The Canadian Geographer
Le Géographe canadien
Canadian Association of Geographers
Association Canadienne des Géographes

An argument for ethical physical geography research on Indigenous landscapes in Canada

Geoffrey G. L. Kershaw
School for Resource & Environmental Studies, Dalhousie University

Heather Castleden
School for Resource & Environmental Studies, Dalhousie University

Colin P. Laroque
Department of Geography and Environment, Mount Allison University

In Canadian physical geography, the ethical implications of research occurring in Indigenous spaces and places have historically been overlooked. Physical geographers, particularly those working in northern Canada, are beginning to recognize that our research takes place in a sensitive social space and the knowledge we pursue has ethical and moral implications. The Canadian Geographer *recently published a special issue (56:2) that documents the many challenges and opportunities of community-based participatory research involving Indigenous peoples in Canada. Throughout that issue, the 2010 Tri-Council Policy Statement, Ethical Conduct for Research Involving Humans (TCPS2), was referenced as important in directing a shift towards ethical interactions with Indigenous peoples in research. Drawing on material from the special issue and the TCPS2, this article gives an overview of the authors' experiences in attempting to execute an ethically sound physical geography study in traditional Dene territory in northern Saskatchewan. The viewpoint concludes with thoughts on what bridges and barriers exist when attempting physical geography research that is sensitive to the ethical responsibilities of working in Indigenous spaces. From our perspective, physical geographers can strengthen the ethical defensibility and overall quality of their research by enhancing involvement with indigenous communities that are potentially impacted by their research findings.*

Keywords: Idle No More, Indigenous Peoples, physical geography, oil sands, TCPS2

Un plaidoyer pour la recherche éthique en géographie physique des paysages autochtones au Canada

Dans la pratique de la géographie physique au Canada, les répercussions éthiques des travaux de recherche menés sur des espaces et des lieux autochtones ont été peu étudiées dans le passé. Les géographes physiques, en commençant par ceux qui sont actifs dans les régions nordiques du Canada, sont peu à peu conscients du fait que nos travaux de recherche se déroulent dans des espaces sociaux sensibles et que les connaissances que nous souhaitons acquérir ont des conséquences sur le plan éthique et moral. Le Géographe canadien a récemment fait paraître un numéro spécial (vol.56, no.2) qui rassemble des informations sur les nombreux défis à relever et les possibilités de la recherche participative axée sur la communauté et portant sur les peuples autochtones au Canada. Tous les auteurs ont accordé une importance à l'Énoncé de politique des trois Conseils: éthique de la recherche avec des êtres humains (EPTC-2) dans l'évolution vers des interactions éthiques en recherche avec des peuples autochtones. En s'appuyant sur des informations tirées du numéro spécial et de l'EPTC-2, cet article présente une vue d'ensemble des expériences que les auteurs ont éprouvées dans le cadre d'une étude de géographie physique conforme à l'éthique menée dans le territoire traditionnel de Dene, situé au nord de la Saskatchewan. Des perspectives sont esquissées sur les éléments facilitateurs et les obstacles qui peuvent se présenter lorsque des travaux de recherche en géographie physique sont effectués de manière responsable sur le plan éthique dans des espaces autochtones. Nous sommes de l'avis que les

Correspondence to/Adresse de correspondance: Geoffrey G.L. Kershaw, School for Resource & Environmental Studies, 6100 University Avenue, Suite 5010, P. O. Box 15000, Halifax, NS B3H 4R2, Email/Courriel: gglkershaw@gmail.com

The Canadian Geographer / Le Géographe canadien 2014, xx(xx): 1–7
DOI: 10.1111/cag.12092

géographes physiques peuvent renforcer l'éthique et la qualité globale de leurs travaux de recherche par le renforcement de la participation active des communautés autochtones susceptibles d'être affectées par les résultats de leurs travaux de recherche.

Mots clés : Idle no more, peuples autochtones, géographie physique, sables bitumineux, EPTC-2

Introduction

The ethics of physical geography in Indigenous spaces

The Idle No More movement (INM), which is an Indigenous peoples' led resistance to recent federal omnibus legislation affecting Indigenous treaty rights and environmental integrity (Idle No More 2012; CBC News 2013), has precipitated a lively, if not heated, national dialogue concerning the relationship between Indigenous–settler[1] peoples in Canada:

> The vision of INM revolves around Indigenous ways of knowing rooted in Indigenous sovereignty to protect water, air, land and all creation for future generations. The Conservative government bills beginning with Bill C–45 threaten Treaties and this Indigenous vision of sovereignty. The goal of the movement is education and to revitalize Indigenous peoples through awareness and empowerment. INM has successfully encouraged knowledge sharing of Indigenous sovereignty and environmental protections. This message has been heard around the world and the world is watching how Canada responds to the message sent by many INM supporters. (Meekis 2013)

The three research funding councils of Canada (Canadian Institutes of Health Research [CIHR], the Social Sciences and Humanities Research Council of Canada [SSHRC], and the Natural Sciences and Engineering Research Council of Canada [NSERC]) have established a *Tri–Council* policy statement concerning the ethical conduct of researchers receiving their grants. The 1998 statement was in need of revision to maintain its currency with the evolving nuances of what constitutes "ethical" research, and so in 2010 a revised joint policy statement was released*: The Tri–Council Policy Statement: Ethical Conduct for Research Involving Humans* (CIHR et al. 2010), or TCPS2 for short.

