

Indigenous Language Revitalization and Technology From Traditional to Contemporary Domains

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This paper describes critical areas in which technology plays a role in language and culture revitalization and explores efforts made by Indigenous communities to preserve, maintain and revitalize their Indigenous language with the help of computer technology.

People are interested in both traditional and contemporary culture and are finding new ways to practice and preserve their cultural heritage. One way includes the use of computerized and digital multimedia technologies. (Scott, 2007, p. 138)

An approach that is not new, but which has been under-utilized and has yet to be proven useful in Indigenous¹ communities is the integration of technology to supplement efforts in Indigenous language education, revitalization and maintenance programs (Grenoble & Whaley, 2006). In the 1970s, the first Apple PC appeared, followed by the IBM PC in the following decade. The 1990s, however, brought about an array of technologies that included videodiscs, CD-ROMs, digital video, virtual reality, 3-D systems, HyperCard, Hyperstudio and the Internet. Since then, the Internet has expanded rapidly, allowing users to search for information on the world wide web, download readily available files (documents, videos, music) and communicate with others via asynchronous tools (e-mail, message boards, blogs) and synchronous tools (chat and webcam) (Murdock, 2004).

Many Indigenous communities have embraced technologies, such as audio, video, and multimedia as a means to revitalize their language (Penfield, Cash, Galla, Williams & Shadow Walker, 2006). For example, the Native Hawaiian² community has incorporated technology in the curriculum at *Kula Kaiapuni* (Hawaiian Language Immersion Program) (Hartle-Schutte & Nae'ole-Wong, 1998; Ka'awa & Hawkins, 1997; Warschauer, 1998; Warschauer & Donaghy, 1997).

Technology encompasses a wide range of objects, methods, systems, tools and practices, which extends from low to high-end advancements (Zhao, 2003), whereas the latter provides multimodal and human-computer interaction allowing speakers and learners to adapt to the modern world beyond the traditional keyboard and mouse input/output. More specifically, computer technology can be viewed either as a benefit, aid or supplement to language learning or may be viewed as a distraction and unnecessary tool. The focus of this paper will be on the former. Warschauer (1998) and Hartle-Schutte and Nae'ole-Wong (1998) describe critical areas in which technology plays a role, specific to the Hawaiian language community. However, the following categories: 1) preservation of the Indigenous language; 2) material development and dissemination; 3) multiple modes of communication; and 4) achieving relevance, significance and purpose can be applied to other Indigenous languages as well.

Indigenous Language Revitalization

Before examining technological efforts made by Indigenous language communities, readers should be aware of my life as a member of an Indigenous language community. Born in Hilo, Hawai‘i in 1980, raised in *Pahala*, and educated at a private Hawaiian day and boarding school, *Kamehameha Schools* in Honolulu, O‘ahu, I was brought into the world during a time when our Native language, Hawaiian, was not transmitted to the younger generation. An estimated 1,000 speakers existed at this time, of which half resided on the island of *Ni‘ihau*³ and the other half being elders 70 years and older. On the other hand, I emerged at a time where a handful of educators, parents and administrators were determined to revitalize our language. This was the beginning of the Hawaiian Renaissance, which consisted of “university language classes, a weekly Hawaiian language talk show, a newsletter, student and teacher organizations, the promotion of Hawaiian street names and Hawaiian-only camping trips to traditional areas” (McCarty, 2002, p. 297), as well as the *Kūpuna* (Elders) Program. The latter program allowed Hawaiian elders to teach the language in the public schools (Wilson, 1998). Awareness among this group started a surge of renewed cultural heritage, identity, Hawaiian studies and interest in our language. The Hawaiian community progressed and has since developed Hawaiian immersion schools that educate children from birth through high school. In addition, the University of Hawai‘i in Hilo now offers undergraduate and graduate degree programs in which the medium of instruction is Hawaiian (Kalani, 2007; Thompson, 2007).

