

RESPECTING THE TERRITORY: SELF- DETERMINED AND RELATIONAL TECHNOLOGY IN INDIGENOUS LANGUAGE REVITALIZATION

PAUL J. MEIGHAN

Abstract: One common goal for Indigenous language revitalization (ILR) initiatives is to promote intergenerational language transmission and use at home. Could technology assist in ILR? This paper will illustrate and give examples of how technology in relation, or relational technology, can facilitate formal, informal, and self-directed/determined forms of language learning and knowledge transmission (e.g., community-led apps, websites, and social media). These “transnational” forms can (1) assert nondominant heritage/ Indigenous voices, creations, maps, and “right[s] to speak” (Darwin & Norton, 2014) across nation-state boundaries, and (2) acknowledge the central role of local territory, community, and the land/environment (e.g., the Indigenous Knowledge Social Network [SIKU] app).

Pòl Miadhachàin (Paul J. Meighan), M.A., Trinity Western University, is a Gàidheal (Scottish Gael) born and raised in Glasgow, Scotland. He is a Ph.D. Candidate (Educational Studies) at McGill University, Canada, recipient of the AAAL 2021 GSA Multilingual Matters Award, and corecipient of the TIRF 2021 DDG Russell N. Campbell Award. His current research focuses on relationships among Indigenous language revitalization, traditional ecological knowledge, and technology.

Parts of this paper have been published in *AlterNative: An International Journal of Indigenous Peoples* (2021), 17(3), 397–405 under Creative Commons Attribution license (CC BY 4.0).

A map is not the territory it represents, but, if correct, it has a similar structure to the territory, which accounts for its usefulness.

—Alfred Korzybski, *Science and Sanity*, 1933, p. 58.

Introduction

Technology is not neutral; it is an extension of a knowledge system. Technology reflects our frames of reference, the maps of the territories we orient ourselves by, and mediates our experiences, behaviors, and practices. A fundamental starting point in discussing the role of technology in endangered and Indigenous language revitalization is identifying to what extent the knowledge system, or “map” in question, relates to the “territory” (Hayakawa, 1952; Korzybski, 1933), and whether the *relationship* with technology (or lack, thereof) perpetuates social inequities, linguistic/cognitive imperialism (Battiste, 2002), and White (epistemological) supremacy (Minde, 2003).

Due to colonization, imperialism, and globalization predominantly characterized by a binary, Western (Cartesian–Newtonian) worldview (or map), Indigenous languages, and cultures continue to be threatened and endangered (Chiblow & Meighan, 2021), both in physical and digital environments (or territories). A Western-dominated digital landscape can perpetuate a monocultural, monolingual universality; a flawed orientation or relationship to territories colonized extensionally; an internalized deficit ideology (Phyak, 2021), and (epistemological) racisms (Kubota, 2020). As Bateson (1972) notes, “we are most of us governed by epistemologies that we know to be wrong” (p. 485) and “the creature that wins against its environment destroys itself” (p. 493). As a consequence of “wrong epistemologies” or the “epistemological error” in dominant Western thought and, by extension, colonization, language can be viewed as a commodity and be decontextualized and disembodied from the land, community, or local territory (Meighan, 2021a). Language policy, planning, and legislation, which follow external to territory “standards” (e.g., proficient and appropriate Indigenous language speakers not granted “accreditation” by colonial institutions) or Western pedagogies (e.g., language as decontextualized or disembodied in grammar or comprehension activities) may not meet the maps, or sociocultural needs, of the local community.

What Is Technology and What Is Its Role in ILR?

Technology is much more than machines. Technology is the result of practical applied knowledge, skills, and networks that are continually evolving, fluid and context-dependent (Silverstone, 2005). In other words, technology is not neutral and is the extension of the knowledge and belief system, which

has led to its creation (Strate, 2012). Examples of technology include writing systems, the pencil, the wampum belt, mass media, television, and more recently, online and digital technologies, such as the Internet and cellphones.

