

ARCTIC

VOL. 73, NO. 1 (MARCH 2020) P. 81–98

<https://doi.org/10.14430/arctic70000>

What is Effective Research Communication? Towards Cooperative Inquiry with Nunavut Communities

Dominique A. Henri,¹ Nicolas D. Brunet,² Hillary E. Dort,² Helen Hambly Odame,² Jamal Shirley,³
and H. Grant Gilchrist⁴

(Received 12 April 2019; accepted in revised form 11 October 2019)

ABSTRACT. Communication is recognized as the foundation of developing partnerships in science. In this study, we assess the effectiveness of several communication processes, practices, and tools used by wildlife researchers in northern communities in Arctic Canada. A case study was conducted in the communities of Cape Dorset and Coral Harbour (Salliq), Nunavut, Canada, to assess the effectiveness of research communication approaches carried out by the northern marine bird research group of Environment and Climate Change Canada, which has a long-standing research relationship with these two communities. Our objectives were to 1) explore local experiences with research—marine bird research in particular, 2) examine what communication approaches and tools Nunavummiut viewed as most effective for learning about research activities and feeling engaged in the process, and 3) identify new and emerging communication needs in Nunavut communities to support more effective research partnerships. Our findings indicate that several communication methods used by wildlife researchers, such as community meetings, have become less effective because of changing information-sharing practices at the community level. Other communication practices, such as using social media, hold much promise, but as of yet are underutilized by researchers, though of interest to northern communities. Acknowledging that every northern community is unique, with context-specific priorities, capacities, and needs, effective research partnerships should be built upon communication approaches that foster cooperative inquiry and learning. In progress towards this goal, we explore two emerging and related themes: first, access to information and communication technologies in the two communities, and second, the engagement of youth in Arctic research communication and delivery.

Key words: research; communication; Inuit; marine birds; youth; Internet; Nunavut

RÉSUMÉ. La communication est reconnue comme le fondement de la formation de partenariats en science. Dans le cadre de cette étude, nous évaluons l'efficacité de plusieurs processus, méthodes et outils de communication employés par les chercheurs de la faune dans des collectivités nordiques de l'Arctique canadien. Une étude de cas a été réalisée dans les collectivités de Cape Dorset et de Coral Harbour (Salliq), au Nunavut, Canada, afin d'évaluer l'efficacité des approches de communication en matière de recherches mises en œuvre par le groupe de recherche des oiseaux aquatiques du Nord relevant d'Environnement et Changement climatique Canada, qui effectue des recherches depuis plusieurs années dans ces deux collectivités. Nos objectifs étaient les suivants : 1) explorer les expériences locales en matière de recherche, plus particulièrement en ce qui a trait aux recherches sur les oiseaux aquatiques; 2) examiner quelles approches de communication et quels outils les Nunavummiuts considèrent comme les plus efficaces pour se familiariser avec les activités de recherche et pour se sentir engagés dans le processus; et 3) déterminer les besoins en communication nouveaux et émergents des collectivités du Nunavut afin de donner lieu à des partenariats de recherche plus efficaces. Selon nos constatations, plusieurs méthodes de communication employées par les chercheurs de la faune, comme les rencontres communautaires, ont perdu de leur efficacité en raison de l'évolution des pratiques de partage de l'information à l'échelle communautaire. D'autres méthodes de communication, comme les médias sociaux, s'avèrent prometteuses, mais les chercheurs ne s'en servent pas encore beaucoup même si elles revêtent de l'intérêt au sein des collectivités du Nord. Reconnaisant le caractère unique des collectivités nordiques, qui ont des priorités, des capacités et des besoins propres à leur contexte, la réalisation de partenariats de recherche efficaces doit se fonder sur des approches de communication favorisant l'apprentissage en collaboration. Dans l'optique de cet objectif, nous explorons deux thèmes

¹ Environment and Climate Change Canada, 105 McGill Street, 7th floor, Montréal, Québec H2Y 2E7, Canada; dominique.henri@canada.ca

² School of Environmental Design and Rural Development, University of Guelph, 50 Stone Rd. East, Guelph, Ontario N1G 2W1, Canada

³ Nunavut Innovation and Research Institute, Nunavut Arctic College, PO Box 1720, Iqaluit, Nunavut X0A 0H0, Canada

⁴ Environment and Climate Change Canada, 1125 Colonel By Drive, Raven Road, Carleton University, Ottawa, Ontario K1A 0H3, Canada

émergents et connexes : premièrement, l'accès aux technologies de l'information et de la communication des deux collectivités, et deuxièmement, l'engagement des jeunes en matière de communication et de réalisation des recherches dans l'Arctique.

Mots clés : recherche; communication; Inuit; oiseaux aquatiques; jeunes; Internet; Nunavut

Traduit pour la revue *Arctic* par Nicole Giguère.

INTRODUCTION

In Arctic research, competent interpersonal and group communication is recognized as the foundation of strong community-researcher partnerships (Brunet et al., 2014a; Timm et al., 2016; Arctic Council, 2017). Communication fosters trust and empathy within research relationships beyond the expectations of transparency, standard ethics protocols, and access to results (Arnold and Wade, 2015; CIHR et al., 2018). Competent communication within the research process provides opportunities for partners to engage with results through communication-rich, two-way or group information sharing and co-produced knowledge exchanges (Trenholm et al., 2010; Johnson et al., 2016). This, in turn, is associated with increased utility of research and integration into local policy development and implementation (Arctic Council, 2017). Competent communication stems from and supports a shared understanding and valuing of the research process, allowing for better research governance by improving project design and implementation, as well as enhancing research outputs and policy outcomes for non-academic partners (Van Kerkhoff and Lebel, 2015).

Research communication practices reflect the evolving nature of community-researcher partnerships. Recent literature has demonstrated that environmental research in Arctic Canada is increasingly driven by local and regional priorities, especially when Indigenous and land-based expertise is needed to achieve project objectives. This is mainly resulting from the increased capacity and self-determination of northern Indigenous communities to shape research priorities, ethics, and approaches to better reflect their values and traditions (Brunet et al., 2014a; ITK, 2018). Researchers based in southern areas of Canada, who still represent the vast majority of principal investigators and team members of Canadian Arctic research, often seek to partner with local knowledge holders and organizations in order to access the land, knowledge, and skills required to advance academic and government research programs (Brunet et al., 2014b). In Canada, Inuit Nunangat (Inuit homelands) is comprised of four regions: the Inuvialuit Settlement Region (Northwest Territories), Nunavut, Nunavik (northern Québec), and Nunatsiavut (northern Labrador) (ITK, 2018). Inuit living across Inuit Nunangat today have a strong interest in conducting research projects that reflect Inuit ontologies, epistemologies, and priorities, with important implications for their livelihoods, health and wellbeing, and relevance for resource management and environmental policies (ITK, 2018; Pfeifer, 2018). As such, the National Inuit Strategy on Research supports “Inuit

self-determination in research as the means for fostering respectful and beneficial research that serves the needs and priorities of Inuit” (ITK, 2018:5).

In this context, effective partnership development and participatory approaches to research emphasize the role of early and ongoing communication with Arctic communities. Communication can serve to build trust, exchange information about research conduct and outcomes, and promote shared benefits accrued from research (for example, research informing decision making), especially when issues under study are potentially contentious (Shanley and Laird, 2002; Jones et al., 2008; Kainer et al., 2009; Pearce et al., 2009; Phillipson et al., 2012; Brunet et al., 2016). To date, however, approaches to research communication in the Canadian Arctic may have focused more on unidirectional or top-down information dissemination (one-way communication going from researchers to research audience) than collaborative knowledge exchange (two-way or networked communication) (King et al., 1998; Van der Sanden and Meijman, 2008; Mea et al., 2016). Communication practices employed to date by researchers have included interactive knowledge exchange workshops, community-based mapping, radio broadcasts, site visits, film or video, the use of social media, and the development of printed pamphlets, posters, manuals and reports intended for local audiences (Shanley and Laird, 2002; ITK and NRI, 2007). In recent years, researchers and local partners in Arctic Canada have improved the field of science communication in participatory research projects by integrating social media and communication technologies with experiential learning strategies (Bell et al., 2014; Ljubicic et al., 2014; Arctic Eider Society, n.d.).

In spite of these positive developments, challenges remain. Cost and time commitments associated with northern travel are often mentioned as factors limiting the breadth and depth of research communication with Arctic communities (Danielsen et al., 2014; Mallory et al., 2018). In addition, the scientific process, from research design and data collection to reporting, typically requires extensive analyses, reflection, and peer review prior to the dissemination of results. Northerners have voiced that the length of lag time between research activities and the dissemination of research results back to communities is a key concern (ITK and NRI, 2007; Brunet et al., 2014b). Further obstacles to competent research communication include translation issues (such as inconsistencies or inaccuracies in translation in local languages), lack of local interest in some research topics, lack of academic interest in topics of local or regional relevance, lack of local resources

to process and use information, lack of appropriate training and resources among researchers for communicating effectively with northern communities, and fundamental issues with the structure of academic institutions and funding, which are typically built around competitive, short time cycles (Brunet et al., 2016; Johnston et al., 2018). Taken together, these challenges can explain why some researchers may have ignored overwhelming evidence regarding the importance of competent communication with local communities in Arctic research. In some contexts, a comparatively low interest in certain research topics on the community side coupled with a relatively low ability by researchers to properly communicate research appears as a key challenge to overcome.

Despite calls for establishing communication as a central requirement to collaborative research processes in the circumpolar Arctic (Arctic Council, 2017), few studies have formally assessed the efficacy of the diverse strategies and tools used by researchers to communicate with local partners and communities (Ferguson et al., 2014; Timm et al., 2016; Arctic Council, 2017). To date, most discussions have focused instead on higher-level considerations such as transparency, timing, and cultural appropriateness of communication strategies (Arctic Council, 2017). Furthermore, many researchers tend to overestimate the success of their communications in their reporting, suggesting to us a need to assess independently not just communications (in the plural) as material outputs, but the quality of specific communication (in the singular) processes, practices, and tools used by researchers themselves (Smith, 1999; Keysar and Henly, 2002; Timm et al., 2016).

