

## Case Study: An Evaluation of Information and Communication Technology Use in Upriver Halq'eméylem Language Programs

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Indigenous communities are using information and communications technology (ICT) to document languages and to support language maintenance and revitalization activities. Both critical funding and effort goes into the development, deployment, and maintenance of ICT; however, the effectiveness of ICT is not always clearly understood. This case study examines how ICT has been incorporated into Upriver Halq'eméylem language programs. Participants indicated that ICT is being used successfully as a supplementary tool in coordination with specific learning strategies and activities such as story-telling, games, and looking up a word or concept. However, they indicated that ICT is not being used outside of those specific learning activities. The study indicates that ICT can be a valuable tool in the effort to revitalize a language; however, the type of ICT and how it is integrated into the program and community need to be carefully planned out. A list of key findings is provided.

**1. Introduction**<sup>1</sup> Linguists estimate that 50–90 percent of the 6,000 to 7,000 known languages in the world will disappear in the 21st century (Grenoble 2011:27). Indigenous communities have been working to reverse language shift since the 1800s. Today, information and communications technology (ICT) is an integral part of language documentation, maintenance, and revitalization activities. Both critical funding and effort goes into the development, deployment, and maintenance of ICT, yet the effectiveness of ICT is not always clearly understood. The existing literature suggests that ICT can support language learning of commonly studied languages in formal programs (Zhao 2003); however, research on the use of ICT in revitalizing endangered, severely endangered, and less-commonly spoken Indigenous languages suggests that ICT may support the learning of endangered languages but may not bring about fluency. Fluency is generally achieved through interaction with fluent speakers. Unfortunately, there are often few fluent speakers in such communities. Notwithstanding this challenge, Indigenous peoples around the world continue to put money and effort into ICT for language revitalization.

<sup>1</sup>I would like to thank the Upriver Halq'eméylem community for granting me permission to perform the research. The participants of the community showed great generosity through their willingness to spend time with me and share their thoughts and concerns about information and communications technology and the Halq'eméylem language.

The Upriver Halq'eméylem language community began to use ICT in the mid-1900s to document their language. Over time, the community continued to incorporate ICT and today ICT is an integral tool in the teaching of the language. By understanding how the technology is being used and its effectiveness, we gain insights into how ICT may be implemented within language revitalization activities in a meaningful way. The research undertaken attempted to understand the effectiveness of ICT within the established Upriver Halq'eméylem language revitalization program to help inform communities making future decisions. Findings suggest that ICT can be used as a supplementary tool successfully when the learning strategies are in place and the technology has been appropriately selected to support the learning strategies; that ICT which enables interaction between individuals has significant potential to contribute to developing fluency, but only if the language is already being used; and that content creation should be considered a critical part of any ICT implementation strategy. A full list of findings is provided as part of the Summary.

**2. Literature Review** There is a complex relationship between technology and society (Alia 2009; Castells 2005; Headrick 2009; Kaplan 2009a; Pinch & Bijker 1987; Warschauer 2004). An ICT implementation may include technical aspects such as the telecommunications network, laptops, and smartphones; however, social aspects such as how the technology is used, what content is available, the purpose for which the ICT is intended, and who has access must also be considered. Within language revitalization programs, technology exists in many forms including the Internet, email, language software, digital newsletters, audio, radio, video, databases, multimedia applications, and content. Multimedia applications provide a combination of graphics, sound, video, and animation, and facilitate the sharing of ceremony, dance, music, art, and oral language traditions, furthering the language learning experience (Dyson et al. 2007).

Language program objectives need to be matched closely with the ICT chosen, as different technologies influence different outcomes. For example, radio can “generate an increase in language and promote the use of quality language in propelling students to be aware of an audience of listeners” (Bennett 2003:60); video can provide a multidimensional view of language, incorporating content, shared meaning, and sense-making through language; and audio tapes are useful for patterned language instruction and developing further language skills (Bennett 2003). Technology can be an inexpensive way to record (Eisenlohr 2004), archive (Reyhner & Lockard 2009), and preserve a language as well as to develop and disseminate materials (Galla 2009; Warschauer 1998). Therefore, understanding how ICT is used is important to understanding its effectiveness.

The specific content used must also be considered. As with television (Cazden 2003, Pasch 2010), content on the Internet has the possibility of impacting local languages and cultures, both through the language used and the message itself. English has become the lingua franca within the context of the Internet (Crystal 2003, Warschauer 2004) and increasing Internet access in homes can contribute to a decrease in speaking and transmitting an ancestral language (Krauss 1998). Addition-

ally, the content itself may influence how Indigenous peoples are seen by both themselves and others. The increase of content created by Indigenous peoples that is reflective of their culture and language—whether heard through radio, seen on television, or accessed through the Internet—is seen as a positive step forward (Alia 2009, Iseke-Barnes & Danard 2007, Pasch 2010).

Notwithstanding the potential for the Internet to negatively affect Indigenous language use, having access to the Internet is critical today for “education, political participation, community affairs, cultural production, entertainment, and personal interaction” (Warschauer 2004:28). ICT also has a role to play within language revitalization; however, the so-called ‘digital divide’ must be addressed. The digital divide separates individuals and communities who have access to ICT from those who do not. While the digital divide is sometimes thought to refer solely to computers and connectivity, discussions around the digital divide should also include social factors such as literacy, technology literacy, gender, age, language, economics, and available content (Warschauer 2004).