A fundamental issue that needs to be taken into consideration when discussing the role of technology in ILR is identifying which or whose knowledge system is being enacted. Who created the website? What is its purpose? How is data being shared or stored online? These questions and concerns are particularly crucial when it comes to discussing Indigenous languages and cultures which have been disprivileged and disenfranchised by imperialistic, capitalistic, and colonial knowledge systems (Battiste, 2002). Pool (2016) underscores that, “for their colonising mission, imperialists imported data methodologies, smugly assuming that epistemologies other than Euro-North American ones were inferior. This view still haunts the wider society’s acceptance of information systems now being generated by Indigenous scholars” (p. 62).

I would like to stress here that this paper does not intend to position the role of technology as a substitute for real-life face-to-face interaction, or a panacea for ILR, but rather an addition to existing initiatives, a means to reclaim pride, elevate prestige in Indigenous languages and cultures, foster community capacity building and healing, and a way for existing speakers and learners to interact. This paper will highlight to what extent, and under which context(s) technology supports and has supported ILR, and what implications this process has for “mapping and/or understanding the territory” in a more relational, useful, and respectful way.

Technology Use through Time: Types, Stages, and Applications

Technology has been present for thousands of years, from power technology, such as the use of fire during the Old Stone Age, all the way through to our current day use of cellphones and social media. Tuuri and Koskela (2020) remark, “technology has been an integral part of the development of humanity for so long and in so fundamental a way that it is difficult to conceive of a world, and humanity, without technology. Technology (or technics) thus constitutes essential characteristics of humans” (p. 2). Throughout time, technology has evolved through varying stages, which have been summarized nonexhaustively in Table 1. The purpose of the table is to identify technological and relational trends in the past, present, and future and to highlight the rapid development of digital and online technologies over the past three decades to this day.

Technology has been grouped into six types, which have been listed in approximate chronological stages with examples in Table 1: (1) Facilitation technologies; (2) Communication technologies; (3) Web 1.0 Digital and online

Table 1. Types, stages, and evolution of technology use (from Meighan, 2021b).

Types and stages of technology	Examples	Relationship	Evolution
(1) Facilitation technologies	Crockery, pots, guns, agricultural machinery and tools	Individual and/or group → local environment	<i>Facilitation</i>
(2) Communication technologies	Writing systems (e.g., pictographs), writing implements, mass media (e.g., television), telephone, typewriter, and computer	Individual, group and/or state → (mass) audience	<i>Communication</i>
(3) Web 1.0 Digital and online technologies (~1990–2005)	Digital cellphone, multimedia (e.g., DVD, CD-ROM)	State and/or group → mass audience	<i>Digital Information</i>
(4) Web 2.0 Digital and online technologies (~2005–2015)	Social media, smartphones, video games, the Cloud, broadband	State and/or group ↔ mass audience; Peer-to-peer (P2P)	<i>Digital Negotiation</i>
(5) Web 3.0 Digital and online technologies (~2015–the present)	Augmented reality (AR), virtual reality (VR), blockchain	P2P; Peer ↔ mass audience	<i>Digital Creation</i>
(6) Semantic technologies: (The future)	Internet reality, artificial intelligence (AI), 3D/4D avatars	Technology ↔ human audience ↔ environment	<i>Digital Simulation</i>

technologies (~1990–2005); (4) Web 2.0 Digital and online technologies (~2005–2015); (5) Web 3.0 Digital and online technologies (~2015–present); and (6) Semantic technologies.

These categorizations are not indicative of all technological developments and are not neat or concrete historical or chronological boundaries. Instead, they serve as a basis to exemplify how technology has been viewed and utilized in dominant Western ideals of technological progress. Underscoring the dominant Western, binary (or two-valued) worldview is particularly important here as the World Wide Web was created by Western people for a Western audience. For example, Tim Berners-Lee, the inventor of the World Wide Web, envisaged “universality” and “dictated the monolingual [English] design of the web” (Kelly-Holmes, 2019, p. 28). The Web, however, is not monolithic or linear in terms of development and is still evolving.

The notions of Web 1.0, 2.0, and 3.0 used here, “although important when analysing the political economy of the Web” have limitations and are cultural constructs influenced by Western business rhetoric. They often carry “generalized understandings about the social uses of technology” (Barassi & Treré, 2012, p. 1281).