The goal of this study was to assess the effectiveness of a variety of communication processes, practices, and tools used by researchers in Arctic communities. Importantly, communication effectiveness was assessed here by community members, not by researchers. We conducted a case study in the communities of Cape Dorset and Coral Harbour (Salliq), Nunavut, Canada (Fig. 1), focusing on evaluating the strategies, roles, and outcomes of communication activities carried out by an Environment and Climate Change Canada (ECCC) science team doing research on marine birds in the area. Our project was undertaken by both government and academic researchers in close collaboration with local Hunters and Trappers Organizations (HTOs) from the two participating communities. Our objectives were to 1) explore local experiences with research—marine bird research in particular, 2) examine what communication approaches and tools Nunavummiut (people of Nunavut) viewed as most effective for learning about research activities, findings, and feeling engaged in the process, and 3) identify new and emerging communication needs in Nunavut communities to support more effective research partnerships in the future.

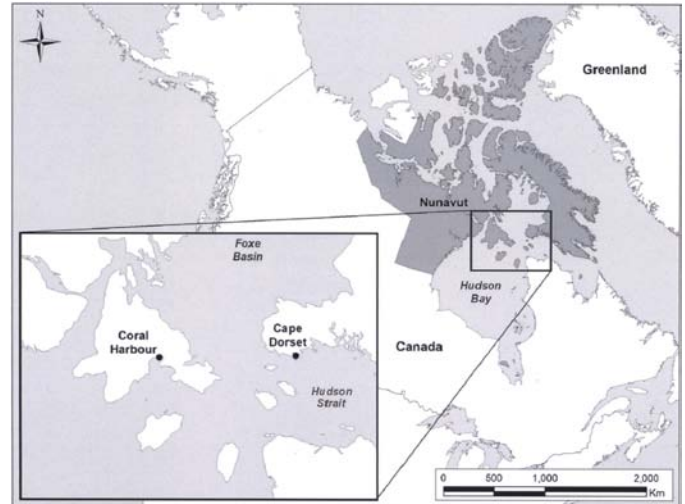


FIG. 1. Study area.

A Case Study of Research Communication—ECCC Marine Bird Research Group

For over 40 years, ECCC researchers have conducted scientific research on the ecology of marine birds near Coral Harbour and Cape Dorset, Nunavut, as well as other locations in the eastern Canadian Arctic. Local HTOs and residents from both communities have supported this ongoing research program throughout the years and assisted annually with fieldwork. Given the significant role that wildlife plays in Inuit subsistence and cultural identity (the Nunavut population is 86% Inuit; Arriagada, 2016), Nunavummiut have a strong interest in participating in research projects conducted on wildlife species across their territory (ITK and NRI, 2007). There is also growing recognition within the wildlife research community about the partnership role that Inuit must play in Inuit Nunangat research (ITK, 2018).

Therefore, a key objective of the ECCC marine bird research group has been to communicate effectively with northern residents. Researchers and students from this group (who are, to date, mostly southern-based non-Inuit researchers trained in biology and marine ecology) have made annual community visits to inform community members about research activities, seek their input and guidance on projects, and engage local residents meaningfully in scientific research. During these community visits, communication approaches and tools have included HTO and community meetings (supported by PowerPoint presentations, posters, pamphlets, and reports translated in both English and Inuktitut), informal discussions with residents, school visits, and participation in local radio broadcasts (including phone-in shows). Recently, researchers and students have also developed specialized presentations on marine bird ecology for both high school and elementary school children.

Our project explored local communication activities carried out by the ECCC marine bird research group as a

case study of research communication. The impetus for this work was twofold. First, researchers and scientists from the ECCC marine bird research group were interested in assessing how they could improve the way they communicate and work with northern residents. Prior to our project, communication strategies used by members of the ECCC marine bird research group had not been formally evaluated by community members, although concerns had been voiced by some residents from Coral Harbour and Cape Dorset regarding the timing, strategies, and content of research processes and outputs. This study also addressed a need expressed by HTO board members and residents from these two communities to find ways to improve communication between Northerners and wildlife researchers in particular. We chose to conduct our project in Cape Dorset and Coral Harbour because of this local interest in improving research communication coupled with the long-standing research relationships (dating back to the 1980s) between the ECCC marine bird research group and these communities. We built upon these relationships to access in-depth, balanced perspectives while facilitating open conversations regarding successes and failures in ECCC research communication practice.

Positionality of Authors

Since researchers are not neutral actors, reflexivity and acknowledgement of co-author positionality are warranted (Sultana, 2007; Hoppers, 2009; Anwar and Viqar, 2017). Manuscript authors included two southern Canada-based government researchers from ECCC, three southern Canada-based academic researchers from the University of Guelph, and one Nunavut-based researcher affiliated with the Nunavut Innovation and Research Institute. All authors identified as non-Indigenous. Government researchers included a social scientist specialized in collaborative environmental research in northern Indigenous communities (Henri), and the lead biologist of the ECCC marine bird research group (Gilchrist). All academic and Nunavut-based researchers involved in this study were unaffiliated with the ECCC marine bird research group; Brunet, Dort, and Hambly Odame had never worked or collaborated with ECCC prior to conducting this project. Co-authors contributed diverse and complementary expertise, which included experience in community-based collaborative environmental research in Nunavut and Arctic Canada (Henri, Brunet, and Shirley), marine bird research in Nunavut (Gilchrist), and communication studies (Hambly Odame, Dort). Three authors (Henri, Brunet, and Gilchrist) were directly involved in project activities taking place in Cape Dorset and Coral Harbour, with varied histories of engagement with these two communities: Gilchrist had conducted marine bird research in or near both communities and collaborated with local HTOs and residents for over 20 years, Henri had conducted research projects periodically in both communities over the last 10 years, and Brunet had never visited the communities prior to this study.

METHODS

We followed a pragmatic inductive approach inspired by elements of grounded theory (Glaser and Strauss, 1967; Charmaz, 2014) and collaborative inquiry (Bray et al., 2000). We used predetermined (deductive) assessment criteria from the literature as backdrop to applying grounded theory as an inductive descriptive tool (Strauss and Corbin, 1998; Charmaz, 2014). We sought information regarding four main themes from research participants: 1) participant experience with research, 2) impact of research in the community, 3) evaluation of research communication, and 4) identification of best research communication practices (Table 1). We integrated these themes into the collaborative inquiry process, which involved interviewing participants, convening discussions, and developing new knowledge collectively. We believe this process allowed us to develop insights that were grounded in data and participant experiences while acknowledging important advances in the literature (Timm et al., 2016). The approach was combined with the case study method to achieve our research objectives (Eisenhardt and Graebner, 2007), a strategy which development and management literature has acknowledged as relevant when developing new insights about communities and organizations (Turner, 1983; Suddaby, 2006; Fendt and Sachs, 2008; Vannoy and Salam, 2009). The case study method was appropriate in this study because it posits that the phenomena under study are intrinsically tied to the context in which they emerge (Yin, 2009). It has also been effective in studying community participation processes in science in the past (Jones et al., 2008; Pearce et al., 2009; Brunet et al., 2014b).

Data Collection and Analysis

In spring 2016, initial scoping meetings were held in Coral Harbour and Cape Dorset by members of the ECCC marine bird research group. These meetings served to present this project to community members and organizations, develop and gauge support for the research goal, and identify potential participants. Local HTOs gave permission and support to carry out the project, which was conducted under a research license (01 016 16N-M) from the Nunavut Innovation and Research Institute.

Brunet conducted a total of 35 semi-structured interviews in Cape Dorset (378 households located at 64°13' N, 76°32' W; population: 1441) and Coral Harbour (227 households located at 64°08' N, 89°09' W; population: 891), between April and October 2016 (GC, 2017; Fig. 1). In all cases, interviewees signed a consent form describing their rights as participants and the conditions for use and release of recorded information. The interviewer discussed the consent form before the interviews. All participants received an honorarium for their time according to a set amount deemed appropriate by local HTOs. Interview participants were primarily, but not exclusively, local residents who were engaged either directly or indirectly

TABLE 1. Deductive assessment themes from the existing literature and coding structure yielded by the data. Predetermined themes are presented in the first column; emergent subthemes are presented in the second column.

Main theme	Subtheme or code	Code description
Experience with research	Direct participation—Guide	Participant acted as field guide
	Direct participation—Interpreter	Participant acted as interpreter
	Direct participation—Observer	Participant acted as observer during research
	Direct participation—HTO	Participant provided logistical support as HTO member or staff
Impact of research in community	Direct participation—None	Participant had not participated in research
	Indirect participation—Information	Means through which participant received information about research (e.g., radio, TV, meetings, school visits, word-of-mouth)
	Relationship	Level of participant familiarity with or knowledge about individual researchers
Evaluation of research communication	Knowledge of research	Level of participant recall of information about research projects
	Positive	Positive impacts of research in the community
	Negative	Negative impacts of research in the community
	Communication medium	Evaluation of communication medium used by researchers (e.g., meetings, radio, reports)
Identification of best research communication practices	Frequency of communication or reporting or both	Evaluation of frequency of communication and community visits by researchers
	Translation	Participant comments on research translation
	Clarity	Participant comments on clarity of research communication
	Relationship	Participant comments on individual researchers
	Barriers to research engagement	Participant comments on barriers to research engagement at the community level
	Best communication medium or strategies	Advice on preferred communication medium or communication strategies
	Youth engagement	Need to engage youth in research
	Internet connectivity and infrastructure	Need to improve Internet connectivity and infrastructure
	Two-way exchange	Need for communication as two-way exchange
	Timing of communication	Advice on timing of research communication within research process and community life
Language of communication	Advice on language of communication	

in research activities conducted by the ECCC marine bird research group. Participants included former field guides, interpreters, and local project coordinators, as well as individuals who had attended past meetings organized by the research group or who had read reports, pamphlets, or posters about the group activities. Interviewees also included community residents who had never participated in research projects or had received limited information about research happening in or near their community. Participants were identified from previous work by the ECCC marine bird research group, attendee lists from past community meetings organized by the group, and communication with local leadership (theoretical sampling). Local liaisons within HTOs and the Kivalliq Inuit Association (KIA) provided valuable guidance in identifying potential interview participants.