Exacerbating the issue of the digital divide, language programs may inadvertently become technology projects which “often focus on providing hardware and software and pay insufficient attention to the human and social systems that must also change for technology to make a difference” (Warschauer 2004:6). Social issues such as historical trauma and economics are often identified as the barriers to learning while ideological clarification, face-to-face interaction, and intergenerational transmission are viewed by some as solutions to revitalizing a language (Holton 2011). In this view, technology is a supplementary tool for language learning and not a substitute for face-to-face interaction (Cazden 2003; Fishman 2008; Warschauer 2004); that is, technology cannot replace “human desire and effort” (Dauenhauer & Dauenhauer 1998:70), “mimic the genius of a child speaking their tribal language” (Kipp 2009:2), or reflect actual speech patterns such as intertextual gaps and silences (Eisenlohr 2004). Additionally, if technology is used, it must be integrated in a way that enables language learning “beyond the word or phrase level” (Galla 2009:176) and it must be accessible, current, and user-friendly. Notwithstanding these challenges, technology is a key strategy today for many communities when looking to revitalize a language.

There are benefits to using ICT for language revitalization. For example, ICT can be reused and repurposed by multiple communities. ICT can also bring speakers and learners together over long distances. Multiple types of ICT are available including standalone and web-based multimedia platforms: Computer-Assisted Language Learning (CALL) products such as Rosetta Stone programs; digital books; online dictionaries; web portals; and commercial off-the-shelf (COTS) applications such as iTunes (Holton 2011). Databases can be used to document as well as facilitate access to content. Additionally, ICT may attract the younger generation and encourage language use through the introduction of new technology and innovation. Technology is an integral part of many people’s lives and technology integration may support language learning into that area of people’s lives (Godwin-Jones 2013).

The implementation of technology needs to take into consideration both technical and non-technical questions (Warschauer 2004). The formulation of “an Indigenous

language ideology based on traditional values and contemporary responses to language endangerment that contrasts with the approaches of outside agencies” (Moore & Hennessy 2006:119) was key to the success of the Tagish FirstVoices project. This ideology allowed the project team to control how the Tagish language and culture are represented within and by the FirstVoices technology. Similarly, the FirstVoices website in Alert Bay was seen by the community as important, but not central, to the language revitalization effort. The words and phrases within the tool are used by community members for both teaching and learning. Additionally, in this instance, FirstVoices acted as a catalyst that generated secondary efforts that may not have otherwise occurred (Godfrey 2008).

Ojibwe immersion schools are successful in producing highly fluent adult speakers; however, Hermes et al. (2012) note that the social contexts in which the students learn do not allow them to move from an academic conversation to a conversation at home. Technology has been identified as one potential solution to bridge this gap:

Endangered language learners need to hear everyday discourse in order to relearn and use conversation. The opportunity to use technology to bridge this gap between speakers and learners can bring the few fluent speakers available into many different homes and provide a model of what spoken language could sound like. (395)

As a result, rather than focusing on a specific cultural activity, Hermes et al. (2012) report that they tried to bring the language into everyday discourse.

Multimedia technology may support language revitalization outside of formal learning situations (Hermes & King 2013). Noting that the Ojibwe language is rarely spoken and that a school setting does not result in fluency, Hermes & King evaluate the *Ojibwemodaa* software which “provides a simulated-immersion experience for Ojibwe language learners” (128) to understand how the software was used in a home setting. The content included movie clips, flashcards, interactive games, grammar quizzes, and pronunciation and conversation practice, which have their origins in a materials creation project (Hermes et al. 2012). Hermes & King (2013:131) conclude that “software has the potential to promote face-to-face, interpersonal interactions within the family” contrary to the expectations of some community members; however, Hermes & King (2013) note that preconceived ideas of how a language is learned in a school setting influenced how the families learned the language. Also, children saw learning the language as “a chore” (140) and did not seem to understand that the goal was to use the language in conversation. Hermes & King (2013) conclude that while the research showed that technological tools can initiate language usage, “more work needs to be done to understand specifically what kinds of tool or activities could motivate youth to embrace learning their heritage language” (141).

One application of multimedia technology for Indigenous language revitalization was documented by Galla (2010:17), who notes that “the language goals of the community need to be determined prior to the incorporation of technology in these efforts,” and that the literacy and oral proficiency of the community was a key factor in the utilization of technology. Galla (2010) notes that students are comfortable

with technology because they “grow up in a multiliterate environment, consisting of reading, writing, listening, speaking, and computing” (48), and that if we can understand which technology students use regularly, we can then identify technology that will support language revitalization efforts. Additionally, while the younger generations were the primary users of technologies, the Elders were “up and coming users of technology” (105).

Language revitalization programs bring together technology and language in particular ways and with specific goals. ICT has been used within these programs since the late 1800s when audio recordings of Indigenous peoples were first made on wax cylinders (Makagon & Neumann 2008). These recordings allowed for unidirectional activity; that is, individuals could listen to the recording but could not interact with it. Today, the advances in ICT enable an interactive, bi-directional experience in which users can interact either with the technology or other users. Language can also be captured in context with cultural activities, allowing for a deeper understanding of the language. Multimedia applications are becoming increasingly easy to create and allow for the integration of video, audio, pictures, and text, as well as interaction with human beings. Access to databases and dictionaries provides teachers, administrators, and learners immediate access to language at the lexical, grammatical, and contextual levels. However, the literature here reviewed highlights the fact that language is best learned in interactive, contextual situations such as within the family home or daily routine. With the advent of small portable devices that allow for different types of communication between individuals and groups, ICT, in theory, now allows these situations to occur.