Table 1 also illustrates the relationship of technology between humans and interactants and the sociotechnological evolution from *Facilitation, Communication, Digital Information, Digital Negotiation, Digital Creation, to Digital Simulation*. The relationship and evolution of technology is crucial to undertake a more holistic and nuanced assessment of technology’s social impact on ILR and better understand who is enacting technology and for whom. The continually evolving Internet, or Web, is a complex sociotechnical environment with multiple uses dependent on social contexts and relationships (Barassi & Treré, 2012).

This paper will focus on the role of digital and online technologies in ILR during the Web 1.0, 2.0, and 3.0 eras. The purpose is to track what developments there have been in technology’s social role, what these trends signify for a decolonized, more than Western, digital landscape, territory, and future.

Digital and Online Technology Use in ILR Initiatives

Technology Use in the Web 1.0 Period (~1990–2005)

During the Web 1.0 era, there were several examples of ILR initiatives that used the affordances of the new World Wide Web and digital technologies, such as the desktop computer and the CD-ROM. One of the first ILR initiatives to utilize the potential of the World Wide Web and Communication Technologies was Te Wahapu (The Estuary). Te Wahapu was a computer-based communications system created in 1990, focused on the revitalization of the Maori language in New Zealand to “symbolize the integration of high technology with Maori concerns and interests . . . [and] convey the message that ‘English has no monopoly when it comes to making use of advanced technology’” (Benton, 1996, p. 189). Another example is Leoki (Powerful Voice), an electronic bulletin board system established in 1993 and delivered entirely in the Hawaiian Indigenous language (Warschauer, 1998). Leoki provided “online support for Hawaiian language use in the immersion schools and the broader community” (Warschauer, 1998, p. 142). Leoki facilitated the creation of materials that were both culturally responsive and in the language.

Revitalization and reclamation strategies during the Web 1.0 era have involved creating spoken and written dictionaries and audio- or video-recording

Elders speaking their Indigenous language. The web-based resource FirstVoices, founded in British Columbia, is an example of how technology has been utilized by First Nations' communities in Canada to document, archive, and learn Indigenous languages using text, sound, and video clips. Interactive CD-ROMs and other types of multimedia have also been used for ILR during the Web 1.0 era. In Alaska, the Lower Kuskokwim School District produced a bilingual CD-ROM in English and Yup'ik, a central Alaskan language, for the traditional story *How the Crane got Blue Eyes* (Cazden, 2002). Other examples of multimedia ILR initiatives from across the globe include a modern-day television soap opera in Scottish Gaelic (Cormack, 1994) and a CD-ROM for adolescents about ice hockey in Ojibwe (Williams, 2002).

Key Takeaways and Insights on the Role of Technology in the Web 1.0 Era

ILR initiatives have been fundamental for making Indigenous voices heard and represented across the globe during the beginnings of the digital age. However, as Table 1 illustrates, this era was characterized by the evolution of a largely unilateral transfer of Digital Information. Information pertaining to Indigenous languages, cultures, or communities was placed on the Internet by a group, community, or state, without the broader input of those who were using the materials.

Despite many Web 1.0 initiatives being coined interactive, such as the ability to listen, view, or click on materials, there was a lack of cocreation of knowledge or user input on material development. The majority of initiatives were examples of low-tech (Galla, 2009) projects based on one sensory mode: in this case, output over input. Looking in more detail at who creates endangered language websites and the level of knowledge cocreation, Buszard-Welcher (2001) finds that 38% of the 50 sites on "Native American or Canadian" Indigenous languages belonged to groups and only four of those were created by a "Tribal" member or official organization (p. 332). Some of the CD-ROMs lacked cultural context, such as in the case of the Yup'ik language and culture (Cazden, 2002). For instance, Indigenous words were placed on the CD-ROM without a literal or faithful translation (or map of the territory), which could transmit valuable and useful knowledge about the origins of a word or phrase and the local ecosystem. Leonard (2001) gives an example of Vichingadh Ethog (Yellow Pond Lily) in Deg Xinag, an Alaskan language. A more faithful translation, or map, would be "Muskrat's Plate" (Leonard, 2001, p. 4). Leonard remarks, "For a beginning language learner, literal translations provide a great deal of fascinating cultural information and further impetus for investigation into one's own culture" (p. 4).