Although I did not attend a Hawaiian immersion school, I learned Hawaiian as a second language for six years in intermediate through high school. Upon graduation, I moved to Tucson, Arizona where I currently reside and continue my education. My passion since has been to find and document what types of computer technology Indigenous language communities are using, how these technologies are used for language and culture revitalization and the effectiveness of such technologies on language learning.

The role of technology in Indigenous language revitalization and preservation

Indigenous communities are naturally concerned with how technology can in any way contribute to language revitalization. In the Hawaiian community, Warschauer (1998) and Hartle-Schutte and Nae‘ole-Wong (1998) describe critical areas in which technology has played a significant role in language revitalization. Although specific to a community, the identified categories described: 1) preservation of the Indigenous language; 2) material development and dissemination; 3) multiple modes of communication; and 4) achieving relevance, significance and purpose can be applied to other Indigenous languages and communities as well.

Language preservation among Indigenous communities, including Hawaiians, has been a major concern, even more so with how technology can assist in this process. However, technology, which is not new to the Hawaiian community, has helped to document and preserve the voices of our people, gifting our future generations with priceless knowledge and wisdom. In 1834, the first printing press was shipped to *Lahainaluna* on *Maui*, the first school west of the Rocky Mountains. Newspapers were created on a daily basis in Hawaiian

and since the printing press, technologies of all types have evolved, from low to high tech advancements that have aided in preserving the language. This progression includes the following, in no particular order: Hawaiian television programs, radio, cassette tapes, audio books, CDs, DVDs, web-based products, on-line dictionaries, web radio stations, local news station, language websites, movies, distance learning classes (i.e., *Kulāiwi* and *Niulohiki*), search engine, electronic bulletin board system (*Leokī*), electronic library (*Ulukau*), music sites (i.e., *Huapala*) and audio podcasts.

Documents published in the 19th and 20th centuries, such as Hawaiian language newspapers have since been transferred to microfiche and through a project of Bishop Museum in *Honolulu*, scanned digitally and made available on *Ulukau* at <http://ulukau.org> (Ulukau, 2003). This project, *Ho'olaupa'i: Hawaiian Newspaper Resources* provides searchable text files from archival newspaper collections dating between 1834 through 1949 (University of Hawai'i Mānoa Outreach College, 2008).

Although there is seemingly a lack of texts available in the Hawaiian language, the *Ulukau* website provides invaluable resources, which anyone—Native or non-Native—can access. The purpose of this site is to “make these resources available for the use, teaching, and revitalization of the Hawaiian language and for a broader and deeper understanding of Hawai'i” (Ulukau, 2003). In addition to Hawaiian language newspapers, this repository allows students, teachers, as well as future generations to find complete publications that range from the Hawaiian bible, dictionary, history, mythology, customs, traditions, *ali'i* (chiefs), etc.

Owing to a continuous flux with technology, the conversion of newspapers, documents, cassette tapes, etc into digitally archived files does not guarantee a lasting shelf life, however it at least assures the community that something is being done to safeguard the material from further deterioration. While there is legitimate concern regarding transmission of information that was traditionally passed down orally from generation to generation, Dauenhauer & Dauenhauer (1998) warn that “the risks of sharing information are less dangerous at the present time than the risk that it may otherwise be lost forever” (p. 92). By preserving these resources, our language and culture will be known by future generations as well as the world to see and hear.

Curriculum and material development and dissemination

A significant challenge that language instructors face in Indigenous communities, include lack of textbooks, pedagogical, culturally relevant, and authentic materials that depict the language and culture in a non-stereotypical way. Using Microsoft Office programs, such as PowerPoint, Excel and Publisher, authentic language materials and curriculum can be created as needed to develop interactive lessons, digital storybooks, printable books to be used as textbooks, etc. For communities, the ability to produce a product instead of going through a publisher is significant and less expensive.