The literature reviewed above highlights the fact that we do not fully understand the effectiveness of ICT within language revitalization programs to promote language revitalization in a meaningful way or to enable fluency. However, Indigenous peoples, using limited funds and effort, continue to incorporate such technologies into their efforts to revitalize language. The research undertaken here attempts to understand the effect of ICT within an established language revitalization program to help inform future decisions.

**3. The Halq'eméylem Speaking Community** The Halq'eméylem language is spoken by the Stó:lō people of southern British Columbia and is considered to be endangered (Kinkade 1991) or severely endangered (FPHLCC 2010a). The Stó:lō people are made up of twenty-four First Nations bands which are connected by language, culture, history, and family relations. By the 1960s, the younger generations were primarily English speakers (Bracewell 1997). It was then that Oliver Wells interviewed and recorded Halq'eméylem speakers, Casey Wells developed a writing system, and Chief Richard Malloway and Alec James began language classes. In the early 1970s, Steven Point, Mark Point, Roy Point, and Bob Hall began the Skulkayn Heritage Project to interview and record Elders. In the course of this project, a large number of tapes were recorded and transcribed. Brent Galloway worked with the Coqualeetza Education Training Centre and the Elders until 1980 to record the language, develop

a writing system, a language course, a teacher training course, and to create the Stó:lō Sitel curriculum (Bracewell 1997).

Stó:lō Shxweli, a teacher training program, was initiated in 1994 by Gwendolyn Point, who was responsible for kindergarten-to-grade twelve programs and language programming. The program was supported by Coqualeetza for the first four months, after which they withdrew support due to disagreements with the administration. The program was further supported by Geoffrey Mills, Peter Lindley, Siyàmiyatéliyot (Elizabeth Phillips), Wanda Lewis, Verlie Ned, Shirley Norris, and Strang Burton as well as three fluent Elders, Ts'áts'elexwót (Elizabeth Herrling), Xwiyólemot (Tillie Gutierrez), and Rosaleen George (Bracewell 1997).

Strang Burton worked with Elders Ts'áts'elexwót (Elizabeth Herrling) and Rosaleen George to record the language, producing approximately 9,000 individual files. Burton also supported the creation of several CD-ROM games, including *Gifts of the Creator*. Ts'áts'elexwót and Strang Burton worked closely together to record personal history stories as well as conversational examples. The materials created by Rosaleen George, Elizabeth Herrling, and Strang Burton are archived at the Stó:lō Research and Resource Management Centre Library and Chilliwack Museum and there are discussions underway as to how to make these available to community members.<sup>2</sup> Stelómethet (Ethel Gardner) used “video communications software and hardware” (MacDonald 2009:64) to allow learners to speak with Siyàmiyatéliyot (Elizabeth Phillips). The Apple iChat application is also a major project at Stó:lō that supports learning of the language (Gardner 2012).

Today, three organizations support Halq'eméylem programs by creating and maintaining materials, and providing support to teachers and community members: the Coqualeetza Education Training Centre; the Stó:lō Nation, an organization representing a sub-set of the First Nations bands within the Stó:lō traditional territory; and Seabird Island Band, a self-governing, independent Halq'eméylem-speaking First Nations band.

The Stó:lō Head Start program focuses primarily on families and young children, and provides culture and language transmission assistance in addition to “education, health, nutrition, and social support” (Moore & MacDonald 2013:708; MacDonald et al. 2010). The Sts'ailes school provides a language program for pre-schoolers through secondary school; seven classes are held per day with language and culture as the core subject. The Seabird Island Community Elementary and Secondary School teaches the Halq'eméylem language from kindergarten to grade twelve (Seabird Island Band 2013). School District 33 has two language instructors for kindergarten to grade twelve, who are invited into classrooms to share the language and culture; School District 34 has one language instructor (Abbotsford School District 2015); and the University of the Fraser Valley provides four courses in Halq'eméylem (Modern Languages Institute 2015).

Recent press releases and interviews (Henderson 2011; Henderson 2013; FPHLCC 2010b; Hui 2012) highlight how the First Peoples' Heritage, Language and Cul-

<sup>2</sup>Strang Burton [resident linguist, Stó:lō Resource Centre], interview by Bourget, Nicolle, July 11, 2013, Stó:lō Resource Centre, Chilliwack, BC.

ture Program and Stó:lō Nation are working together to implement technological resources such as FirstVoices. The twenty-four bands which make up the Halq'eméylem-speaking community have put significant effort into populating the FirstVoices site with culturally relevant materials. In 2011, FirstVoices and Stó:lō Nation worked together to release a version of the archive that can be accessed on an iPod Touch, iPad, or iPhone (Henderson 2011). Content can now be used through other FirstVoices applications including a mobile language lab and a tutor application which allows a user to practice by recording and listening, then rerecording (Hui 2012).

ICT is an established tool within the Upriver Halq'eméylem language programs. For four decades, funding and personal efforts as described above have been, and continue to be, applied to both technology and non-technology related activities. This case study attempts to evaluate the role ICT played and its effectiveness in the revitalization of the language.

**4. Methodology** My initial research was undertaken to better understand how the Halq'eméylem language revitalization program was using technology to achieve its goals. Qualitative data were collected through multiple methods. Semi-structured interviews were the primary data-collection method; ten interviews yielded 84 pages of data, or approximately 35,661 words. Interview guides were created for the four primary roles to be interviewed: teachers, students, technologists, and the subject matter experts. The guides for the roles of teachers, students, and technologist each began with a set of similar questions designed to identify the role of the research participant within the language program, the level of language fluency, the level of comfort with ICT, and the goals of the language program.