The cost of developing and creating materials and software, filming, recording, and purchasing hardware, such as desktops and other multimedia tools, were very costly and involved considerable amounts of time. Access to the newly created Internet and hardware or software was limited to certain areas or people who had the ability to connect and also afford the costs of being online.

Technology in the Web 1.0 era did offer much potential for ILR and had an additional “cool” element (Buszard-Welcher, 2001, p. 337). This element can appeal particularly to the younger Indigenous generation and help restore prestige and pride in Indigenous languages and cultures (Buszard-Welcher, 2001). Technology, despite not yet being fully dialogic in terms of cocreation of knowledge, was a means of interaction among language activists. Email lists and the like enabled platforms for sharing Indigenous innovations, aspirations, and concerns across different website groups (Grenoble & Whaley, 2006). Technology connected language activists both within, across, and outside of Indigenous communities, fostered relationships across the globe, and was a crucial “key motivator in the sense they are ‘not going it alone’” (Grenoble & Whaley, 2006, p. 190).

Technology Use in the Web 2.0 and Web 3.0 Eras (~2005–the Present)

ILR initiatives have built upon the strategies incorporated during the Web 1.0 era and taken advantage of new advances in digital and online technologies during the Web 2.0 and Web 3.0 eras. In dominant Western business rhetoric, Web 2.0 era is characterized by increased user participation or collaboration (Barassi & Tréré, 2012). Examples of Web 2.0 digital and online technologies are faster broadband Internet speeds; P2P sharing and creation, such as Wikipedia; social media, such as Facebook, YouTube, and Twitter; and the smartphone (see Table 1). The emerging Web 3.0 era is viewed as having increased user creation, cooperation (Barassi & Tréré, 2012), and a decentralization, localization, and democratization of power. Examples of Web 3.0 technologies include blockchain distributed ledger technology, geolocation, and augmented reality (AR) or virtual reality (VR).

The Web 2.0 and 3.0 periods will be discussed together. Forms of technology use between 2005 and the present day have involved cross-over elements and interplay, which are still emerging, can be categorized as both Web 2.0 and Web 3.0, and do not neatly fit a chronological timeframe. As Barassi and Tréré (2012) remark, “the Web needs to be understood as an integrated sociotechnical system, in which different Web applications and stages coexist” (p. 1273).

The main feature of the Web 2.0 and 3.0 eras for ILR is the movement beyond *Digital Information* to *Digital Negotiation* and *Digital Creation*. ILR initiatives have more widely implemented digital technologies with the view of enabling Indigenous language speakers and learners, in both remote and urban areas, to access informal, formal, and self-directed language and cultural learning opportunities. These include using the Internet and web-based resources to share land-based planning activities, such as information about hunting, fishing, and other traditional economic activities. For example, SIKU (Sea Ice) is an Inuit Knowledge Wiki and Social Mapping Platform app which shares traditional knowledge information and satellite imagery to Inuit communities (Heath & Arragutainaq, 2019). These initiatives can “connect youth and Elders to help promote intergenerational knowledge transmission . . . all the while encouraging language revitalization” (Winter & Boudreau, 2018, p. 45).

Digital and online spaces for learning and implementing Indigenous languages have also begun to move beyond viewing or clicking on materials to enabling more opportunities for more collaborative and multimodal interaction, negotiation, and creation. For example, the use of keyboard, audio, video, screen, and image. The Passamquoddy-Maliseet Language Portal (www.pmpportal.org) is an example of a web collection of language documentation materials that contains short videos of conversations and interactions among fluent Passamaquoddy-Maliseet speakers. Nishnaabemdaa is an instructional app, created by Anishinaabek Language Commissioner and Elder Barbara Nolan (www.barbaranolan.com) in collaboration with Ogoki Learning Systems, to help users of all ages learn common words and phrases in the Nishnaabemwin (Ojibwe) language. Talk Sauk (www.talksauk.com) is a collaborative website, created by the Sauk language department in collaboration with Elders, which has an interactive dictionary, games, videos, and more. These initiatives are low-tech (one sensory mode), midtech (two sensory modes), and high-tech (multimodal interactive technology) (Galla, 2009), depending on community needs and the learning context.