During the initial stages of *Kula Kaiapuni*, teachers as well as parents created materials via translation from English to Hawaiian using the cut and paste method. The language program was,

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hampered by a lack of textbooks and other pedagogical materials in Hawaiian. At *Ānuenuē* School on *O‘ahu*, parents and community volunteers are invited in for ‘cut and paste’ sessions, where Hawaiian translations of American textbook pages are cut and pasted on to the original textbooks. This is of course an unsatisfactory solution, due not only to the immense time and effort involved. ‘The main problem is that this imposes a perspective from outside the islands’, says Laiana Wong, a Hawaiian language instructor and a member of the Hawaiian language lexicon committee. “We need to develop original materials in Hawaiian that can reflect our own culture, perspective, and reality.” Developing such materials, and other aspects of the immersion program, also involves a huge update of the Hawaiian lexicon, which had badly stagnated due to 100 years of linguistic repression. (Warschauer & Donaghy, 1997, p. 352)

However, in 1994 a program guide was published by the Board of Education revealing a long-range plan, which included exploring creative ways to deliver quality curriculum to the student. More specifically, item Priority Action B.2a intended to utilize available technology as a viable means for delivering curriculum.

1. Make interactive video available as a means to network available resource persons throughout the immersion sites.
2. Provide network capabilities for immersion computer systems as a means to exchange language items among various schools and offices in order to improve communication and to facilitate dissemination of curricular materials.
3. Strengthen and make available various modes of technology to each immersion site.
4. Develop a telecommunications service for the Hawaiian language immersion student, which will also serve the Hawaiian language community throughout the state.
5. Provide training in equipment and software available for student use.
(State of Hawai‘i Board of Education, 1994)

In 1995, a year following the report, an electronic bulletin board system called *Leokī* (Powerful Voice) was introduced in *Kula Kaiapuni*, as well as other departments, organizations, and offices by the *Hale Kuamo‘o* Hawaiian language curriculum office at the University of Hawai‘i in Hilo. With an estimated 1,000 registered users, *Leokī* operated entirely in Hawaiian (Hale, 1995; Warschauer & Donaghy, 1997). This system provided “online support for Hawaiian language use in the immersion schools and the broader community” (Warschauer, 1998), a variety of telecommunication services through the Hawaiian language via the Internet and distribution of language materials that allowed teachers to share materials and curriculum with other instructors throughout the state. Addition-

ally, students were able to search for materials in a shared resource area, chat, e-mail, and have synchronous discussions all in the Hawaiian language through *Leokī* (Warschauer & Donaghy, 1997).

With appropriate software, communities no longer need to be dependent on publishing companies to print language materials. Printing costs, which include paper, toner, and staples are relatively inexpensive. In addition, another option includes saving the language materials as a digital file to be used and interacted with on specific computers (community and/or school computer labs) or downloaded to personal computers via the Internet. This later alternative eliminates paper altogether, preserves the language, and allows for greater distribution to community members who are separated by distance.

Multiple modes of communication

Indigenous language speakers and learners are no longer confined to a specific geographical area, but instead are scattered throughout the world, thus posing a challenge of communication. However, with the assistance of technology, distance should not be a factor in language learning and speaking. Keiki Kawai‘ae‘a, Director of Curriculum Materials at *Hale Kuamo‘o*, shares her concern of distance and linking language communities with each other. “There’s a small community at *Keaukaha*, and there’s a small community of kindergartners and first graders at Waimea, and they’re all over; . . . they need to have more peers to speak with” (Warschauer, 1998, p. 144). Teachers and administrators are finding ways to connect speakers that are separated by distance and to provide additional environments that can contribute to their students’ development and learning. Fortunately, *Leokī* has granted Hawaiian communication between other Hawaiian language learners and speakers statewide (and beyond) via e-mail, discussion groups, and chat allowing the language to be used in formal and informal settings. Prior to this implementation, communication in the language was bound to the geographical location of the school.