Secondary materials included historical proposals for the language revitalization program; websites highlighting the language initiatives; published interviews with community members in the media; previous research results which provided a holistic view of the community's efforts to document and revitalize the language, as well as the extent of the use of ICT; and ICT documentation which provided context around specific hardware and software applications. An inductive approach allowed theory to emerge from patterns within the data (Eisenhardt & Graebner 2007; McLaren 2010).

The sample, though small, provides good representation of roles within the language programs within the geographic area of the Fraser Valley and thus provides diverse perspectives allowing for a source of rich data. These roles include those of teacher, student, and technologist, with eight of the participants playing more than one role. Of the ten participants, three were subject-matter experts and seven were members of the language community. The subject-matter experts included Tracey Hebert and Shaylene Boechler of FirstVoices and Strang Burton, the resident linguist. The seven language community participants are not named for confidentiality reasons and are identified within this document simply as a numbered participant, i.e., P1.

**5. Findings** The effectiveness of ICT is often compromised by social and technical issues. Based on interview results, two issues impacted technology use and effectiveness: cost and connectivity. Cost was described as impacting the technology available within the schools and within homes of community members, while connectivity issues were due to cost as well as technological constraints within schools. Participants noted that the technical connectivity issues were minor and usually resolved upon identification. Participants also confirmed that they and other community members had access to the Internet, if not from home, then from other locations such as libraries and coffee shops. Neither literacy nor age was an issue; participants, whose ages ranged from mid-twenties to early sixties, described themselves as technically competent, defined here as the ability to use ICT and perform basic troubleshooting with the technology.

Participants identified ten different information and communications technologies (Table 1) used with the Halq'eméylem language. A breakdown of the number of participants using ICT within specific learning activities and those using ICT as part of their daily lives is provided in Table 1.

**Table 1.** ICT used with Halq'eméylem language by participants

	Used within specific learning activity	Used within daily life
Video (FirstVoices, DVD, Other)	5	
FirstVoices Dictionary	4	3
FirstVoices Games	4	
Story books (FirstVoices, DVD)	4	
CAN-8 VirtuaLab	2	
Quizlet	2	
Audio recording (CDs, iPod, MP3)	2	
Email		2
Social Media (Facebook)	1	
Language Master	1	

Discussions around ICT were primarily device-agnostic; that is, participants identified the product (i.e., video) or application (i.e., Quizlet) that they used, rather than the device. There was only one exception to this trend, a hardware tool called a Language Master. Generally, however, interviews focused on the application of the technology rather than hardware.

Table 1 highlights the fact that ICT is rarely used with the Halq'eméylem language outside of immediate learning situations. This does not seem to be related to any digital divide issues, as participants confirmed that they and other community members use ICT on a regular basis for non-language related activities. There may be multiple reasons why participants do not use ICT with the Halq'eméylem language. It may be an indication of an access issue that is not widely understood and which the participants were not able to identify or have underestimated. It may indicate that the ICT is not easily integrated into daily life. The ICT developed may not be the most

suitable for the community members or provide the required functionality. Finally, it is possible that people do not use the language outside of learning situations. Burton suggested that the primary reason that Halq'eméylem-specific ICT is not used by community members is because people do not use the language:

But the thing about the technology, the thing about everything, classes, education, language planning, everything that we try to do, it's like we're trying to support something that's not happening. So, if people were talking to their aunt and their grandmother or a couple that said we're going to make Halq'eméylem a part of our life and so on, then the technology and the classes could help them. But if all you have is the technology, then that's not going to solve the problem. The problem is a social problem, or a personal problem.

However, ICT is used with the language within specific learning situations. The following is an overview of the ten forms of ICT used by participants.

**5.1 Video** Video in the context of this research is associated with both DVDs and digital files such as can be found on the internet. Within the context of this research, participants used the terms video and DVD interchangeably. The videos *Shi-Shi-Etko*, *Shin-chi's Canoe*, *Hálxeywa: A Torch Lighting Story*, *Sásq'ets: The Story of the Sasquatch*, and *Raven Tales* were highlighted by participants as being viewed regularly. Participants noted that video provides a multidimensional view of language by incorporating content, sharing meaning, and allowing the viewer to attach meaning to personal experience. The value of multimedia videos of local cultural activities is that the learner can be a participant in content creation, the recorder, or part of the audience. A video can be created by anyone with a camera or a computer, and then the video can be written onto a DVD with a writer or burner that comes with most computers, or the video can be uploaded to an Internet site.

**5.2 FirstVoices** FirstVoices is an interactive database to which a community can add audio, images, video, and other resources. There are multiple interactive options available to communities including an archive, a chat facility, games, videos, storybooks, and a language tutor. For example, the archive functions as an online dictionary which allows a user to see the written form of the word, hear the pronunciation, and see an image or related video. The uploading of content is an easy process and the site is a true multimedia platform, allowing for video, audio, text, and hyperlinks, and promoting user interaction.

Participants access the dictionary through a standard web interface, i.e., a browser, as well as through a mobile application which allows access on an iPhone, iPod, or iPad. Participants who used this application identified that they were very comfortable with this application, and two participants noted that they had seen others using the dictionary outside of a learning environment. Participants used the online dictionary inside the classroom as a supplementary tool to support their teaching. P5

noted: “We’ll get the kids whatever words they want to know, so they get to choose and then if we don’t know it, we look it up on FirstVoices.” P<sub>3</sub> noted that while in a class, “somebody had a question and we were looking it up and somebody just took out their iPhone and said, ‘I’ll just look it up on FirstVoices.’” Participants also referenced using the application outside of the classroom setting to do homework, help out community members, provide information to others in general discussion, or support other teachers. P<sub>3</sub> noted, “I used it more with homework, just double-checking things. Or with my parents. I was like, ‘Oh you should hear how this is said,’ or, ‘I’ll look this word up,’ or, ‘This is what I’ve been doing.’”