One interpreter was hired in each participating community to assist with interviews (N. Toonoo in Cape Dorset, and B. Saviakjuk in Coral Harbour); each was remunerated for their services. Prior to conducting interviews, Brunet reviewed technical terms and concepts specific to this project with the interpreters to ensure accurate and consistent translation. Local interpreters led interview participant recruitment and contacted potential participants through methods they deemed most appropriate in their community (e.g., phone calls, home visitations). Interviews were conducted in person, lasted between 0.5 and 1.5 hours, and were carried out in the participants' preferred language (Inuktitut or English) and location (including HTO and KIA offices, and people's homes). Brunet was present during all interviews and the local interpreter attended interviews requiring simultaneous translation. Most interviews were conducted in Inuktitut.

Interview questions were intentionally open-ended to allow interviewees to speak authentically and in a relaxed manner (Huntington, 1998). Questions asked varied somewhat depending on participants' knowledge of or relation to the research, although the objectives remained the same. With permission from each participant, we obtained various types of data (nominal, ordinal, and interval) that covered the following topics: 1) professional and personal background, 2) experience with wildlife research and marine bird research in particular, 3) perspectives on science communication activities conducted by the ECCC marine bird research group (including recommendations for best practices), and 4) other experiences with research and research communication.

No further interviews were conducted when each category of analysis was theoretically saturated, that is, when no additional data could have facilitated further elaboration of qualities of perspectives and relevant social meanings (Glaser and Strauss, 1967). Overall, we interviewed 21 men and 14 women, ranging in age from 19 to 85 years old, with a wide variety of relationships

TABLE 2. Interviewee characteristics.

Variable	Response category	% of total (n = 35)
Age	Early (18–39 years old)	26
	Middle (40–69 years old)	43
	Late/Elder (70+ years old)	31
Gender	Male	60
	Female	40
Ethnicity	Inuit	91
	Other	9
Research engagement intensity ¹	High	17
	Medium	40
	Low	43
Current or former occupation or membership to local councils, boards, and organizations ²	Active hunter, trapper, fisher, and/or picker	46
	Hunters and Trappers Organization board member or manager	37
	Area Co-Management Committee board member ³	11
	Hamlet Council member	11
	Search and Rescue Team member	11
	Research interpreter/guide/translator	23
	School teacher	11
	Inuit Association employee	3
	Wildlife officer	3
	Elders Committee member	3
Other (including: unemployed, care giver, student)	26	

¹ High: Participant directly participated in research projects, received a significant amount of information about research projects, and had some direct interactions with researchers.

Medium: Participant had no direct participation in research projects but received a significant amount of information about research projects or researchers, or directly participated in research projects but received limited information about research projects or researchers.

Low: Participant had no direct participation in research projects, received limited information about research projects, and had limited or no direct interactions with researchers.

² Response categories for this variable were self-identified by participants. More than one response category can apply to an individual participant.

³ In Coral Harbour only.

to research and with researchers; all but three participants were Inuit (Table 2).

Interviews were recorded with permission and transcribed in full. Data were analyzed by two team members (Henri and Brunet) using the constant comparison method (Glaser and Strauss, 1967) in the qualitative data analysis software NVivo 11 Plus (QSR International Inc., Melbourne, Australia). Transcripts were coded using both predetermined and emergent categories or themes that were progressively refined through an iterative process until definitive patterns emerged (Babbie, 2001; Charmaz, 2014; Cuerrier et al., 2015). Comments made by participants about the ECCC marine bird research group were distinguished from comments made about research in general. Predetermined codes were broad and derived from our research objectives. Emergent codes were developed by assigning categories to interview passages. In this way findings were grouped thematically to generate empirical evidence for further analysis. Table 1 presents the coding structure yielded by the data; it shows strong congruence between predetermined and emergent codes and highlights new insights offered through emergent coding, thus illustrating the usefulness of employing both emergent and predetermined analytical categories.

Upon completion of data analysis and within 17 months of the field investigations, Henri distributed illustrated posters describing the main project results to all community partners. Thank-you letters were also prepared for all interview participants and other community collaborators. Posters and letters were sent by mail in Cape Dorset and distributed in person in Coral Harbour. Henri returned in person to Coral Harbour in April 2018 to present and discuss project results with the local HTO, the KIA, and individual research participants.

Limitations

Potential limitations are associated with our methodology and the positionality of authors. The interviewer (Brunet) was a male researcher of Euro-Canadian descent with over 15 years of experience in community-based participatory research in Arctic Canada. He visited Coral Harbour and Cape Dorset for the first time while conducting interviews for this project. We acknowledge that responses received during interviews might have been influenced or biased by the level of familiarity of the interviewer with the local culture, as well as his personality, age, gender, linguistic competence, and professional affiliation. For example,

TABLE 3. Interviewee experience with wildlife research and researchers.

Relation to research	Communication medium ²	% of total (n = 35)
Direct involvement in research ¹		
Acted as guide and/or interpreter		23
Acted as research coordinator and/or for logistical support		17
Indirect involvement in research		
Learned about research through one or more communication medium ³	Radio	23
	TV	6
	Meetings	43
	Reports, pamphlets and posters	20
	School visits from researchers	6
	Word-of-mouth	20
	Informal discussions with researchers	26
	Social media	0
Perceptions of researchers and research		
Researchers	Could recall information about individual researchers	40
	Could not recall information about individual researchers	57
Research	Could recall information about research projects	66
	Could not recall information about research projects	34

¹ Response categories for “direct involvement in research” were self-identified by participants.

² Types of communication were identified by participants. More than one communication medium can apply to an individual participant.

³ Includes learning about research proposals, fieldwork, project updates and results, incident reports, for example..

the interviewer may have missed subtle cues offered by participants given his dual “outsider” position as a non-Inuit and non-resident. The loss of some information through translation may have also characterized the data collection process (Brook and McLachlan, 2005). Some nuances may have been lost, for instance, when interpreters gave English summaries of lengthy and detailed explanations provided by participants in Inuktitut. Furthermore, given Brunet’s position as a researcher unaffiliated with the ECCC marine bird research group, participants may have expressed their opinions about the group (especially critical ones) with more transparency than if the interviews had been conducted by ECCC. We acknowledge that some participants could have strategically represented their reality (Scott, 1990) by not expressing critiques of research communication so as to maintain their relationships (and employment opportunities) with ECCC. In spite of such possible limitations, we sincerely believe that respondents were generally very open in sharing their views (including critical ones) about research communication. Participants’ willingness and enthusiasm to contribute to this project and share their knowledge and experiences demonstrated the openness that characterized the research process in both communities.

RESULTS

Throughout this section, illustrative quotes are provided to reflect the breadth and diversity of perspectives shared by interview participants. These quotes are not attributed to individual interviewees to preserve their anonymity.

Participant Experiences with Research and Researchers

Almost all interview participants had been either directly or indirectly involved in wildlife research (Table 3). Direct involvement in research (as categorized by participants) was predominantly through employment as a field guide or interpreter (23% of interview participants). Certain guides had strong relationships with researchers and related numerous stories about experiences on the land. Some individuals, typically members of HTOs, also had many years of experience coordinating studies, providing logistical support, and reviewing research outputs during meetings. These “high intensity engagers” (17%) had long-standing relationships with researchers of the ECCC marine bird team. Many other participants identified as “medium intensity engagers” (40%). They were knowledgeable about ongoing research because of their long-standing roles with committees, boards, and leadership within communities. They also knew individual researchers through multiple interactions with them over time. Finally, the remaining large number of interviewees were characterized as “low intensity engagers” (43%); they had not participated in research projects and had had limited or no interactions with researchers. Results also suggested that numerous participants (all types of engagers considered) could not recall information about specific researchers (57%) or projects (34%).

Recommended Communication Strategies

During interviews, participants from Coral Harbour and Cape Dorset discussed their preferred medium for communicating information about research (Fig. 2). The perspectives they shared illustrated that favoured

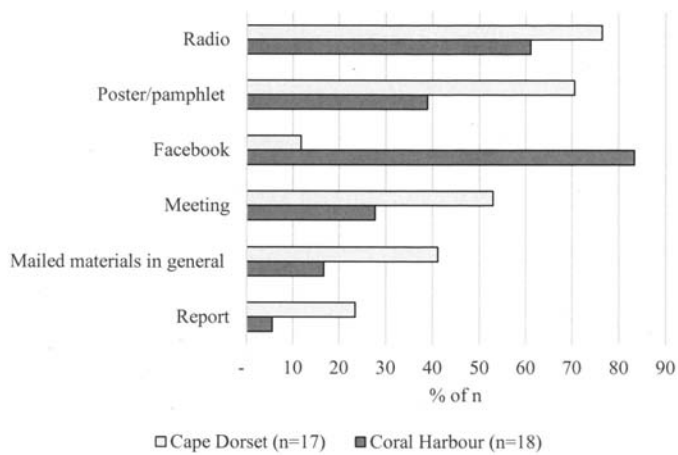


FIG. 2. Preferred research communication medium identified by participants in Cape Dorset and Coral Harbour grouped by community: Cape Dorset (n = 17) and Coral Harbour (n = 18). Individual participants could identify more than one preferred media type.

communication approaches can present both similarities and differences between communities, which has implications for how researchers may be most efficient in communicating research in different Nunavut communities. When grouping participant responses according to three age categories (early [18 to 39 years old], n = 9; middle [40 to 69 years old], n = 15; and late [70 years old and over], n = 11, we did not find substantial differences in preferred communication media among the categories. A more equitable sampling of younger community members would be required to explore this relationship further.