Although face-to-face communication is most beneficial in language learning, e-communication can also play a significant role, providing students opportunities with other modes of communication that are prevalent in the modern world. A collaborative project, *Pāhana Haku Mele* (Compose a Song Project) between school sites on two different islands required long distance communication between students via e-mail and chat (Warschauer, 1998). Kaho‘okele Crabbe, instructor at *Keaukaha* Elementary, initiated the collaborative project so his students could have “authentic opportunities to communicate outside the classroom. Too few of our students get a chance to really use Hawaiian outside of school” (Warschauer & Donaghy, 1997, p. 358).

Using technologies such as chat, e-mail, forums, text messages, wikis, and blogs are just a few spaces in which Indigenous languages can be promoted. Application of these tools allows for connections with other speakers and learners all over the world without leaving the comfort of your home.

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Achieving relevance, significance and purpose

Learners of second languages who are students of the grammar method “sometimes achieve high grades in a language class and then find themselves at a loss when it comes to actually using the language” (Adley-SantaMaria, 1997, p. 139). However, regardless of the pedagogical method used, more often the language is taught out of context, not supported outside of the classroom, and has “severely restricted use in the wider community” (Slaughter, 1997, p. 2). Therefore, to support and promote language learning, expansion into broader areas needs to occur in education, work sphere, community, government, mass media, business, and out-of-school environments locally, regionally, and nationally (Fishman, 1991; Hinton, 2001).

In Indigenous communities, some may be skeptical on how technology can aid in revitalization and if it is even worth the time and investment. However, within the last decade, the Hawaiian language has found its way and place on the Internet. Learners can search the Internet to find an array of Hawaiian language websites, which more than often are school websites and/or personal websites. Examples of these websites include the *Ka Haka ‘Ula O Ke‘elikōlani* College of Hawaiian Language website (<http://www.olelo.hawaii.edu/khuok/>), On-line Hawaiian Dictionary website (<http://www.wehewehe.org>) and the author’s personal website (<http://www.u.arizona.edu/~candaceg>). Since web design no longer requires a rich knowledge of html programming and code, anyone can design a basic website. As a result, schools can create websites that provides resources relevant to *Kula Kaiapuni* and general knowledge for the broader community.

Additionally, *Hale Kuamo‘o* created a custom keyboard and font that encompasses diacritical marks of Hawaiian, ‘okina (glottal stop) and kahakō (long vowel). Macintosh software have been customized so that the drop-down menus display in the Hawaiian language. One such program is Kid Pix, which is similar to PowerPoint, but designed for young users. Students using this program can create culturally relevant and significant material both in the Hawaiian language and for the Hawaiian language. Other programs that have been translated include ClarisWorks and Mario Teaches Typing (Donaghy, n.d.).

Functional Hawaiian is expanding beyond the conversational level to include all aspects of life; education, government, business, virtual spaces, science, etc. Hawaiian is no longer just a conversation language. This was proved true when a local Hawaiian music station received a call in September 2007 following a varsity football scrimmage between Damien High School and *Ānuenuē*. The uniqueness of this game was due to *Ānuenuē* being comprised of Hawaiian language immersion students. Here is what a Damien parent shared with the listeners of Hawaiian 105 KINE:

They came over there with 26 varsity players and they all speak Hawaiian. The quarterback calling his plays in Hawaiian. The quarterback coming up changing his plays audible in Hawaiian. The offensive linemen they calling their blocking assignments in Hawaiian. The whole

community speaking Hawaiian, cheering in Hawaiian. We were like Goliath, they was David and the difference was the language barrier.

It is clear from this example that the Hawaiian language is moving beyond boundaries that are formally structured. Kawai‘ae‘a expresses, “we want children to know that Hawaiian is not just good enough for sitting at a party and talking story. Hawaiian is good enough for every part of life. That is the sign of a healthy, living language” (Hale, 1995). Hawaiian is a breathing language and there is no limit to where the language can and should be spoken. The Hawaiian language will be a viable language for the many generations to come.