A substantial change from TCPS to TCPS2 was the addition of Chapter 9, which is specifically dedicated to the ethics of research involving Indigenous peoples in Canada[2] (CIHR et al. 2010). Chapter 9 was a constant reference in last year's (2012) Summer Issue of *The Canadian Geographer* (56:2) (Castleden et al. 2012a, 2012b; Grimwood et al. 2012; Koster et al. 2012), which focused on Indigenous community–based participatory research in Canadian geography. The special issue included accounts of the progress made and challenges faced by geographers responding to the ethical requirements of research involving Indigenous peoples in Canada.

The current structure of the TCPS2 does not give direct consideration to non–human research subjects: "[r]esearch that involves the collection and analysis of tissue samples from animals or plants, and not involving human research participants, is not covered within the scope of this policy and does not require institutional REB review" (CIHR et al. 2010, 113). Although physical geography research does not typically involve human participants, the resulting knowledge produced often has impacts on human populations. After examining Chapter 9, we found it surprising how little direction is given concerning how physical geographers might apply ethical principles in their research when occurring on Indigenous lands.[3] Were one to "read between the lines," one might make the connection that, in some respects, guidance for ethical considerations concerning non–human subjects is provided tangentially by association with Indigenous peoples. For example, Indigenous peoples' "ethical obligations often extend to respectful relations with plant, animal and marine life" (CIHR et al. 2010, 108). This consideration is limited, however, to First

[1] By "settler" we mean non–Indigenous peoples whose ancestors, or themselves, have immigrated to Canada, reside on traditional Indigenous territories, and effectively dispossess Indigenous peoples from those territories.

[2] In this article, Indigenous peoples in Canada refer to First Nations, Métis, and Inuit peoples; the federal government has designated these peoples as "Aboriginal" in the Canadian Constitution.

[3] In this article, the broadest definition of Indigenous lands is considered traditional territory, which includes all lands occupied and used historically by an Indigenous group (Bill 2006). Traditional territory often extends beyond lands which Indigenous groups have title to in contemporary times, be they reserve lands or treaty lands that are part of larger co–governance structures.

Nations, Inuit, and Métis lands, which include "Indian reserves, Métis settlements, and lands governed under a self-government agreement or an Inuit or First Nations land claim agreement" (CIHR et al. 2010, 108).

In short, the ethical responsibility for physical geography research is limited, but there is space to rethink those responsibilities within the guidelines of the TCPS2. Encouragingly, there has been movement among physical geographers in northern Canada to engaging in more community involvement in research occurring in Indigenous spaces and places (Korsmo and Graham 2002; Gearheard and Shirley 2007). University-based offices of research services could strengthen this development by not releasing funding to researchers until such time as they have demonstrated that their "research is [not] likely to affect the welfare of an Indigenous community, or communities…[and that if it will, the] researchers shall seek engagement with the relevant community" (CIHR et al. 2010, 110). This stipulation applies a broader understanding of Indigenous well-being that considers the environment's state of wellbeing as linked to human health (Parkes 2010), a concept often referred to as EcoHealth (Rapport and Singh 2006). As NSERC is responsible for assuring the TCPS2's full and fair application in NSERC-funded research, and is "committed to the continued evolution of this Policy" (CIHR et al. 2010, 105), growing attention to Indigenous rights and interests—as expressed in the INM movement—should be viewed as an opportunity to reassess the TCPS2's application in physical geography.

(Un)learning to collaborate

The importance of Indigenous community involvement in physical geography research is heightened when one considers how many Indigenous worldviews often emphasize "[o]ne essential aspect of their relationship to nature [that] humans are formed of the same essence as other life forms and may transform from one to the other" (Kew and Griggs 1991) (Ayers et al. 2012, 265).[4] As the TCPS2 does acknowledge "the role of community in shaping the conduct of research that affects First Nations, Inuit and Métis communities" (CIHR et al. 2010, 107), non-human subjects should be treated with such respect as the local Indigenous community deems fitting. Following from Ayers et al. (2012, 265), the result could be ethical considerations for non-human subjects' having parity with humans. In this light, physical geographers should ask Indigenous peoples associated with the land under study about the ethical and/or relational sensitivities they have towards non-human subjects and how we, as (still largely non-Indigenous) researchers, can accommodate them.

Physical geographers do not typically receive training in participatory research, which is not requisite for their projects and is even actively discouraged by the dominant discourse based on the values of scientific objectivity (Feldman 2004). This lack of skill is, in part, responsible for the limited buy-in from local residents of externally developed conservation projects (Mulrennan et al. 2012). The expectation for separation between researchers and potential Indigenous community partners is reinforced in the TCPS2: "a community may, for example, support a research project carried out independent of community influence, or without any further collaboration of the community in the actual implementation of the research in order to use *scientifically defensible results* to validate a negotiating position" (CIHR et al. 2010, 122) (emphasis added).