In addition to the online dictionary, the FirstVoices site also provides the ability for a community to incorporate games into their learning activities.<sup>3</sup> Templates for games include: “Word Search,” where the player must find the hidden words; an online jigsaw puzzle; “Concentration,” where players must find the matching pairs; “Quiz Me,” where the player must choose the correct answer to a language question?; “Sentence Scramble,” where the player must unscramble the sentence; “Picture This,” where a player must match the number identifying a picture to the corresponding word; and hangman. FirstVoices Kids<sup>4</sup> is targeted towards children ages zero to five years old and includes two game templates. In “Exploring Pictures” a picture is shown and the application highlights an item within the picture by coloring it while the audio provides the name of the item. In “Colouring Pictures,” a child chooses a color and then colors the picture using the computer mouse, while audio functionality plays the name of the color and the name of the item being colored. The templates for these games are provided to the community; however, the community is responsible for creating and uploading the content to the site. That way, the content, including the vocabulary, pictures, and audio, is culturally relevant and local to the community using the game.

Three of the participants identified games as useful within the classroom setting, as they supported memorization and repetition, and because they caught the attention of the students in the class. I was able to observe one class where three of the games were used. P<sub>9</sub> displayed the “Exploring Pictures” game on a large screen and the children gathered around the screen. As the picture changed color, the children would listen for the name of the item being colored and then yell it out as a group. After working through three pictures, the teachers changed to a jigsaw puzzle. Different animals including a grizzly bear, salmon, and a seagull were displayed on the screen and the Halq'eméylem word for the animal was provided in audio format by the computer. The students repeated the word and then, using Halq'eméylem, directed P<sub>9</sub> who was putting the puzzle together on the screen. After working through a few pictures, P<sub>9</sub> switched to the “Colouring Pictures” game. The picture looked the same as might be found in a child’s coloring book—that is, forms of objects with black outlines. Then one by one, an element of the picture was colored by the application and the audio of the name of the item was provided in Halq'eméylem. The students repeated the

<sup>3</sup><http://www.firstvoices.com/en/Halqemeylem/games>

<sup>4</sup><http://www.firstvoiceskids.com>

word out loud, practicing their vocabulary. The children seemed very familiar with the games and participated enthusiastically.

ICT was used in addition to other activities within the classroom and does not reflect the total learning experience. Students also recited prayers, sang, danced, and then played a game where they would repeat back words and phrases in the Halq'eméylem language.

**5.3 Storybooks** Digital storybooks are similar to video, but with an interactive format allowing for the experience of changing a page and listening to the audio recording that accompanies the text. Storybooks can be stored as digital files on Internet sites such as FirstVoices or on DVDs, allowing individuals with no connection to the Internet to access the storybook. FirstVoices allows the storybooks to be opened in both a Flash version, which plays the storybook as a video, and a text version, which displays the storybook as a continuous page of text with still pictures. The text version allows the option of listening to the audio by clicking a button for each piece of text. Storybooks referenced include *Ye Spípath* ('Baby Bears') and *Tháyem Te Swōqw'elh Léxwtel* ('A Weaving Story').

In the classroom situation that I observed, P10 used the storybook *Ye Spípath*, which tells the story of two baby bears adopted by a family. The children had been introduced to the story in a previous class and so were familiar with the general story line. The pictures were accompanied by a text in both English and Halq'eméylem and the story was narrated in Halq'eméylem by the Elder, Ts'áts'elexwót (Elizabeth Herrling), who has since passed on. P10 had the children listen to the story in Halq'eméylem while asking the children questions and providing reminders in English.

Similarly, participants noted that *Tháyem Te Swōqw'elh Léxwtel* ('A Weaving Story') had been integrated into an upper-level university course in which students learned to weave alongside the story. The storybook allowed students to see the weaving as it was happening and students were able to weave while learning the language and cultural aspects of weaving. The digital book also provided an audio narration by an Elder, a commentary in textual form in both Halq'eméylem and English, the option to review different levels of grammar online, and a print copy of the book. The storybook was on a DVD that accompanied the printed book. P1 noted that the storybook allowed students to have access to people who could weave and talk about the experience in a cultural context, and that it was helpful for students to see an experienced weaver weaving on screen. Additionally, because it is on screen and can be replayed, students are able to weave alongside these individuals by watching and replaying sequences, which enhances the learners' experience. The multidimensional aspects of a digital storybook can therefore add value by engaging the interest of the student and increasing the depth of the experience.

**5.4 CAN-8 VirtuaLab** CAN-8 VirtuaLab (CAN-8) is “a 100% digital language laboratory”<sup>5</sup> and was integrated into university-level Halq'eméylem courses at the University of the Fraser Valley, though it was noted by participants that this may soon be replaced with a different product with similar functionality. The application is available online and is accessed through the University of the Fraser Valley's website. The ability to connect to that site through the Internet is a requirement to download the application, after which students login with a user ID and password to access the application and specific language files. The CAN-8 application must be loaded with content by the instructor. For the Halq'eméylem language, this content includes audio files and text. The student listens to a word or phrase in Halq'eméylem and can then record the word and play it back. As the recording is played back for the students, a system-generated visual representation of the voice is shown, along with a system-generated visual representation of the original recording, allowing for a comparison of the two. Thus students can see, not just hear, the accuracy of their pronunciation and cadence. In this case, the recordings were primarily audio recordings made by Elders in the past and uploaded to the system. A printed copy of the audio was provided to the student as part of a course packet and students were asked to listen and then record specific words and phrases as homework. The instructor could then log on to CAN-8 and review the students' recordings.