Indigenous Internet Creators Decolonizing the Digital Landscape

In the Web 2.0 and Web 3.0 eras, Indigenous communities have gone beyond being recipients of information or collaborators to also being Internet “Producers” (Kelly-Holmes, 2019) and creators. They have had more control and self-determination over the content produced and created. This self-determining creation step is necessary to decolonize the digital landscape, territories, and ensure that Indigenous voices and worldviews (maps) are also

represented and privileged online in a culturally relevant way. Movie, video, and song projects have been and are being developed by Indigenous Peoples with a focus on Indigenous languages and cultures. Movies have been made in Indigenous languages which are critically endangered, such as the film *SGaawaay K'uuna* (*The Edge of the Knife*) released in 2018 and made entirely in the Haida language. And Jeremy Dutcher, the 2018 Polaris Music Prize winner, released the album *Wolastoqiyik Lintuwakonawa* (*Our Maliseets Songs*) in which Jeremy sings in the Wolastoqiyik language. Video games are also providing a rich medium that reflects traditions of oral storytelling with different strategies for language and cultural preservation and revitalization (Lameman & Lewis, 2011). The *Never Alone* game was developed by the first Indigenous-owned gaming company, Upper One Games, in collaboration with the Iñupiat, an Alaska native people (Winter & Boudreau, 2018). *Honour Water* is a singing game and features Anishinaabe songs and teachings about the importance of protecting water (Hearne & LaPensée, 2017).

Indigenous social media use has become more influential and visible during the Web 2.0 and Web 3.0 eras. Although social media can have drawbacks and very real negatives, such as cyber bullying and cyber racism, platforms, such as Facebook, Twitter, and YouTube have assisted ILR and Indigenous communities in sharing community and cultural knowledge, events, memes, and snippets of language. Sharing stories or videos online as part of Facebook groups, Instagram or Twitter posts, or on YouTube and TikTok enables Indigenous young people to be their Indigenous identities. Indigenous youth can connect, affirm and give a voice to their own particular cultural and linguistic identities which have not been constructed, imagined, or set by outsiders (Katsi'sorókwas Jacobs, 2019). Indigenous coders and coding initiatives have become more prominent. The Pinnuaq Association piloted a coding workshop, where Inuit children created their own sites and content. Virtual Songlines in Australia taught Indigenous youth to code their own content and be proud of their culture and heritage. Coders North in Northern Ontario also launched in 2019 to bring together Indigenous digital producers, teach coding and highlight opportunities for Indigenous youth to learn through digital technology. More Indigenous-led and -guided digital archives and content management systems (CMS) are emerging as a response to colonizing effects of exclusion, discrimination, and annihilation of Indigenous knowledge, People, and life ways (O'Neal, 2014). For example, FirstVoices hosts Indigenous public and private community sites for language archiving, where the Indigenous community members retain ownership of any content they create.

Indigenous scholars, creators, and visionaries are also making an impact in emerging AI, AR, and VR technologies. Aboriginal Territories in Cyberspace (www.abtec.org) and the Initiative for Indigenous Futures (www.indigenousfutures.net) are Indigenous-determined research networks at Concordia University, Montréal, who are consolidating Indigenous presence in virtual worlds. Ogoki Learning develops immersive Indigenous language learning apps using VR (www.ogokilearning.com). Te Hiku Media, created from Indigenous language data and following cultural protocols, is able to deploy the “first speech-to-text algorithm in Te Reo Māori” (Lewis, 2020, p. 162). And Hua Ki’i is an AR prototype of an “Indigenous language image recognition app with geolocation functionalities [which] allows the user to take a photo of an object and learn the word for that object” (Running Wolf et al., 2020, p. 110).

Key Takeaways and Insights on the Role of Decolonizing Technology from the Present-Day Web 2.0 and Web 3.0 Eras

Digital and online technologies in the Web 2.0 and 3.0 eras are dramatically more inexpensive than in the Web 1.0 era and barriers to entry have been considerably reduced. The digital divide, despite still needing improvements in terms of physical and nonphysical access and equitable representation, begins to narrow as most Indigenous Peoples, even in remote areas, now have access to a cellphone and use it to interact and communicate (Carpenter et al., 2017). Cellphones can record, film, and connect to the Internet. Indigenous Peoples no longer need to rely on governmental or external funding to start projects as many ILR initiatives can be started from the home community. For example, the AR prototype Hua Ki’i “currently has a modest feature set but 10 years ago the technologies that enable it were unattainable beyond wellfunded labs” (Running Wolf, 2020, p. 120).