Local Radio

According to interviewees, local radio broadcasts remain an important—and perhaps the most effective—single medium for research communication at the community level in Nunavut. Local FM radio stations across the territory are either owned and operated by local community groups or by the Canadian Broadcasting Corporation. In both communities, participants commented on the usefulness of the local radio to foster information exchange among researchers and community members. An Elder from Cape Dorset explained:

I think it's going to take cooperation between the researchers and the community to be able to work closer together ... Radio announcements [are] a big thing because you get out to the public and more people listen to that. We know that there is less attendance now at public meetings. [I am] thinking that the radio is a better measure to actually get out to the people, because not too many people attend meetings anymore.

Social Media

The conducted interviews revealed that the idea of using social media as a means to create awareness

or post information about research has not gained as much traction in Cape Dorset as it has in Coral Harbour, pointing to important distinctions in community-level communication preferences and capacity. For example, in Coral Harbour, residents typically use the Facebook community group called *Salliqvaluk* for trading and selling purposes; respondents did indicate that researchers could either attain membership to the group or provide information to a community member to use this platform. Some interviewees suggested that this could be a good complement to radio as a means to announce a project, post a job advertisement, and inform the community about the arrival of research teams. For instance, when asked about the best ways to reach people in his community, a participant from Coral Harbour said: “Put it on *Silliqvaluk* Facebook like our local radio, then everybody sees that.”

Community Meetings

Communication of research at community meetings was mentioned by 53% of Cape Dorset participants and 28% of Coral Harbour participants (or 40% of all participants) as a preferred research communication medium (Fig. 2). Importantly, it was suggested that researchers should incorporate their presentations into existing planned meetings organized by hamlet councils, HTOs, and other local organizations. These community-led meetings are already in the schedules of residents and can reach individuals who are busy with meetings and other leadership and family responsibilities. In both communities, interviewees recommended that researchers attend meetings that local organizations already organize on a regular basis to discuss wildlife matters, such as the HTO annual general meeting (AGM). A participant from Coral Harbour, who had been involved in the local HTO for over 20 years, commented: “Well it would be nice if one of the researchers ... could come in once a year at the AGM and try to get involved with that.” Furthermore, by combining research talks from various studies on the same day, communities are better able to grasp the breadth and potential connections between research projects and to identify the individuals conducting the work. For instance, an elderly man from Cape Dorset, who had worked with the local HTO and had been involved in various wildlife research projects over the years, recommended that researchers share information in a more holistic way by combining updates from all research projects happening around the community at a single event. Species of particular interest, such as caribou and polar bears, would draw numerous attendees who would then learn about other projects: “The HTO has an annual general meeting every year. It'd be nice to have polar bear biologists, DFO [Fisheries and Oceans Canada], and seabird people attending those meetings and answering questions from the community.”

However, many interviewees cautioned that community meetings now have lower attendance than they used to

and have become less effective for knowledge sharing and information exchange within the community. Two Elders from Cape Dorset (one man and one woman), who had witnessed a change in meeting attendance over their lifetime, explained:

A lot of people don't attend public meetings anymore these days. In the earlier days, many people used to be attracted and went to the meetings. In the older days, I went too, but these days I don't attend too many meetings anymore. But I do hear [at meetings] they've discussed wildlife and whatever research was done before. There's a lack of interest in public meetings. Older generation, they were really into the meetings. But this younger generation doesn't seem to pay very much attention.

Before we had too many distractions, a lot of people were interested in public meetings. But all this television and all that cyber stuff is serving a distraction and amongst that, addictions too. There's a lot of things that prevent people from gathering much anymore.

Interviewees identified multiple reasons why community meetings focused on wildlife research seemed to have become less popular in recent years. They highlighted a lack of interest about certain research topics and the presence of competing interests and commitments among community members. They also cited a change in information-sharing practices at the community level and in particular the advent of social media and communication technologies. Nonetheless, participants who commented on knowledge exchange during community meetings attended by wildlife researchers were generally pleased with how researchers shared information about their work and answered questions from local residents.

Other Communication Strategies

We also found that a combination of methods, such as radio announcements and the distribution of illustrated pamphlets or posters at central locations, tends to reach the highest number of people if carried out in collaboration with local agencies holding legitimacy regarding wildlife issues (such as local HTOs). Some participants noted that a familiar voice on the radio speaking in Inuktitut was very important (when reaching older individuals for instance). They suggested that involving community residents in local radio shows about research was critical for raising listeners' interest in the information presented. However, respondents mentioned that the radio was not as effective and thorough in conveying detailed information about research projects.

The local radio proved particularly useful for announcing the arrival of researchers, public meetings, and recruitment activities for fieldwork. Detailed information about projects was more likely to reach community residents if pamphlets or reports were sent by mail or delivered in person to

individual households, which is actually feasible in smaller Inuit communities such as Coral Harbour and Cape Dorset. In addition, some interview participants encouraged researchers to set up a booth at a central popular location in the community (e.g., local stores) to discuss their research in person and distribute written information to those interested.

Interviewees also highlighted the importance of researchers' attitudes when communicating with and working in their communities. Regardless of the communication strategy employed by researchers, participants outlined the importance of listening to community perspectives and concerns and being humble and respectful. A Cape Dorset resident who had not been directly involved in research projects, but witnessed many researchers visiting in his community over the years explained:

Sometimes, well, I haven't been in approval of researchers sometimes because when they arrive, they think they know everything. They know it all. And knowing our Traditional Knowledge, when you can observe that they're doing something wrong, that doesn't sit very well with me. Even though you know what they're doing is not right, they go ahead saying it's right. And as Inuit people it's not right for us.

Lastly, respondents mirrored other work in this field regarding workload and the potential for saturation and research fatigue of community research partners (ITK and NRI, 2007; Brunet et al., 2017; ITK, 2018). We observed that community members who are engaged in research are typically involved in numerous aspects of community life, including participation in local committees and responding to family needs. We recognized it is important for researchers not to overburden these individuals with research communication activities, consider that they may be busy with other commitments, and plan accordingly.

Consideration of Language, Images, and Graphics

Nearly all interview participants highlighted that translating all research communications (both oral and written) into local Inuktitut dialects was very important to ensure effective communication between researchers, local partners, and community members. Some highlighted that having texts available in both English and Inuktitut allowed for difficult translations and certain technical words or concepts to be better understood. This enabled readers to crosscheck terms and text in both languages for accuracy of understanding: "[My wife would] rather have them both 'cause sometimes the wording in there does not fit her understanding so she could use the English word to better understand which is what." Some interviewees also perceived Inuktitut translation as a way to support research communication practices that both promote the Inuktitut language with younger generations and provide employment for local interpreters and translators.

Graphics, such as line charts with axes showing population changes for species, were well understood and appreciated by most respondents, especially when these graphics were integrated into a short report that provided explanations regarding patterns or trends. Nearly all participants reported that they appreciated images independent of the medium. In particular, some indicated that pictures of local research assistants and guides participating in research activities were particularly attractive and garnered attention from all age groups. Participants indicated that including images of people and wildlife was an effective way to stimulate engagement when displaying posters and distributing materials at general stores or other locations in communities.

Working with Local Schools

Working with school administrators and teachers presented both opportunities and challenges in improving communication of research in partner communities. Interviewees indicated that preparing hands-on workshops, presentations, and materials for in-class activities were important ways to reach school-aged children, who are often left out of the research process. However, our results also suggested that long-term benefits from these time- and resource-consuming activities (for researchers) may be limited within communities. In our case studies, ad hoc opportunistic classroom visits by researchers from the ECCC marine bird research group were not integrated into or supported by school curricula. As conducted, these visits also did not provide students with opportunities to be prepared or follow-up. This lack of engagement beyond the classroom visit itself seemed to result in limited retention of information and learning outcomes. Initial explorations of this in Cape Dorset indicated that students could barely remember researcher visits or the content of a presentation that had occurred just a few weeks before. The four teachers (three non-Inuit) interviewed in Cape Dorset suggested improvements by having researchers provide early notice of their planned school visits, as well as an outline of the presentations or activities they proposed. Teachers explained that this would allow them to prepare complementary materials and activities and garner their students' interest in advance:

... giving us lots of forewarning that people are coming in is always good.

It would be good to provide me with an idea of requirements ... any pre-information, even just for myself. And then anything that [researchers] want me to talk to the kids or prep with the kids ahead of time. Ideally, they would bring their own materials and stuff, but if there was something that they were needing, letting me know ahead of time to see if there's something I can get for them. Just them coming in and having some follow-up activities with the kids would be really great.

The teachers interviewed also suggested that researchers leave age-appropriate posters to support continuous learning through teacher-led follow-up activities after the visits. Teachers highlighted that hands-on, interactive presentations or activities that included the use of Inuktitut were best adapted to student learning:

The kids really like to look at pictures, I know when the girls came in a few weeks ago with the birds, they had lots of pictures of like the little birds and stuff. Then [students] were saying all the Inuktitut names for all of the species that we would look at. So that was really good. Also, any time that you could tie in the Inuktitut words for things, the kids definitely kind of take in the information better. Here at our school the kids are taught fully in Inuktitut until grade three, and then they switch fully to English. So, my grade five students, for example, this is only their second year of English, maybe third year.