Two of the participants believed that CAN-8 was a useful tool in language learning as it allows for a student to practice pronunciation outside of the classroom. P<sub>3</sub> noted that “[the instructor] had us using CAN-8 so we could record ourselves. [...] and then hear back how we were pronouncing things and then that way we could send her our recordings and she could listen to them.” P<sub>1</sub> commented that the tool provided a good exercise in pronunciation because students were able to listen to the recording of a word or phrase by a fluent speaker, record themselves articulating the word or phrase, and then play back the recording.

**5.5 Quizlet** Quizlet<sup>6</sup> is a free website that allows students and teachers to build flash cards, test each other using the cards, and build quizzes to review the materials. As with the other applications, the content must be uploaded into the system by the users and can include audio files, pictures, and other content. Originally recommended by a Halq'eméylem student, the application was quickly shared with other students and partially adopted by the teacher.

**5.6 Audio recording** Three of the seven participants identified audio recordings as valuable technology. A key benefit of audio recordings is that a recording made for one purpose can often be reused within multimedia applications for other purposes. In this case, audio recordings are used within applications such as FirstVoices and CAN-8; however, participants also mentioned using the plain recordings on their own. For example, P<sub>2</sub> noted:

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<sup>5</sup><http://www.can8.com/>

<sup>6</sup><http://quizlet.com/>

We had CDs, which I flipped through my iTunes and put on my iPod. I could listen to them at work and in my car to practice [...] people sometimes look at you funny when you're speaking another language driving around, but it was great practice.

This type of activity allows additional time with the language and supports language learning. The ability to transfer the audio recording to multiple devices allows learners to use the audio recording in different ways. Examples include using the audio recording in a CD player in a car, as referenced above, or on an MP3 player while walking. The device used therefore does not limit the availability of the recording to individuals comfortable with only one type of technology, but allows for multiple devices to be used. For example, P4 suggested that two versions of audio could be created, both a CD version and an MP3 version, as “some of the people that are using them, like the teachers, they're Elders and so they are not into all of the technology.”

**5.7 Email** One of the hurdles with email is the requirement for special fonts and characters used within the writing systems of languages such as Halq'eméylem. In an ideal situation, email would provide an opportunity for a learner to interact with a more proficient speaker; however, this has not been widely adopted, likely because learners have limited language skills and there are few expert speakers with whom they can communicate. Indeed, only two of the participants were using email to communicate in the language.

Notwithstanding the fact that only two participants were using email, email was identified as providing a strong opportunity to use Halq'eméylem. Though no participant used email extensively to communicate in Halq'eméylem, the two participants who did occasionally email in Halq'eméylem noted that the interactive nature of the exchange, though delayed, forced them to think about what to say and how to say it. For example, P1 noted that in the majority of her emails, she would use a Halq'eméylem salutation, *éy swáyel* ‘good day,’ to begin the email and then end the email with *kw'étslóme* ‘see you’; however, creating the body of the email was much more complex.

**5.8 Social media** No formal social media pages for the language existed at the time of the research, though one of the students noted that she had used Facebook to interact with another student during the duration of a learning activity. After that activity was completed, they stopped using social media with the language. Such applications could be set up with the content being maintained by a proficient speaker or enthusiastic learner. However, substantial time and effort is required to maintain such sites and the desired interaction with users may or may not occur. Websites and social media sites require constant maintenance to ensure that content is recent, contextual, and continuing to engage the community. Management of the user comments may also be required to ensure a friendly and welcoming environment for the community.

**5.9 Language Master** The Language Master is a physical device that allows users to listen to audio, then record their own voice and listen to what they said. Halq'eméylem words are first recorded onto cards with magnetic strips. Then, the student or teacher can run this card through the machine and hear the word or phrase being spoken. The student can record the word and then compare the pronunciation. There is no Internet connectivity required. The Language Master is used in a school with limited access to ICT, including connectivity, and was highlighted as an important tool for language learning.

**6. Learning strategies in use** While participants were not asked directly about learning strategies, the semi-structured interview format allowed participants to elaborate on how they used technology. In almost every case, participants positioned ICT within the context of the learning strategy. I was therefore able to map the learning strategies used to the specific form of ICT in use (see Table 2).

**Table 2.** Intersection between ICT and learning strategies as identified by participants

Learning strategy identified by participant	Functional description of learning strategy	Video	FirstVoices Dictionary	FirstVoices Games	Story books	CAN-8 VirtualLab	Quizlet	Audio recording	Email	Social Media	Language Master
“A really neat way of learning”	Multidimensional	✓	✓	✓	✓	✓	✓	✓	✓		✓
“Listening to the words”	Recitation, repetition, recording			✓		✓	✓				✓
“You’re really engrained in the language”	Learning while creating	✓					✓	✓			
“I had to think how to respond”	Interaction with people		✓							✓	✓
“At the dinner table”	Integration into daily life		✓							✓	✓
“It’s all Stó:lō...And it hits home”	Accessing cultural specific content	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
“Hearing an Elder’s voice”	Access to Elders’ voices	✓	✓	✓	✓	✓	✓	✓		✓	✓

The checkmarks in Table 2 indicate where participants have identified that ICT intersects with the learning strategy. The learning strategies can be sorted into three categories: targeted learning outcomes, supporting fluency, and cultural content assimilation.