Examples of technological efforts made by Indigenous language communities

Technologies among Indigenous communities include but are not limited to wax cylinder recordings to digital audio recordings, e-mail to chat, video recordings to interactive audio video conferencing, and/or surfing the Internet to playing interactive computer games. The multitude of language projects that involve Indigenous communities are categorized by levels of technology and presence of the Indigenous language. These include a) low-tech initiatives, which are based on one sensory mode, b) mid-tech initiatives, which comprise of two sensory modes or the traditional keyboard and mouse input/output, and c) high-tech initiatives, which consist of multimodal interactive technology, in which input and output are key factors.

Low-tech initiatives emphasize one sensory mode, allowing the learner to receive the Indigenous language through sight or hearing. More specifically, the user visually sees the language either in printed material (e.g., books) or on a screen (e.g., subtitles), or audibly via a speaker or sound system. Included in this category are the following technologies: printing press and audio media comprised of radio programs, audio recordings, audio books, videos, movies, and television programs (see Table 1). In most instances, the latter group provides audio to the user in the Indigenous language, along with graphics that provide context, but not visual text. Moreover, when subtitles are available, the Indigenous language spoken is translated into a written form of a language of wider communication and/or not represented. If however these audio media accompany texts in the Indigenous language (audibly hear the language and visually see the language), these technologies can be considered mid-tech media (see Table 2).

Oftentimes, the early products of these technologies are retrieved or rediscovered only to find that the material has deteriorated tremendously. However, there are many language materials that have survived or been repaired, and have been properly archived and preserved as digital files. Language materials found in this category are frequent among Indigenous communities in comparison to mid- and high-tech initiatives. But for an Indigenous language to flourish, the language needs to enter domains of the 21st century as well as require bisensory and multimodal interactivity.

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Table 1. A sampling of low-tech initiatives

<i>Technology Media</i>	<i>Product</i>
Printing press	Newspapers—Hawaiian (University of Hawai‘i Mānoa Outreach College, 2008); Books, print materials—Hawaiian (‘Aha Pūnana Leo, 2006)
Radio programs	News, language lessons, songs—Lakota, Navajo & Sahaptin (Martin, 1996)
Audio recordings, digital storybooks or lessons	Wax cylinders—Hopi (Sekaquaptewa & Washburn, 2004); Cassette tapes—Hawaiian (Wight, 2005); CD—Western Mono (Kroskrity, Bethel & Reynolds, 2002), Yu‘pik (Villa, 2002); DVD ; Audio podcasts, mp3, or digital audio files—Hawaiian (Kualono, 2008); Microsoft PowerPoint—Mohave, Navajo, Oneida (Penfield et al., 2006); E-books
Videos/movies	Tape reels; VHS or DVD—Hawaiian (‘Aha Pūnana Leo, 2000); Video podcasts
Television programs	News/headlines—Hawaiian (KGMB9, 2008); Language classes

Table 2. Comparison between low-tech audio and mid-tech audio initiatives

<i>Level</i>	<i>Example: Movie</i>
Low-tech (unisensory)	Hear the Indigenous language: The language spoken is an Indigenous language with no accompanying texts in the Indigenous language (e.g., movie in Hawaiian with no subtitles or subtitles in a language other than Hawaiian); OR see the Indigenous language: The language spoken is English with accompanying texts in the Indigenous language (e.g., movie in English with subtitles in Hawaiian)
Mid-tech (bisensory)	Hear AND see the Indigenous language: The language spoken is an Indigenous language with accompanying texts in the Indigenous language (e.g., movie in Hawaiian with Hawaiian subtitles)

Mid-tech initiatives are bisensory, allowing the learner to receive the Indigenous language through sight and hearing and/or require the use of a keyboard and mouse (point and click), and access to the Internet. Some examples of this category include the following technologies: audio media accompanied by texts which comprise of audio recordings accompanied by a transcript, audio/digital storybooks accompanied by the story, video/movie and television programs with subtitles in the Indigenous language and web-based media. In reference to the

first group of mid-tech initiatives, audio media, the Indigenous language is seen and heard, as opposed to being seen or heard (see Table 2).