[Researchers] brought claws from the birds and they passed them around. And so, yeah, that was really cool because they had like a band on the claw and the kids have been saying: "Aw, I think we've got a bird with a band." Because if they have a tag on them, then they know to turn it in to [...] the lands' guy. Yeah, I remember that, so the kids have been talking about if they get a bird with a band. They know what to do with it.

Some teachers mentioned, however, that a lack of both human and material resources in schools, as well as high turnover rates of both administrative and teaching staff were important barriers to building relationships with individual researchers and research teams. We did not explore this topic further, although it would warrant more in-depth exploration. Indeed, the time and effort required on the part of teachers and students to engage with researchers (and the need for special ethical scrutiny for research activities in Nunavut schools) is a special concern for school administrators. The Nunavut Department of Education has therefore recently implemented a policy requiring that researchers obtain departmental approval before conducting any research activities in Nunavut schools (Nunavut Department of Education, 2018). While this requirement is meant primarily for formal research activities involving students as research participants, some types of science outreach activities (those where students and teachers are enlisted to gather data or process samples) are also subject to review.

Lastly, interview participants within the school system indicated that local interest in research can be enhanced by considering the connection between individual projects and the bigger picture, that is, their relevance to broader ecosystem or societal changes and their connection to community life, priorities, and local harvest activities. Interviewees challenged researchers to ask the question "Why is this research important?" and advised them to

be always prepared to articulate both the community benefits and larger implications of their work. Some spoke of a disconnect between research and community life and highlighted how it could be bridged by having researchers better explain the relevance of their work and prioritize research topics and questions of interest to the community.

DISCUSSION

Best Approaches for Research Communication

Research practice in Arctic Canada is changing. This change, according to our study, is not emerging from new research needs or changing paradigms in Arctic science, but from increased capacity and self-determination of Inuit communities, agencies, and leaders to shape research priorities and processes that better reflect their values and traditions (Brunet et al., 2014a, 2017; ITK, 2018). We believe that the most effective strategies and tools used in research communication in this context are also evolving and adapting to changes in local capacity to sustain collaborative research programs. Over the course of this study, we were able to identify some best practices for research communication in Nunavut, based on information shared by interview participants from Cape Dorset and Coral Harbour, our analysis of their insights, and our understanding of the literature on this topic (Table 4).

Our results suggested that no single communication process, practice, or tool used by researchers is sufficient to communicate effectively and support collaborative research partnerships with Nunavut communities. For example, our findings indicated that some established communication practices and tools, such as community meetings, maybe losing their effectiveness. Other strategies, such as the use of social media to foster collaborative knowledge mobilization, hold much promise, but are currently being underutilized by researchers.

Based on our findings, competent communication of research involving Nunavut communities should include the development of communication strategies locally tailored to existing networks, information-sharing pathways, and technological capabilities. It is important for researchers to engage with technologies in use in Nunavut communities and to explore ways in which the usage of both older (radio, television, postal service) and newer media (broadband Internet) can be innovative (Coelho, 2018). For instance, we found that social media, such as Facebook, was an effective tool to reach a large number of individuals in Coral Harbour but may not be as effective in Cape Dorset. Our results also illustrated that certain communication approaches, such as appearances on local radio shows and at community meetings, are still effective yet often improperly deployed in research programs. In order to create meaningful research relationships rooted in listening, mutual learning, and respect, first steps require effective information sharing and consulting with local

community members and organizations to understand their priorities and preferred communication practices.

It is also worth noting that when asked about their preferred research communication medium (see Fig. 2), participants from Cape Dorset and Coral Harbour mentioned, almost exclusively, media that mostly promote one-way communication from researchers to local residents (i.e., radio, printed materials, postings on Facebook). At the same time, interviewees highlighted the importance of researchers listening to community perspectives and concerns, which is impossible to accomplish fully through radio appearances, printed materials, and postings on Facebook. These two statements therefore seem contradictory. Indeed, in order for a meaningful dialogue (two-way communication) to take place between researchers and local residents, Nunavummiut need to commit time and energy to exchanging ideas and speaking with researchers. However, as some participants suggested, such a commitment may be challenging because of research fatigue and other demands of community life. Future research could clarify these discrepancies by asking interviewees to explain why they suggested mostly one-way communication media, whether research is perceived as tangential to day-to-day life, and if so, what could make research more relevant to northern communities.

Importantly, while our results mainly focused on research communication processes, practices, and tools in two Nunavut communities, it is important to acknowledge that research communication is deeply enmeshed in the wider communication context within northern communities (i.e., how, when, where, and which information is exchanged and by whom). We recognize that this theme would warrant more attention and further research, as our exploration of this topic was somewhat limited. Our study nonetheless highlighted that competent research communication necessitates that researchers have an awareness of and desire to understand this larger context in order to position research communication within broader community conversations. To this end, being humble, respectful, able to listen, and open to accommodate the priorities, concerns, and schedules of local residents are important attitudes for researchers to cultivate as foundations to competent research communication.

In addition, our results highlighted the critical role that interpreters and translators play in fostering competent research communication in Nunavut, where most communications between local residents and visiting researchers require the assistance of interpreter-translators who play an indispensable role in bridging both linguistic and cultural barriers. Competent research communication in this context requires researchers to work effectively and respectfully with interpreters and translators, as well as to find ways to ensure accuracy and reliability in the translation process. Researchers should seek guidance from local communities and organizations (see, for example, NRI and NI/TS, 2009) to identify available interpreter-translators who are best suited for a particular project and

TABLE 4. Summary of best practices for research communication discussed within the context of this study.

General best practice	Relevant examples provided by participants from Coral Harbour and Cape Dorset
Adapt communication to community context	Differences were observed in preferred communication medium between communities
Consult with community organizations and residents to establish communication strategy	Participants offered valuable insights about communication strategies that are best adapted to their community
Consider existing community communication networks, information-sharing practices, needs, and technological capacity	Participants identified specific communication networks that researchers could leverage (existing community meetings, community Facebook group) Researchers should be prepared to discuss the relevance of their research with the community Lack of Internet access was raised as a challenge
Consider translation carefully	Translating research communication into Inuktitut is important Use Inuktitut translation as a way to promote Inuktitut language among younger generations and as a source of local employment
Consider use of images and graphics in communication material	Images and graphics can be useful to generate community interest and support learning
Consider strengths and limitations of communication methods	Local radio is important to reach a wide audience but limited for conveying detailed information More people can be reached by employing a variety of communication methods
Consider working with local schools	School personnel recommended providing early notice of school visits, emphasizing hands-on activities, and leaving complementary material for teacher-led follow-up activities with students Providing dedicated resources for engagement with local students was raised as a challenge by teachers
Consider research fatigue	Community residents engaged in research are often involved in other aspects of community life that demand their time and energy Information about multiple research projects can be shared in a single event to optimize communication
Adapt communication to changes in information-sharing practices in the community	Changes were observed in preferred communication medium over time (community meetings have lost their effectiveness and social media is gaining popularity)
Adopt appropriate attitude	Researchers should strive to remain humble, respectful, and open in order to accommodate local priorities and concerns

ensure these skilled workers are provided with the support they need to perform careful research translation.

Beyond specific communication processes, practices, and tools, two important themes emerged from our analysis that we believe deserve further discussion. First, poor Internet connectivity was perceived by interview participants as an important barrier to increased local engagement with researchers and communication among research partners. Second, interviewees indicated that more needs to be done to communicate with and develop research materials relevant to youth within and beyond school-based activities. These two themes are interrelated because lack of Internet access disadvantages community members who are often most interested in information and communication technologies, such as youth, teachers, and entrepreneurs.

Internet-Enabled Communication Technologies

A commitment to competent communication by researchers should be foundational to developing partnerships between researchers and northern communities in Arctic Canada. Technological change, such as Internet-enabled communications technologies and improved Internet access, can present opportunities

for researchers to initiate and maintain two-way and group dialogue with local partners. However, while technology can facilitate communication across vast geographical distances, it is not a panacea and cannot entirely bridge the cultural, linguistic, political, or economic divides that can exist between researchers and their community-based partners (Dutheil et al., 2015). For example, as this study illustrated, translation and the role of interpreter-translators within the community are also very important. Similarly, researchers' use of closed, community-oriented, online spaces (e.g., *Salliqvaluk* Facebook group in Coral Harbour) may be restricted when community gatekeepers control access and membership. Internet-enabled communications technologies cannot, in and of themselves, lead to better interpersonal communication or research partnerships (Trenholm et al., 2010). Critically, these technologies can nonetheless mitigate some of the significant logistical challenges faced by researchers and community partners who can be thousands of kilometres and multiple time zones apart. They are a significant enabling tool for researchers and their partners in the community who are engaged in developing a co-designed research process that addresses the issues and targets the objectives of all parties (Brunet et al., 2017).

Securing adequate funds, creating an achievable scope of work, and having sufficient time to build and maintain strong, communication-rich relationships with Arctic communities is a challenge for researchers. Beaton et al. (2017) suggested that technologies that facilitate dialogue, such as videoconferencing, can allow researchers and local partners to plan and meet regularly to support collaborations. In northern Ontario First Nations, Canada, for instance, social media, videoconferencing, and mobile applications have already become important to gathering and sharing scientific data and traditional knowledge while maintaining community social networks over large distances (Molyneaux et al., 2014). Using digital tools has also been associated with enhanced bridging social capital (i.e., connections that bridge communities, groups, or organizations) (Brunet et al., 2017). As such, Molyneaux et al. (2014) found that building linkages with individuals outside the community allows for communal empowerment and influence on the wider society. Supporting online networks can therefore “provide material, economic, informational resources, assist with problem solving, and provide emotional and other forms of support in everyday life and in times of special need” (Kirmayer et al., 2009:73). Recently, research indicated that using a broad range of communication processes, practices and tools creatively, appropriately, and effectively can serve to maintain research partnerships as well as gather, protect, and share information generated by projects, including Indigenous knowledge (Beaton et al., 2017). Enhanced Internet service coverage in Arctic Canada can enable researchers to access remote computing facilities and transmit field data (AECTIWG, 2016) but also, and importantly, benefit northern communities and collaborative research partnerships. A recent study by Coelho indicated that many Nunavummiut hoped for improvements in Internet services, and “wanted their Internet access to be improved, to be faster, less expensive, to have more bandwidth, and for the connection to be more reliable” (Coelho, 2018:521). In Nunavut, an enhanced Internet service coverage, however, comes at a significant cost.