**6.1 Targeted learning outcomes** Learning within a classroom was the primary way participants were using the language. Having specific learning goals was identified as the primary learning strategy. Within this category, participants identified three major approaches, which they termed using a ‘multidimensional approach,’ ‘recitation, repetition, and recording;’ and ‘learning while creating.’

Multidimensional learning was defined by students as learning using techniques that used different learning tools, incorporated physical activity, and encouraged the students to have fun while learning. P<sub>3</sub> noted that multidimensional learning is not just about having fun but also provides a safe place to learn. She explained that techniques using stuffed animals and coloring may take a student back to how they felt learning as a child, and that these basic techniques appeal to everybody. She further noted that these techniques take everyone back to a point where they realize they are learning something new, and that the students in this situation are not afraid to fail because they feel they are at a child’s level of learning and that they are safe. Having a safe place is important, as residential school trauma has resulted in generations of First Nations peoples not feeling safe to learn or speak their languages (FPHLCC 2010a; Moore & Hennessy 2006). Additionally, criticism within a classroom either from teachers or other students may result in learners not wanting to speak the language (Walsh 2005). Such situations often cause second-language anxiety which can significantly impact the ability of students to speak the language. However, this can be alleviated somewhat by providing an environment where students feel safe (Piechurska-Kuciel 2011). Humor can be used to provide such an environment, helping students to feel more relaxed and reducing anxiety (Wagner & Urios-Aparisi 2008). The use of multidimensional and fun activities to teach Halq'eméylem creates a safe and comfortable environment. The value in this approach is supported by participants who noted that students seemed more engaged and learned more during fun activities and when teaching methods were varied.

Such multidimensional activities do not need to be complex to be effective. Participants identified activities such as coloring, doing crossword puzzles, completing word searches, throwing around toy stuffed animals, visual aids, games, writing on the board, and jumping around while performing an action under discussion. P<sub>3</sub> recalled that students played “a Snakes and Ladders game that we adapted to Halq'eméylem [...] [the teacher] had all these fun ways to learn language so that you’re not just being drilled on spelling and pronunciation.” P<sub>5</sub> identified that she had found a tool online that allowed her to use multiple ways of learning:

I was tired of writing out my flash cards so I was looking for an app on my phone for flash cards and I came across the Quizlet.com, and it was awesome. Because you can record your own voice, you can add a picture to it, there’s so much you can do with Quizlet.

All of the forms of ICT identified except for email are associated with a multidimensional approach and can be used to capture a learner's attention and promote learning.

The second approach supporting specific learning outcomes includes recitation, repetition, and recording where the recording is performed by the student herself. Recitation and repetition allows the learner to practice speaking in the language while becoming used to the cadence and tone as well as supporting memorization activities. Recording oneself allows a learner to hear differences between an expert speaker and a learner's attempt, allowing learners to narrow in on challenge areas.

I was able to observe how teachers used repetition and recitation as a tool in a classroom of preschoolers: the preschoolers repeated words spoken by their teachers as well as words heard on the videos watched. Additionally, P1 noted that a child likes to hear the same story over and over again. As the story is read to the child, the child begins to confirm his or her understanding of the story by asking questions or making statements about what is happening and waiting for the reader to confirm their understanding. P1 identified this process as a natural way to learn, that is, repetition while building a foundation and confirming what is being learned.

Such repetition while learning the Halq'eméylem language is important, especially for adult learners, as Halq'eméylem has significantly different phonemes than English and Halq'eméylem phonemes can be very difficult for a non-speaker or a learner to distinguish. While very young children are able to hear these differences, adults become accustomed to the language(s) that they speak regularly and have more difficulty learning these different phonemes (Bransford et al. 2000).

Recording can be effective when using applications that allow the pronunciation and cadence to be seen. The ICT supporting this learning strategy includes FirstVoices games, CAN-8, Quizlet, and the Language Master.

'Learning while creating' is the third approach supporting the targeted learning outcomes strategy. Participants noted that creating language resources requires the same type of thought processes as interaction or having conversations. For example, P1 noted that when a student is asked to draw an apple, the student may need to consider what kind of apple as well as what color, shape, and form, and be able to identify these attributes. These thought processes, she commented, are part of language learning. A second example provided was that of creating a video for a project requiring research both to document the topic and to ensure that the correct language is used. P1 noted that creating such materials can be fun and can support language learning. She described how she created a video of *qauoot* or fishing with a net. As part of the creation process, P1 had to find the required language, put the video together, and create sub-titles. P1 concluded by saying that this experience helped with her language acquisition and believes that similar activities would benefit students, especially those in high school, who really are engaged with the newer technologies. On a smaller scale, P5 noted that using Quizlet to create cue cards was of value because "you have to type in all the words, you have to incorporate the pictures, and you can record your own voice so you're really engrained into the language when

you use Quizlet.” ‘Learning by creating’ as a strategy is supported by video, Quizlet, audio recording, and email.

**6.2 Supporting Fluency** The second learning strategy identified was to support fluency within the Halq'eméylem language. Participants described two approaches to supporting fluency in the language: interaction between individuals and integration of the language into daily life.

Three types of ICT support these two learning approaches: the FirstVoices dictionary, email, and social media. The FirstVoices dictionary allows individuals to look up words and phrases while simultaneously interacting with other individuals. While the FirstVoices dictionary does not allow interaction between individuals, it was reported that it was easily accessible and was used by participants to augment their conversations both inside and outside of the classrooms. Thus, it supports human-to-human interaction. Email and social media allow for interaction between individuals through a technology interface. Participants reported that email was used for interaction and required a significant amount of thought on the part of the sender and receiver. Social media was referenced only minimally by participants; however, participants indicated that this usage required in-depth thought about the language and allowed for users of the social media sites to respond in the language.