The remaining technology in this category, web-based, and its products have been introduced in the last decade (see Table 3). Although popular amongst children, use of these web-based technologies primarily occurs in the English language. Communities such as the Hawaiians have created web-based materials, specifically websites that are in the language with an option to view a bilingual version in Hawaiian and English. Other Indigenous language web-based sites are making its way to the Internet, including on-line dictionaries with audio files, wikis and blogs. While initiatives in this category are bisensory and/or require access to the Internet, there are still more advanced technologies that allow for multimodal interactivity.

Table 3. A sampling of mid-tech initiatives

<i>Technology media</i>	<i>Product</i>
Web-based	Wikis—Navajo, Maori (Wikipedia, 2004); Electronic library—Hawaiian (Ulukau, 2003); Search engine—Hawaiian (Donaghy, 1998); On-line dictionary with audio—Yurok (University of California Berkeley, 2008); Web sites—Hawaiian (Go!, 2008)

High-tech initiatives allow for asynchronous communication, synchronous communication or multimodal interactivity between the user and the technology (see Table 4). In this category, input and output of the Indigenous language are key factors. Communities involved in Indigenous language education and revitalization have recently entered this domain and are exploring ways to utilize modern technology to promote the use of their Indigenous language. By using technologies that are “hot” and “popular” in today’s market, communities can use this as a strategy to engage youth to learn their language.

Asynchronous tools, such as blogs, e-mail and discussion boards, enable communication over a period of time via a “different time-different place” mode. These tools give users the flexibility to connect at their own convenience.

Table 4. A sampling of high-tech initiatives

<i>Technology media</i>	<i>Product</i>
Asynchronous	Blogs—Nahuatl (Pixan, 2008); Discussion Board; E-mail
Synchronous	Telephone—Deg Xiang (Taff, 1997); Chat; Webcam; Audio video conference
Interactive multimedia	Digital/computer/video games—Blackfoot (Parker, Heavy Head & Becker, 2005; Petten, 2005); Electronic bulletin board system—Hawaiian (Warschauer & Donaghy, 1997); Rosetta Stone—Kanien’kéha, Inupiaq, Chitimacha (Bittinger, 2006; Rosetta Stone, 2008)

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Synchronous tools, such as the telephone, chat, webcam, audio video conference, enable real-time communication in a “same time-different place” mode. These tools provide the users with instant communication. Instead of using the language of wider communication, learners and speakers can use their language over the phone and/or can type e-mails in their Indigenous language. The creation and use of a customized keyboard may be necessary to type phonetic or syllabic characters that are not a part of the standard QWERTY keyboard.⁴

The final category is interactive media, which provides immersive language environments integrating graphics, audio, video, assessment and may include text or speech input from the user. Examples of this include computer games, electronic bulletin board systems, and commercial software. A handful of Indigenous communities, Kanien’kéha (Mohawk Nation located near Montréal, Québec), Inupiaq in Alaska as well as the Chitimacha tribe in Louisiana have invested substantial money into software such as Rosetta Stone to revitalize their languages. These technologies provide speakers and learners a range of opportunities to use the language in the 21st century. The Indigenous language is no longer limited to the traditional and formal education setting, but rather expanded to include contemporary domains.

Effectiveness of technology

With the many changing faces of literacy, it is most common to find that students are very familiar with technology. Students grow up in a multiliterate environment, consisting of reading, writing, listening, speaking and computing. Although education is currently standards driven, it is important that teachers make a concerted effort to find out what types of technology their students regularly and commonly interact with, have an understanding on how to integrate literacy into technology and how to incorporate technology into their classroom. With this knowledge, integration of familiar technologies can be implemented in the classroom to engage their learning and foster language learning as well.