The digital landscape continues to be decolonized and represent “a similar structure to the territory, which accounts for its usefulness” (Korzybski, 1933, p. 58). There are now more Indigenous technologies, learning environments that have been implemented and created by and for Indigenous Peoples. For example, Indigenous sites, software developers, coders, Indigenous AI, AR, and VR. The Internet and digital technologies can foster a transnational space where colonial nation-state binaries and linguistic boundaries are dissolved (Darwin & Norton, 2014). Indigenous Peoples can assert their “right to speak” (Darwin & Norton, 2014, p. 59) in their Indigenous languages and in a way that is respectful to their local communities and territories.

Indigenous creators and technologists are counteracting negative and Western or colonial imposed stereotypes, or maps, which view Indigenous Peoples as being confined to a very specific place, time, and territory (Winter & Boudreau, 2018). Stereotypes like this perpetuate a museological context (Castleton, 2018); broadstroke Indigenous Peoples into false dichotomies, such as traditional as opposed to modern; and facilitate a colonial and imperialistic exploitation and conquest of the digital world. Indigenous Peoples decolonizing the digital landscape are breaking habits of algorithmic, linguistic, and technological colonization (Bird, 2020).

More research needs to be carried out by or with Indigenous Peoples on how they view and use technology, what purpose this serves or has served, and whether or not these impacts on day-to-day language usage and promotion of cultural identity, on mapping in relation to territory. Technology use that is responsive to local, preexisting maps and the Indigenous community/territory can foster more ethical relationships and “relational language technologies” (Taylor et al., 2019) going forward.

Conclusion

The role of technology in ILR has grown and evolved in a short space of time from being an extension of dominant Western hegemonies (Kelly-Holmes, 2019) to one in which Indigenous Peoples have an active and important voice in how their maps for technology are used, envisioned, and created for online and digital territories.

Big questions regarding data sovereignty, for example, will always have to be asked before simply copy-pasting technology into ILR initiatives. Which system of knowledge is privileged? Where is the information or knowledge stored? Who has the power to access the knowledge and create streams of knowledge transmission? As illustrated in this nonexhaustive article, “Indigenous communities have long been engaged in the process of ensuring that technology platforms reflect and respond to their traditional ways, cultures and languages” (Carpenter et al., 2017, p. 10). This process continues to this day with Indigenous social media, websites, movies, music, apps, and more.

There are Indigenous Peoples working to ensure that the rapidly evolving future of AI has an ethical foundation rooted in and reflective of Indigenous worldviews and languages (Lewis, 2020). The social use of technology in ILR is also not necessarily considered a substitute to real-life face-to-face interaction or as a panacea for ILR. Technology can be in relation to existing and future initiatives, a means to reclaim pride in Indigenous languages and cultures, and a way for existing and future speakers and learners to learn and interact.

As with face-to-face interactions, the intent and relationship that one forms and builds with technology will decide what impact its present and future use will have. Warschauer (1998) remarked, “Can Indigenous peoples appropriate new network technologies for their own purposes, or in attempting to do so will they see their own cultures and languages swallowed up in a homogenous whole?” (pp. 139–140). More than 20 years and several stages of digital and online technologies later, some may ask the same question. The answer lies in no longer viewing culture or language as a static, decontextualized, or monolithic entity; no longer measuring Indigenous Peoples or languages against colonial yardsticks; and Indigenous Peoples having complete self-determination over the mapping, use, negotiation, implementation, and creation of technology in relation to territory. This self-determination also means that Indigenous communities can choose to engage “outside experts” in ILR projects based on their terms and needs (Bird, 2020, p. 3507).

This paper demonstrates that there are very promising indicators of Indigenous sociotechnological self-determination in mapping in relation to territory. Indigenous content creators, developers, and visionaries are becoming increasingly visible and influential in decolonizing the digital landscape to better serve Indigenous Peoples, their languages, and their communities.