Participants did not identify chat applications as supporting language learning, and therefore chat applications are not included in Table 2. However, Burton, noted that he had used chat functionality to communicate directly with a fluent Elder and that the application had significantly supported his acquisition of the Halq'eméylem language.

Email, chat, and social media applications therefore have the potential to allow individuals to interact and increase written skills potentially leading to literacy which could support the development of fluency. However, these technologies may require a fluent speaker to support the learning process. It is slightly more difficult to see how ICT can support integration into daily life in settings such as the dinner table. However, in today's world one often sees individuals checking email and social media sites during the day and sharing those updates whether shopping, working, or at the dinner table. While not ideal for encouraging social interaction, an online dictionary accessed through a smartphone can support the retrieval of words and information to enhance ongoing conversations. If Halq'eméylem usage with ICT can be increased, this may support increased fluency, which could then flow into daily life in a seamless fashion.

**6.3 Cultural Content Assimilation** Having cultural content was identified as a strategy to increase language learning in the sense that it increased participants' interest in the language and provided context. For example, P5 noted that “just hearing an Elder's voice too, just really, I think opened up the language a lot for us. Makes it a little more personal I think, hearing an Elder.”

Participants noted that having culturally specific content and providing the ability to hear the language in an Elder's voice were key to this approach being successful.

All of the ICT in use support the use and inclusion of cultural content which is created and uploaded by the community. However, content by itself may not support the development of fluency in the language. Hermes et al. (2012) state that content needs to support discourse between what is learned in school and what is spoken at home. The use of content as a learning strategy must therefore be carefully considered against longer-term goals.

While participants did not highlight the connection to ancestors, the ability to listen to an Elder's voice was identified as very important within a learning context by three of the participants. For example, P5 noted that "[it was good] to be able to follow along and actually hear the Elder speak. So instead of guessing the words, and sounding them out by yourself, you kind of had help with the Elder's voice." Similarly, P1 believed that hearing an Elder's voice would support becoming more fluent in the language, while P3 noted that CAN-8 "was a really good tool to be able to hear an Elder speaking because she had Elders recorded."

The participants' comments indicate that the voices of Elders are important for language learning, as Elders may have Halq'eméylem as a first language. Moore & Hennessy (2006:133) highlight the importance of having Elders involved as "elders connect them to their ancestors through their knowledge;" however, Hermes et al. (2012) note that the voices of heritage language learners can be as important as Elders' voices. In my case study, the participants' comments support including Elders' voices in content. However, it may be time to begin recording the voices of second-language speakers as recommended by Hermes et al. (2012). Recordings of such individuals, who have learned or are learning Halq'eméylem as a second language, may allow learners to be more comfortable knowing that others were able to succeed. Recording the voices of learners may also raise the confidence of the individual as well as the perception of the prestige of the language.

**7. Summary** By understanding how technology is being used in practice and its effectiveness, we gain insights into how ICT may be implemented within language revitalization activities in a meaningful way. I determined that while multiple activities are ongoing within the Halq'eméylem language community, there is no centralized language program and thus there is no centralized program directing the use of the technology. As such, the use of ICT is now growing organically through the efforts of individuals and institutions committed to the language. ICT has become an integral tool in the teaching of the language.

Participants observed that ICT is being used successfully as a supplementary tool in coordination with specific learning strategies and activities such as story-telling, games, and looking up a word or concept. They also noted that ICT is not being used to support Halq'eméylem learning activities outside of those specific learning activities. Additionally, participants indicated that ICT that enables human-to-human interaction has significant potential to contribute to developing fluency, but only if the language is already being used.

Findings on the use of technology within the Halq'eméylem language revitalization programs can be summarized as follows:

- Video and audio continue to be significant tools for language learning and should be available in both digital (online) and DVD versions to allow for different learning and personal situations.
- ICT can be integrated into multidimensional and fun activities to relax and engage students.
- Online reference and look-up tools can support spontaneous language learning as they allow users to quickly look up words and terms and share the results. Smartphone apps may be the best medium for this application.
- The multidimensional aspects of a digital storybook can add value by engaging the interest of the student and increasing the depth of the experience and learning opportunity.
- Technology that can be integrated into everyday activities, such as audio that can be listened to at any time, is more likely to drive language learning.
- Email and chat applications can support written literacy as the interactive nature of the exchange, though delayed, forces both sender and receiver to think deeply about the language.
- Repetition and recitation, especially using applications that allow the pronunciation and cadence to be seen, can be effective.
- Technology needs to be applied based on the targeted learning outcomes, whether it be in a class or fluency in a community. Simply putting ICT in front of a student does not guarantee results.
- Content, specifically audio recordings of the Elders and heritage speakers, as well as cultural materials related to the audio recordings, can engage the learner's interest and result in a better learning experience.
- Content creation, such as video creation, should be considered as a critical part of any language revitalization strategy.
- Social media or social technologies can support interactive language learning. However, the content may need to be maintained or moderated by a proficient speaker or enthusiastic learner, which may require a significant investment of time and effort.
- Applications may not need to be created from scratch; Quizlet is an example of a free third-party application identified by a student and adopted by the class for use in language learning.

This study indicates that ICT can be a valuable tool in the effort to revitalize a language; however, the target outcomes and integration of ICT needs to be carefully considered and planned.

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