Technology is by no means the most important means to produce speakers, but rather it gives students more authentic ways in which to communicate and interact using the language. Engaging in authentic communication in Hawaiian is key for successful language learning and through *Leokī* this has been made possible. *Leokī* has provided effective communicative interaction in both the written language through e-mail or chat and in the oral language via open discussions. These types of interactions have been found to be beneficial to language learners (Warschauer & Donaghy, 1997). When using technology in conjunction with language learning, the technology chosen should supplement the lesson and not be the lesson. There has always been a concern about how to integrate technology in a way that facilitates language learning beyond the word or phrase level. Therefore it is important to know what the technology is designed to do and know how to use it.

Availability, accessibility and limited funds

At one end of the continuum, technology can be beneficial; however at the other end, a problem with technology is that it has no potential of making an impact if the tools are not accessible or available due to limited funds. For communities who have limited funding, it is important to note that there are many freeware, free software programs that are available on the Internet for download. However, this does not eliminate concern regarding access.

Access to technology is limited to the school and/or community centers and at other times, the technology is too old or out of date. Continual maintenance and support by the Information Technology (IT) staff is necessary for upgrades, fixes and technical help. Although the digital divide between generations of Indigenous communities seems to be getting narrower, as well as between teachers and students, the effectiveness is only as good as its access and availability of computers and the Internet, knowledge, skills and attitudes crucial to make use of the technological resources, and the knowledge of the Native language (Eisenlohr, 2004).

Training

The effectiveness of the tool will depend greatly on the user's knowledge. For example, PowerPoint can be used in a variety of ways from a simple presentation, a storyboard for a multimedia project, a digital storybook, slideshow, or an interactive lesson. These are just a few ways that PowerPoint can be used. Depending on the goal, language learning via technology is possible beyond the word level if thought through. In PowerPoint, anyone can create an interactive multimedia lesson with hyperlinks to the Internet and within the file itself, audio as well as video files, pictures, graphics, Hawaiian text and more. Just with a little imagination and some time, these lessons can be created by students and redistributed through the school community for language learning. Creating such projects encourages self-reflection and self-assessment (Hartle-Schutte & Nae'ole-Wong, 1998), as well as provides opportunities for diverse learners to be creative, inventive, and successful.

Usability

For communities who use technology, it is important to consider usability and user friendliness. An outcome of finding technologies that will suit multiple generations is that a mentorship (probably the younger generation mentoring the older generation) of some kind will form. Oftentimes when using technology for the first time, it may feel very foreign. With time and use, comfortability should set in instead of frustration. If the latter occurs, only a small percentage will be inclined to use it. A tip to avoid this from happening is to download a trial version to get a feel of the program before paying full price for it.

Conclusion

There is a huge gap pertaining to technology and Indigenous language revitalization that needs attention. In order to indicate whether technology has an

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impact (positive or negative) on language learning, a research study, as well as a language assessment, must be conducted. The overall sense from the published articles on Indigenous languages suggests that there is a general “contentment” and satisfaction to what technology has provided. Yet there is no data that shows that the technology used in the classroom has affected language learning in any way. The literature does not reveal whether students are evaluated in content areas and skills or if the use of technology was assessed. A self-assessment would be a possible tool to evaluate growth and development of the language learner. Using self-assessment, students can track their own progress and become responsible for their learning and their potential. Overall, the critical assessment and in-depth study on the integration of technology and the Indigenous language should include at bare minimum the program used, the purpose of the tool, how the tool is actually being used, how the students are being assessed, what is being assessed, and overall effectiveness. In addition, it is important to note how the tool has made its way in to the classroom; was the technology integration initiated by the teacher, school board, student, IT director or was it a requirement from a higher administrator?

Since technology is so much a part of today’s culture, the future of Indigenous languages will depend partly on technology to engage students in learning. Recent publications have shown that communities are turning toward computer games and integrating language and culture material to engage Indigenous students to learn their language. It is known that when children play computer games, they are immersed in the environment. They figure out the rules on how to win the level and eventually the game without even opening the instruction manual. Students are unconsciously digesting, acquiring and integrating multiple literacies and what better ways to have students learn the language through a fun and painless process. This will become the wave of the future.