Communities in Arctic Canada typically rely on expensive fixed satellite services (FFS) for internet and wireless communication. In 2016, the Canadian Radio-Television and Telecommunications Commission (CRTC) ruled that the national standard for fixed broadband and wireless LTE be set at download speeds of 50 Mbps and upload speeds of 10 Mbps (CRTC, 2016). No community in Nunavut (including Cape Dorset and Coral Harbour) has access to this fixed standard. In Nunavut, SSI and the QINI network offer “last-mile” 4G-LTE and 2G-GSM technology to connect customers in 25 communities over an area of two million km². Internet plans with download speeds of 0.512–5 Mbps range from \$40 per month (2 GB) to \$399 per month (5 GB) for voice and data (GC, 2019). Costly traditional C-band FFS is being modernized with high-throughput satellite services for northern communities. Recent investments target improved quality

of service and affordability. In March 2019, the proposal “*Katinnqaniq*: Community, Connectivity, and Digital Access for Life Promotion in Nunavut” was one of the winners of \$10 million from the Smart Cities Challenge Program (Katinnqaniq, 2019). In 2018, \$49.9 million was allocated to NorthwesTel (a Bell subsidiary) from the Connect to Innovate broadband funding program for improved connectivity in Nunavut (GC, 2019). Satellite dependent communities in Nunavut are also among the eligible communities for the first round of funding from the CRTC’s newly established Broadband Fund, which commits \$750 million over five years to remote and rural broadband (CRTC, 2018).

Fiser (2013) recommended improving northern connectivity by emphasizing shared network infrastructure and shared information technology services in high-cost areas. This approach poses challenges in the Canadian Arctic. For example, the low and dispersed nature of the population across the region requires a community aggregator model for FSS, but there are additional challenges making any type of construction difficult: the lack of road transportation infrastructure linking communities, harsh climate, and extensive distances between communities. The Arctic Internet Exchange (ArcticIX), which was formed to address this issue, partners with the Smart Cities-supported *Katinnqaniq* project. The Arctic Economic Council and Telecommunications Infrastructure Working Group also identified a chronic insufficiency in specialized contractors to build and maintain broadband networks in northern communities (AECTIWG, 2016). Indigenous governments and businesses, including regional broadband providers, play a key role in accessing federal subsidy programs, building and maintaining infrastructure and devices, and retaining technicians to maintain and service Internet users (Fiser, 2013; Office of the Auditor General of Canada, 2018; Katinnqaniq, 2019). Network development and IT services therefore require significant support in Arctic Canada, notwithstanding recent commitments from the Smart Cities, Connect to Innovate, and Broadband Fund programs. Ultimately, these investments and the project designs they give rise to will not bridge the so-called digital divide without supporting self-determined Indigenous innovations that are making space in digital environments for Indigenous worldviews (Winter and Boudreau, 2018). If such a “makerspace” as explained by Winter and Boudreau (2018) was possible, researchers and their community-based partners could inquire collaboratively, exploring opportunities for innovative research communication practices such as digital storytelling, virtual landscapes, and future Indigenous imagery as digital technologies become more accessible and keep improving over time.

Inuit Youth and Research

Our study also indicated that new and innovative communication processes, practices, and tools are needed

to engage school-aged children and young adults who are often not involved in fieldwork and other aspects of scientific research on wildlife, and who are not always targeted by wildlife research communications (Salmon et al., 2011; Provencher et al., 2013). Given that 41% of Nunavut's population is under age 20 (Arriagada, 2016), we believe that neglecting this group in wildlife research communication and community engagement strategies hinders relationship building and training possibilities with future generations of land users, resource managers, local decision-makers, northern-based researchers, and environmental leaders.

Importantly, some interviewees indicated that the knowledge and expertise of highly trained southern-based wildlife researchers conducting fieldwork in the Canadian Arctic rarely reaches Inuit youth, which was concerning to them. Typically, older and more experienced hunters and trappers are engaged in research processes and projects. Similarly, Brunet et al. (2016) illustrated that these groups accrue most of the benefits associated with research partnerships.

In addition, studies have found that land-based skills and knowledge are increasingly held by an older and smaller group of individuals within northern Indigenous communities in Canada (Ohmagari and Berkes, 1997). An erosion of Inuit knowledge and land-based skills has also been documented among the younger generation of Inuit throughout Nunavut (Rasing, 1999; Aporta, 2004). This phenomenon has been attributed in part to southern educational requirements, which result in decreased time to participate in land-based activities, increased participation in wage employment, a general shift in social norms, and an ongoing segregation of younger and older generations (Kral, 2003; Takano, 2004; Henri et al., 2010). Some interviewees reported that many young people in today's Nunavut communities have limited exposure to knowledge of their land via parents and relatives and experience fewer opportunities to spend time outside villages observing and practicing land-based skills (e.g., skills related to way finding and navigation, hunting, fishing, trapping, and camping). These skills are also rarely taught in schools that lack appropriate resources and expertise. Assessments from International Polar Year 2007–08 indicated that “[m]any educators in the north would like to incorporate more integrated learning experiences into their teaching curricula, but while researchers are often keen to contribute to educational programs, they lack the resources to do so” (Provencher et al., 2013:237; see also Salmon et al., 2011). Consequentially, the health and wellbeing of Inuit youth may be at risk. Indeed, nurturing culturally specific relationships with the land, animals, and plants, and developing cultural-based skills has been identified as a protective factor that can enhance the mental health of Indigenous circumpolar youth (Macdonald et al., 2013). Studies have also found that time on the land can foster community cohesion, self-reliance, self-confidence, and a sense of purpose among Inuit youth (Wexler, 2006).

In this context, the role that research and southern-based, typically non-Inuit, researchers can play in providing northern youth with some connection to the land though science remains unclear, but important to explore. Some interview participants explained that Inuit youth are eager to learn more about the land and wildlife but may have limited opportunities to do so. According to interviewees, limited opportunities to connect with the land are occurring for a variety of reasons, including cost and time commitments associated with land-based activities, a certain segregation of the young and older generations, and the presence of fewer community experts about the land, leading to fewer opportunities for youth to learn land-based knowledge and skills at home and elsewhere. Elders, hunters, and teachers we interviewed expressed a strong desire for highly trained environmental researchers to deliver both land-based and in-class modules or workshops that would contribute to further scientific training among Inuit youth. Researchers were also keen to connect with youth. However, a lack of resources and time, limited knowledge of age-appropriate teaching tools, and no established practices for developing learning materials for youth limited these efforts.

We believe that it is worth exploring the role research plays in land-based education in a manner that is respectful of local cultures and traditions. As an Elder from Cape Dorset explained: “We do need to promote the younger people to be more involved [in research]. Because they like the information that they need to know. And somehow, we have to drag them back in so that they can continue, especially with the Inuit traditions.” Although researchers cannot replace the mentorship of local Elders and family, we believe that they may facilitate opportunities to be on the land with local knowledge holders while providing training and mentorship.

Our preliminary investigations in Cape Dorset and Coral Harbour have demonstrated that youth in these communities are interested and curious about researchers and the work they do. In many cases, youth are eager to listen to and engage with researchers who are willing to share knowledge and experiences with respect, openness, and humility. For these reasons, we feel it is important to address the expectations made of Inuit youth engagement in research. Researchers, for example, may unintentionally ask Inuit youth for services beyond their abilities or expertise (e.g., providing translation/interpretation services, serving as field guides or polar bear monitors). Youth can also be expected to act as ambassadors or representatives for research projects and present research results in their communities and at conferences. Given this, we believe that negotiating expectations with youth can be a first step in understanding their potential engagement in research, as well as communication needs and capacity.

CONCLUSION

Many consider that competent communication that fosters two-way and group knowledge exchange is the foundation of strong community-researcher partnerships. Communication processes, practices, and tools used by researchers, northern partner organizations, and individual citizens in Nunavut (and Inuit Nunangat more broadly) have evolved greatly over the years to reflect emerging needs, technologies, and the growing capacity of Northerners to design and engage with research. Our study found that although there is no one-size-fits-all solution to research communication in the Arctic community context, there are opportunities to build better research partnerships by establishing communication strategies early in the research process. Strategies should include the co-design of locally appropriate communication processes, practices, and tools, and respond to the needs of priority groups such as youth. Study participants from Cape Dorset and Coral Harbour also indicated that their capacity to engage in research is hindered by the lack of available and affordable Internet access, which can be expected to change with next-generation broadband services in Nunavut and other Arctic communities. This highlights the need for research communication strategies that are forward thinking and that engage northern youth, who will be research partners and leaders in the future.

