bead” turns up several verb applications missing from the GKS4. “Loom” is an example of a term used in the interviews, but missing from the GKS4. It is given as “mazinaabidoo’iganaatig” in the OPD. “Sew” is also not found in the GKS4 vocabulary, whereas the OPD includes fifteen terms related to sewing practices. Some other terms that are lacking in the GKS4, but found in the OPD, are “feather,” “pattern,” “canvas,” and “thread.” The term “warp,” referring to the threads that run lengthwise on a loom, appears in neither the GKS4 nor the OPD.

27. *Algonquian Language Atlas*, accessed August 3, 2016, <http://www.atlas-ling.ca/#>.

28. *Gibagadinamaagoom*, accessed May 13, 2015, <http://ojibwearchive.sas.upenn.edu>.

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