Students born in the 21st century are surrounded by a multitude of technology and cannot live without it: cell phones, the Internet, e-mail, blogs and iPods. They will no longer have textbooks to read and/or take home, but rather be directed to a computer that provides links to pertinent websites full of relevant information. Schools will turn into wireless laboratories, with information at their fingertips. However, instead of designating technology for certain projects, technology should be an integral part of the curriculum. The outcome: students will become multiliterate in their Native language and English, in addition to being literate in information and computer technology. “It’s like a double advantage for us, we’re learning how to use new tools, like new technology and new tools, at the same time we’re doing it in Hawaiian language, and so we get to learn two things at once. We learn new technology, and implementing it with the Hawaiian language, which I think is really, really good” (Hawaiian language student in Warschauer, 1998, p. 146).

Notes

¹The following terms: Native, Indigenous, and Aboriginal are used interchangeably. The aforementioned terms are defined as “being the first or earliest known

of its kind present in a region” (Merriam-Webster, 2005). Native American refers to three distinct groupings, which includes American Indian, Alaska Native and Native Hawaiian

²Native Hawaiian includes people who indicate their race as Native Hawaiian or who identify themselves as Part-Hawaiian or Hawaiian.

³*Ni‘ihau* is a privately owned island that was purchased by a Scottish family, Robinson’s, in 1863 (Oliver, 1961, p. 280). Residents of this island are the only one in the “world where Hawaiian is the first language and English is a foreign language” (Elbert, 1979, p. 23). *Ni‘ihau* residents are restricted and rarely allowed to be visited by outsiders, including family members. The Robinson family’s intention of creating this environment is to naturally maintain their Hawaiian language and culture.

⁴Chris Harvey of the Indigenous Language Institute, a non-profit organization based in Santa Fe, New Mexico and languagegeek.com creates customized keyboards for workshop participants so that typing of their Indigenous language no longer requires memorization of combination of key sequences. Harvey does an analysis of the language to determine the keyboard layout, ensuring ergonomic positioning. Figure 1 is an example of a customized keyboard layout for Hawaiian that was provided when I attended the “Ancient Voices-Modern Tools—Language and Tech Knowledge, Storytelling with Technology Publisher Workshop” at Pajoaque Pueblo, New Mexico in Fall 2005. Please note that this customized keyboard is not the layout used in the Hawaiian immersion schools.

Figure 1. Keyboard layout for Hawaiian (Harvey, 2005)

‘	1!	2@	3#	4\$	5%	6^	7&	8*	9(0)	-	=	Backspace	
Tab	q	w	e	r	t	y	u	i	o	p	[“] ”	\	
Caps	a	s	d	f	g	h	j	k	l	ō	’		Return	
Shift		z	x	c	v	b	n	m	,	<	.	>	/ ?	Shift
Control	Alt											Alt	Control	

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Notes

- All accents are typed before the base character: ē is typed **Semicolon** then **e**.
- To type the macron accent ̄ use the **Semicolon key** ;, ā is typed **a** then **Semicolon**.
- All changed keys can type their original value by holding down the **Right-Alt** or **Option** key. The **Semicolon** ; is typed **Right-Alt+Semicolon** (Windows) **Option+Semicolon** (Mac).
- Opening and closing quotes. For Mac users, **Right-Alt** is either of the **Option** Keys.
 - ▷ single: ‘ Grave* — ’ Apostrophe
 - ▷ double: “ Shift+Left Bracket — ” Shift+Right Bracket
 - ▷ single ‹ Right-Alt+Shift+9 — › Right-Alt+Shift+0
 - ▷ double ‹‹ Right-Alt+9 — ›› Right-Alt+0

* The opening quote character ‘ is, in Hawai‘ian, a letter of the alphabet, the ‘*okina*. For this reason, punctuation ‘single quotes’ should not be used in this language. “Double quotes” might also lead to confusion. It is suggested that different quotation punctuation be used.

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