ACKNOWLEDGEMENTS

We would like to thank the communities of Coral Harbour and Cape Dorset and all interviewees and contacts who generously shared their knowledge and experience with our research team. Thank you to the following interview participants: (in Coral Harbour) Willie A. Adams, Armand Angootealuk, Doris Bruce, Louisa Kalai, Louisa Kudluk, Marguerite Nakoolak, Davidee Natokok, Sarah Netser, Troy Netser, Ronnie Ningeongan, and six anonymous participants; (in Cape Dorset) Ohito Ashoona, Krisanne Landry, Nina Manning, Peter Nakoolak, Taqialuk Nuna, Numa Ottokie Sr., Annie Pitseolak, Kooyoo Pudlat, Kovianaktuk Pudlat, Oolooreak Pudlat, Paul Pudlat, Qabaruaq Qatsiya, Luutaaq Qaumagiaq, Kelly Quppapik, Annie Reid, Aningmiuq Samayuallie, Quvianaqtuliaq Tapaungai, Chris Wright, and one anonymous participant. We acknowledge the collaboration of the Aiviit HTO and the Cape Dorset HTO, whose members gave permission, insightful advice, and support to carry out this work. Thank you to HTO managers Daisy Emiktowt (Coral Harbour) and Annie Suvega (Cape Dorset) for their logistical support. Thank you to Bobbie Saviakjuk and Nina Toonoo who interpreted the interviews and provided invaluable insights. We would also like to thank Ron Ningeongan, Natasha Ottokie, and Pitseolak Pudlat who provided fieldwork support. We are grateful to Abigail Green who assisted with interview transcription and coding. Thank you to three anonymous reviewers who provided constructive comments on earlier versions of this manuscript. This study was funded by Environment and Climate Change

Canada, the University of Guelph, and the University of Saskatchewan. It was conducted under research license (01 1616N-M) from the Nunavut Innovation and Research Institute.

REFERENCES

- AECTIWG (Arctic Economic Council Telecommunications Infrastructure Working Group). 2016. Arctic broadband: Recommendations for an interconnected Arctic. Tromsø, Norway: Arctic Economic Council.
https://arcticeconomiccouncil.com/wp-content/uploads/2017/03/AEC-Report_Final-LR.pdf
- Anwar, N.H., and Viqar, S. 2017. Research assistants, reflexivity and the politics of fieldwork in urban Pakistan. *Area* 49(1):114–121.
<https://doi.org/10.1111/area.12307>
- Aporta, C. 2004. Routes, trails, and tracks: Trail breaking among the Inuit of Igloodik. *Études/Inuit/Studies* 28(2):9–38.
<https://doi.org/10.7202/013194ar>
- Arctic Council. 2017. Meaningful engagement of Indigenous peoples and local communities in marine activities. Report Part 1: Arctic Council and Indigenous engagement—A review. SAO Meeting, 8–9 March 2017, Juneau, Alaska, U.S.A.
<http://hdl.handle.net/11374/2012>
- Arctic Eider Society. n.d. SIKU: The Indigenous Knowledge Social Network. Mobile app and web platform.
<https://arcticeider.com/siku>
- Arnold, R.D., and Wade, J.P. 2015. A definition of systems thinking: A systems approach. *Procedia Computer Science* 44:669–678.
<https://doi.org/10.1016/j.procs.2015.03.050>
- Arriagada, P. 2016. Inuit: Fact sheet for Nunavut. Aboriginal peoples: Fact sheets. Ottawa: Statistics Canada, Social and Aboriginal Statistics Division.
https://www150.statcan.gc.ca/n1/en/pub/89-656-x/89-656-x2016017-eng.pdf?st=f9CBbN_r
- Babbie, E.R. 2001. *The practice of social research*, 9th ed. Belmont, California: Wadsworth Thomson Learning.
- Beaton, B., Perley, D., George, C., and O'Donnell, S. 2017. Engaging remote marginalized communities using appropriate online research methods. In: Fielding, N.G., Lee, R.M., and Blank, G., eds. *The Sage handbook of online research methods*, 2nd ed. London: Sage. 563–577.
<https://doi.org/10.4135/9781473957992.n32>
- Bell, T., Briggs, R., Bachmayer, R., and Li, S. 2014. Augmenting Inuit knowledge for safe sea-ice travel: The SmartICE information system. 2014 Oceans—St. John's, 14–19 September 2014, St. John's, Newfoundland and Labrador. 1–9.
<https://doi.org/10.1109/OCEANS.2014.7003290>
- Bray, J.N., Lee, J., Smith, L.L., and Yorks, L. 2000. *Collaborative inquiry in practice: Action, reflection, and making meaning*. Thousand Oaks, California: Sage.
- Brook, R.M., and McLachlan, S.M. 2005. On using expert-based science to “test” local ecological knowledge. *Ecology and Society* 10(2): r3.
<http://www.ecologyandsociety.org/vol10/iss2/resp3/>

- Brunet, N.D., Hickey, G.M., and Humphries, M.M. 2014a. Understanding community-researcher partnerships in the natural sciences: A case study from the Arctic. *Journal of Rural Studies* 36:247–261.
<https://doi.org/10.1016/j.jrurstud.2014.09.001>
- . 2014b. The evolution of local participation and the mode of knowledge production in Arctic research. *Ecology and Society* 19(2): 69.
<https://doi.org/10.5751/ES-06641-190269>
- . 2016. Local participation and partnership development in Canada's Arctic research: Challenges and opportunities in an age of empowerment and self-determination. *Polar Record* 52(3):345–359.
<https://doi.org/10.1017/S003224741500090X>
- . 2017. How can research partnerships better support local development? Stakeholder perceptions on an approach to understanding research partnership outcomes in the Canadian Arctic. *Polar Record* 53(5):479–488.
<https://doi.org/10.1017/S0032247417000407>
- Charmaz, K. 2014. *Constructing grounded theory*, 2nd ed. London: Sage.
- CIHR, NSERC, and SSHRC (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada). 2018. Tri-Council policy statement: Ethical conduct for research involving humans.
<https://ethics.gc.ca/eng/documents/tcps2-2018-en-interactive-final.pdf>
- Coelho, K. 2018. New uses of “old” media: Exploring technologies-in-use in Nunavut. *Canadian Journal of Communication* 43(4):507–524.
<https://doi.org/10.22230/cjc.2018v43n4a3222>
- CRTC (Canadian Radio-Television and Telecommunications Commission). 2016. Telecom regulatory policy CRTC 2016-496.
<https://crtc.gc.ca/eng/archive/2016/2016-496.htm>
- . 2018. Telecom regulatory policy CRTC 2018-377.
<https://crtc.gc.ca/eng/archive/2018/2018-377.htm>
- Cuerrier, A., Brunet, N.D., Gérin-Lajoie, J., Downing, A., and Lévesque, E. 2015. The study of Inuit knowledge of climate change in Nunavik, Québec: A mixed methods approach. *Human Ecology* 43(3):379–394.
<https://doi.org/10.1007/s10745-015-9750-4>
- Danielsen, F., Topp-Jørgensen, E., Levermann, N., Løvstrøm, P., Schiøtz, M., Enghoff, M., and Jakobsen, P. 2014. Counting what counts: Using local knowledge to improve Arctic resource management. *Polar Geography* 37(1):69–91.
<https://doi.org/10.1080/1088937X.2014.890960>
- Dutheil, A., Tester, F., and Konek, J. 2015. Unequal exchange: Western economic logic and Inuit/Qablunaat research relationships. *Polar Record* 51(2):140–150.
<https://doi.org/10.1017/S0032247413000673>
- Eisenhardt, K.M., and Greabner, M.E. 2007. Theory building from cases: Opportunities and challenges. *Academy of Management Journal* 50(1):25–32.
<https://doi.org/10.5465/amj.2007.24160888>
- Fendt, J., and Sachs, W. 2008. Grounded theory method in management research: Users' perspectives. *Organizational Research Methods* 11(3):430–455.
<https://doi.org/10.1177/1094428106297812>
- Ferguson, D.B., Rice, J., and Woodhouse, C.A. 2014. *Linking environmental research and practice: Lessons from the integration of climate science and water management in the western United States*. Tucson: Climate Assessment for the Southwest, University of Arizona.
- Fiser, A. 2013. *Mapping the long-term options for Canada's North: Telecommunications and broadband connectivity*. Ottawa: The Conference Board of Canada.
- GC (Government of Canada). 2017. *Census profile, 2016 census*. Ottawa: Statistics Canada.
<http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>
- . 2019. *Announced Connect to Innovate projects*. Ottawa: Innovation, Science and Economic Development Canada.
<https://www.ic.gc.ca/eic/site/119.nsf/eng/00009.html>
- Glaser, B.G., and Strauss, A.L. 1967. *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine Publications Company.
- Henri, D., Gilchrist, H.G., and Peacock, E. 2010. Understanding and managing wildlife in Hudson Bay under a changing climate: Some recent contributions from Inuit and Cree ecological knowledge. In: Ferguson, S.H., Loseto, L.L., and Mallory, M.L., eds. *A little less Arctic: Top predators in the world's largest northern inland sea, Hudson Bay*. Dordrecht: Springer. 267–289.
https://doi.org/10.1007/978-90-481-9121-5_13
- Hoppers, W. 2009. Participatory practices in policy-making: Negotiating democratic outcomes or manoeuvring for compliance? *International Journal of Educational Development* 29(3):250–259.
<https://doi.org/10.1016/j.ijedudev.2008.02.004>
- Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. *Arctic* 51(3):237–242.
<https://doi.org/10.14430/arctic1065>
- ITK (Inuit Tapiriit Kanatami). 2018. *National Inuit strategy on research*. Ottawa: ITK.
- ITK and NRI (Inuit Tapiriit Kanatami and Nunavut Research Institute). 2007. *Negotiating research relationships with Inuit communities: A guide for researchers*. Nickels, S., Shirley, J., and Laidler, G., eds. Ottawa and Iqaluit: ITK and NRI.
- Johnson, J.T., Howitt, R., Cajete, G., Berkes, F., Louis, R.P., and Kliskey, A. 2016. Weaving Indigenous and sustainability sciences to diversify our methods. *Sustainability Science* 11(1):1–11.
<https://doi.org/10.1007/s11625-015-0349-x>
- Johnston, P., Stoller, M., and Tester, F. 2018. Institutional barriers to community-based research: Learning from the Nunavut, Nanivara Project. *Critical Social Work* 19(1):65–84.