References

- Barassi, V., & Treré, E. (2012). Does Web 3.0 come after Web 2.0? Deconstructing theoretical assumptions through practice. *New Media & Society*, 14(8), 1269–1285. <https://doi.org/10.1177/1461444812445878>
- Bateson, G. (1972). *Steps to an ecology of mind*. Ballantine Books.
- Battiste, M. (2002). *Indigenous knowledge and pedagogy in first nations education: A literature review with recommendations*. National Working Group on Education and the Minister of Indian Affairs Indian and Northern Affairs Canada (INAC).
- Benton, R. A. (1996). Making the medium the message: Using an electronic bulletin board system for promoting and revitalizing Maori. In M. Warshauer (Ed.), *Telecollaboration in foreign language learning* (pp. 187–285). Brill.
- Bird, S. (2020). *Decolonising speech and language technology*. Proceedings of the 28th International Conference on Computational Linguistics (pp. 3504–3519).
- Buszard-Welcher, L. (2001). Can the web save my language? In L. Hinton & K. Hale (Eds.), *The green book of language revitalization in practice* (pp. 331–345). Brill.
- Carpenter, J., Guerin, A., Kaczmarek, M., Lawson, G., Lawson, K., Nathan, L. P., & Turin, M. (2017, May). *Digital access for language and culture in first nations communities*. Heiltsuk Arts UBC.
- Castleton, A. (2018). Technology and Inuit identity: Facebook use by Inuit youth. *AlterNative: An International Journal of Indigenous Peoples*, 14(3), 228–236. <https://doi.org/10.1177/1177180118782993>

- Cazden, C. B. (2002). Sustaining Indigenous languages in cyberspace. In J. Reyhner, O. Trujillo, R. L. Carrasco, & L. Lockard (Eds.), *Nurturing Native languages* (pp. 53–57). Northern Arizona University.
- Chiblow, S., & Meighan, P. J. (2021). Language is land, land is language: The importance of Indigenous languages. *Human Geography*, 15(2), 206–210. <https://doi.org/10.1177/19427786211022899>
- Cormack, M. (1994). Programming for cultural defence: The expansion of Gaelic television. *Scottish Affairs*, 6, 114–131.
- Darwin, R., & Norton, B. (2014). Transnational identity and migrant language learners: The promise of digital storytelling. *Education Matters: The Journal of Teaching and Learning*, 2(1), 55–66.
- Hayakawa, S. I. (1952). *Language in thought and action* (1st ed.). George Allen & Unwin.
- Galla, C. (2009). Indigenous language revitalization and technology from traditional to contemporary domains. In J. Reyhner & L. Lockard (Eds.), *Indigenous language Meighan 405 revitalization: Encouragement, guidance & lessons learned* (pp. 167–182). Northern Arizona University.
- Grenoble, L. A., & Whaley, L. J. (2006). *Saving languages: An introduction to language revitalization*. Cambridge University Press.
- Hearne, J., & LaPensée, E. (2017). “We all stand side by side”: An interview with Elizabeth LaPensée. *Studies in American Indian Literatures*, 29(1), 27–37.
- Heath, J., & Arragutainaq, L. (2019, January–March). Siku: Mixing high-tech with ancient know-how. *The UNESCO Courier*, 2019(1), 20–23. https://en.unesco.org/sites/default/files/cou_1_19_en.pdf
- Katsi'sorókwias Jacobs, C. (2019). Two-row wampum reimagined: Understanding the hybrid digital lives of contemporary Kanien'kehá:ka youth. *Studies in Social Justice*, 13(1), 59–72.
- Kelly-Holmes, H. (2019). Multilingualism and technology: A review of developments in digital communication from monolingualism to idiolingualism. *Annual Review of Applied Linguistics*, 39, 24–39. <https://doi.org/10.1017/S0267190519000102>
- Korzybski, A. (1933). *Science and sanity: An introduction to non-Aristotelian systems and general semantics* (1st ed.). Institute of General Semantics.
- Kubota, R. (2020). Confronting epistemological racism, Decolonizing scholarly knowledge: Race and gender in applied linguistics. *Applied Linguistics*, 41(5), 712–732. <https://doi.org/10.1093/applin/amz033>
- Lameman, B. A., & Lewis, J. E. (2011). Skins: Designing games with first nations youth. *Journal of Game Design and Development Education*, 1, 54–63.
- Leonard, B. (2001). Documenting Indigenous knowledge and languages: Research planning and protocol. *Sharing Our Pathways: A Newsletter of the Alaska Rural Systemic Initiative*, 65(5), 11–15.
- Lewis, J. E. (Ed.). (2020). Indigenous protocol and artificial intelligence position paper. *CIFAR*.
- Meighan, P. J. (2021a). Decolonizing English: A proposal for implementing alternative ways of knowing and being in education. *Diaspora, Indigenous, and Minority Education*, 15(2), 77–83. <https://doi.org/10.1080/15595692.2020.1783228>