- Jones, A., Barnett, B., Williams, A.J., Grayson, J., Busilacchi, S., Duckworth, A., Evans-Illidge, E., Begg, G.A., and Murchie, C.D. 2008. Effective communication tools to engage Torres Strait Islanders in scientific research. *Continental Shelf Research* 28(16):2350–2356.
<https://doi.org/10.1016/j.csr.2008.03.027>
- Kainer, K.A., DiGiano, M.L., Duchelle, A.E., Wadt, L.H.O., Bruna, E., and Dain, J.L. 2009. Partnering for greater success: Local stakeholders and research in tropical biology and conservation. *Biotropica* 41(5):555–562.
<https://doi.org/10.1111/j.1744-7429.2009.00560.x>
- Katinnganiq. 2019. Smart cities challenge. Katinnganiq: Community, connectivity and digital access for life promotion in Nunavut.
https://katinnganiq.com/app/uploads/2019/04/Final_Smart-Cities-Proposal_Nunavut_English-Revised-4.pdf
- Keysar, B., and Henly, A.S. 2002. Speakers' overestimation of their effectiveness. *Psychological Science* 13(3):207–212.
<https://doi.org/10.1111/1467-9280.00439>
- King, L., Hawe, P., and Wise, M. 1998. Making dissemination a two-way process. *Health Promotion International* 13(3):237–244.
<https://doi.org/10.1093/heapro/13.3.237>
- Kirmayer, L.J., Fletcher, C., and Watt, R. 2009. Locating the ecocentric self: Inuit concepts of mental health and illness. In: Kirmayer, L.J., and Valaskakis, G.G., eds. *Healing traditions: The mental health of Aboriginal peoples in Canada*. Vancouver: UBC Press. 289–314.
- Kral, M. 2003. *Unikkaartuit*: Meaning of well-being, sadness, suicide and change in two Inuit communities. Final report to the National Health Research and Development Programs, Project #6606–6231–002. Ottawa: Health Canada.
- Ljubicic, G.J., Pulsifer, P.L., Hayes, A., and Taylor, D.R.F. 2014. The creation of the Inuit *siku* (sea ice) atlas. In: Taylor, D.R.F., and Lauriault, T.P., eds. *Developments in the theory and practice of cybercartography: Applications and Indigenous mapping*, 2nd ed. Modern Cartography Series, Vol. 5. Amsterdam: Elsevier B.V. 201–218.
<https://doi.org/10.1016/B978-0-444-62713-1.00014-3>
- MacDonald, J.P., Ford, J.D., Cunsolo Willox, A., and Ross, N.A. 2013. A review of protective factors and causal mechanisms that enhance the mental health of Indigenous circumpolar youth. *International Journal of Circumpolar Health* 72(1): Article 21775.
<https://doi.org/10.3402/ijch.v72i0.21775>
- Mallory, M.L., Gilchrist, H.G., Janssen, M., Major, H.L., Merkel, F., Provencher, J.F., and Strøm, H. 2018. Financial costs of conducting science in the Arctic: Examples from seabird research. *Arctic Science* 4(4):624–633.
<https://doi.org/10.1139/as-2017-0019>
- Mea, M., Newton, A., Uyarra, M.C., Alonso, C., and Borja, A. 2016. From science to policy and society: Enhancing the effectiveness of communication. *Frontiers in Marine Science* 3: Article 168.
<https://doi.org/10.3389/fmars.2016.00168>
- Molyneaux, H., O'Donnell, S., Kakekaspan, C., Walmark, B., Budka, P., and Gibson, K. 2014. Social media in remote First Nation communities. *Canadian Journal of Communication* 39(2):275–288.
<https://doi.org/10.22230/cjc.2014v39n2a2619>
- NRI and NI/TS (Nunavut Research Institute and Nunavut Interpreter/Translator Society). 2009. Tips for working with Inuktitut interpreters-translators in Nunavut. Nunavut Department of Education. 2018. Research in Nunavut schools policy.
https://www.gov.nu.ca/sites/default/files/fillpdf/4.7_edu_-_research_in_nunavut_school_policy_02_18.pdf
- Office of the Auditor General of Canada. 2018. Connectivity in rural and remote areas.
https://www.oag-bvg.gc.ca/internet/English/att__e_43221.html
- Ohmagari, K., and Berkes, F. 1997. Transmission of Indigenous knowledge and bush skills among the western James Bay Cree women of subarctic Canada. *Human Ecology* 25(2):197–222.
<https://doi.org/10.1023/A:1021922105740>
- Pearce, T.D., Ford, J.D., Laidler, G.J., Smit, B., Duerden, F., Allarut, M., Andrachuk, M., et al. 2009. Community collaboration and climate change research in the Canadian Arctic. *Polar Research* 28(1):10–27.
<https://doi.org/10.1111/j.1751-8369.2008.00094.x>
- Pfeifer, P. 2018. From the credibility gap to capacity building: An Inuit critique of Canadian Arctic research. *Northern Public Affairs*, July 2018:29–34.
http://www.northernpublicaffairs.ca/index/wp-content/uploads/2018/07/NPA_6_1_2018_Web_pg29-34.pdf
- Phillipson, J., Lowe, P., Proctor, A., and Ruto, E. 2012. Stakeholder engagement and knowledge exchange in environmental research. *Journal of Environmental Management* 95(1):56–65.
<https://doi.org/10.1016/j.jenvman.2011.10.005>
- Provencher, J.F., McEwan, M., Mallory, M.L., Braune, B.M., Carpenter, J., Harms, N.J., Savard, G., and Gilchrist, H.G. 2013. How wildlife research can be used to promote wider community participation in the North. *Arctic* 66(2):237–243.
<https://doi.org/10.14430/arctic4302>
- Rasing, W. 1999. Hunting for identity: Thoughts on the practice of hunting and its significance for Iglulingmiut identity. In: Oosten, J., and Remie, C., eds. *Arctic identities: Continuity and change in Arctic and Saami societies*. Leiden: University of Leiden. 79–108.
- Salmon, R.A., Carlson, D.J., Zicus, S., Pauls, M., Baeseman, J., Sparrow, E.B., Edwards, K., et al. 2011. Education, outreach, and communication during the International Polar Year 2007–2008: Stimulating a global polar community. *The Polar Journal* 1(2):265–285.
<https://doi.org/10.1080/2154896X.2011.626629>
- Scott, J.C. 1990. *Domination and the arts of resistance: Hidden transcripts*. New Haven, Connecticut: Yale University Press.
- Shanley, P., and Laird, S.A. 2002. “Giving back:” Making research results relevant to local groups and conservation. In: Laird, S.A., ed. *Biodiversity and traditional knowledge: Equitable partnerships in practice*. London: Earthscan. 102–124.

- Smith, L.T. 1999. *Decolonizing methodologies: Research and Indigenous peoples*. London: Zed Books.
- Strauss, A.L., and Corbin, J. 1998. *Basics of qualitative research: Techniques and procedures for developing grounded theory*, 2nd ed. Thousand Oaks, California: Sage.
- Suddaby, R. 2006. From the editors: What grounded theory is not. *Academy of Management Journal* 49(4):633–642.
<https://doi.org/10.5465/amj.2006.22083020>
- Sultana, F. 2007. Reflexivity, positionality, and participatory ethics: Negotiating fieldwork dilemmas in international research. *ACME: An International Journal for Critical Geographies* 6(3):374–385.
- Takano, T. 2004. *Bonding with the land: Outdoor environmental education programmes and their cultural contexts*. PhD thesis, University of Edinburgh, Edinburgh, United Kingdom.
- Timm, K., Hum, R., and Druckenmiller, M. 2016. Using communication theory and strategy to communicate science and build stakeholder relationships in the Arctic. White paper submitted to the “Actor and stakeholder engagement and needs in sustained Arctic observations” Thematic Working Group for the 2016 Arctic Observing Summit.
<https://www.arcticobservingsummit.org/sites/default/files/Timm-Hum-Druckenmiller-REVISEDRC-AOS-Statement-Revised-1222016.pdf>
- Trenholm, S., Jensen, A., and Hambly, H.V. 2010. *Interpersonal communication: A guided tour for Canadians*. Don Mills, Ontario: Oxford University Press.
- Turner, B.A. 1983. The use of grounded theory for the qualitative analysis of organizational behavior. *Journal of Management Studies* 20(3):333–348.
<https://doi.org/10.1111/j.1467-6486.1983.tb00211.x>
- Van der Sanden, M.C.A., and Meijman, F.J. 2008. Dialogue guides awareness and understanding of science: An essay on different goals of dialogue leading to different science communication approaches. *Public Understanding of Science* 17(1):89–103.
<https://doi.org/10.1177/0963662506067376>
- Van Kerkhoff, L.E., and Lebel, L. 2015. Co-productive capacities: Rethinking science-governance relations in a diverse world. *Ecology and Society* 20(1): 14.
<https://doi.org/10.5751/ES-07188-200114>
- Vannoy, S.A., and Salam, A.F. 2009. Managerial interpretations of the role of information systems in competitive actions and firm performance: A grounded theory investigation. *Information Systems Research* 21(3):496–515.
<https://doi.org/10.1287/isre.1100.0301>
- Wexler, L.M. 2006. Inupiat youth suicide and culture loss: Changing community conversations for prevention. *Social Science and Medicine* 63(11):2938–2948.
<https://doi.org/10.1016/j.socscimed.2006.07.022>
- Winter, J., and Boudreau, J. 2018. Supporting self-determined Indigenous innovations: Rethinking the digital divide in Canada. *Technology Innovation Management Review* 8(2):38–48.
<https://doi.org/10.22215/timreview/1138>
- Yin, R.K. 2009. *Case study research: Design and methods*, 4th ed. Thousand Oaks, California: Sage.