- Meighan, P. J. (2021b). Decolonizing the digital landscape: The role of technology in Indigenous language revitalization. *AlterNative: An International Journal of Indigenous Peoples*, 17(3), 397–405. <https://doi.org/10.1177/11771801211037672>
- Minde, H. (2003). Assimilation of the Sami—Implementation and consequences¹. *Acta Borealia*, 20(2), 121–146. <https://doi.org/10.1080/08003830310002877>
- O’Neal, J. (2014). Respect, recognition, and reciprocity: The protocols for Native American archival materials. In D. Daniel & A. Levi (Eds.), *Identity palimpsests: Archiving ethnicity in the U.S. and Canada* (pp. 125–142). Litwin.
- Phyak, P. (2021). Epistemicide, deficit language ideology, and (de)coloniality in language education policy. *International Journal of the Sociology of Language*, 2021(267–268), 219–233. <https://doi.org/10.1515/ijsl-2020-0104>
- Pool, I. (2016). Colonialism’s and postcolonialism’s fellow traveller: The collection, use and misuse of data on indigenous people. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda*. Australian National University Press.
- Running Wolf, C., Running Wolf, M., Moses, C., & Davison, J. (2020). Development process for Hua Ki’i and next steps. In J. E. Lewis (Ed.), *Indigenous protocol and artificial intelligence position paper* (pp. 110–117). CIFAR.
- Running Wolf, M. (2020). Dreams of Kuano’o. In J. E. Lewis (Ed.), *Indigenous protocol and artificial intelligence position paper* (pp. 117–125). CIFAR.
- Silverstone, R. (2005). The sociology of mediation and communication. In C. Calhoun, C. Rojeck, C., & B. Turner (Eds.), *The SAGE handbook of sociology* (pp. 188–207). Sage Publications. <https://doi.org/10.4135/9781848608115.n11>
- Strate, L. (2012). If it’s neutral, it’s not technology. *Educational Technology*, 52(1), 6–9.
- Taylor, J. L., Council, W. W. A. S., Soro, A., Roe, P., & Brereton, M. (2019). *A relational approach to designing social technologies that foster use of the Kuku Yalanji Language*. Proceedings of the 31st Australian Conference on Human-Computer-Interaction. Freemantle, Australia (pp. 161–172). <https://doi.org/10.1145/3369457.3369471>
- Tuuri, K., & Koskela, O. (2020). Understanding human-technology relations within technologization and appification of musicality. *Frontiers in Psychology*, 11, 416. <https://doi.org/10.3389/fpsyg.2020.00416>
- Warschauer, M. (1998). Technology and indigenous language revitalization: Analyzing the experience of Hawai’i. *The Canadian Modern Language Review*, 55(1), 139–159. <https://doi.org/10.3138/cmlr.55.1.139>
- Williams, S. (2002). Ojibway hockey CD ROM in the making. In B. Bumaby & J. Reyhner (Eds.), *Indigenous languages across the community* (pp. 219–223). North Arizona University.
- Winter, J., & Boudreau, J. (2018). Supporting self-determined Indigenous innovations: Rethinking the digital divide in Canada. *Technology Innovation Management Review*, 8(2), 38–49.

Copyright of ETC: A Review of General Semantics is the property of Institute of General Semantics, Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.