Much of NSERC funded research is undertaken with industrial partnerships and often has economic implications. Chapter 9 of the TCPS2 states that if "research has explicit commercial objectives, or direct or indirect links to the commercial sector, researchers and communities may want to include provisions related to anticipated commercial use in research agreements" (CIHR et al. 2010, 129). The use of "may want to" implies that the researcher has a choice, not an obligation, to engage and accommodate a community's economic interests. Research involving Indigenous peoples has often resulted in economic gains not shared with them (e.g., misappropriating Indigenous Knowledge concerning the medicinal properties of herbal plants; geological surveys for future resource extraction (Hein 2000; Mgbeoji 2006)). The current INM movement reinforces that it is incumbent on researchers to fulfill, in good faith, their side of the reciprocity exchange. When access to reserve lands/traditional territories is granted (assuming this level of engagement has already taken place) and the research involves

[4] See Struthers and Peden-McAlpine 2005, Castleden et al. 2009, and Beckford et al. 2010 for other examples of Indigenous expressions of "oneness."

potential economic gain, researchers need to share results and economic benefits with the Indigenous community/communities affected; formal research agreements are one mechanism for doing so.

Our attempt to be Idle No More

As a team of natural and social scientists, we have attempted to respond to the ethical dimension of our research on potential Alberta bitumen mining pollution impacts registered in tree growth downwind. This research project occurs on traditional Dene territory in northern Saskatchewan, and while not a community-based participatory research (CBPR) project—CBPR being much more rigorous and extensive in the measures it uses to assure inclusion and an equitable distribution of influence and benefits between the research team and the partnering community (Castleden et al. 2012b)—the following account reflects our attempt at creating an ethical space given the limited time and financial resources associated with a self-contained masters project.[5]

Phase I—Establishing relations

Dialogue involving the regional Tribal Council had occurred prior to data collection and permission for the study was granted at this level. However, no direct connection had been made with the Chief and Council of the community whose traditional territory the study transect would intersect. Because of this, the lead author had extensive e-mail and telephone conversations with the Band's management concerning how to arrange a trip to the community to discuss the project with the Chief and Council. Logistically this was difficult to achieve due to scheduling incompatibilities and the physical distance between the community and the researchers (~5000 kilometres). After several failed attempts to coordinate schedules, the lead author embarked on an eight-hour drive to the community, hoping but not knowing if the Chief and Council would be available.

The plan on arrival was to simply ask for an opportunity to speak at a Council meeting; the lead author was granted this privilege and gave a brief introduction to the research project (already underway). Additional discussions with the Chief, Band manager, and health coordinator took place immediately afterward. At the conclusion of this first visit, it was agreed that an ongoing dialogue with Band management as well as local teachers was necessary. The involvement of teachers was based on the expressed need to showcase science career options to community youth.

While our 'order of operations' was not perfect, with this trip, three key objectives were met: 1) we created an awareness of our project in the community and attained permission to continue with our research; 2) we demonstrated a commitment to the leadership to communicate openly throughout the research process; and 3) we established an expectation in the community for follow-up and an investment on the part of the research team to make the project relevant to the community's needs.

Phase II—Community engagement

Preparation. An experiential learning module for high school science students was designed with input from community teachers and university educators. It remained difficult to develop full commitment and mutual understanding with the teachers and Band management given the physical distance between the community and our universities, but sufficient conversation occurred to allow us to prepare for two weeks in the community involving class presentations and field trips for the students. The field school was implemented over three weeks in April–May 2012.

Classroom delivery. Before in-class activities began, a week was reserved for the lead author to re-connect with Band management, school administration, and other interested community members. Instruction style and content were discussed with the teachers and other school support staff. Presentations were then made to Grade 10 students in two subject areas: energy and mining, and geography. Approximately 25 students were involved.

Field school. The most important engagement activity was a field trip to sample trees and collect data that would be used in our analysis. The week after class presentations, 14 students, two Elders,

[5] Given the brevity of viewpoint articles, it is difficult to fully articulate the nuances of the project and the Dene community's (and Tribal Council's) support for it; for detail about both, see Kershaw (2013).

one teacher, another school staff member, and the lead author collected tree samples. Students learned to use corers to sample trees, and demonstrated strong interest in the activity. The lead author's planned activities were quickly abandoned to put everyone (else) at ease and allow for unforeseen mutual learning opportunities; in retrospect, this was key to the field trip's success. For example, it opened up an opportunity for an Elder to teach the students and lead author how to break a log by leveraging it between two tree trunks. In another instance, a student was able to translate a conversation between another Elder and the lead author, which led to further discussion about tree selection and the factors that influence tree growth.

The Canadian Light Source (CLS). Nine students elected to participate in an overnight trip to the CLS at the University of Saskatchewan. The third author, himself Métis and originally from Saskatchewan, was present at the university to talk about science as a career motivated by personal connections to the land. Some of the most engaging learning took place over meals or on the road and while these moments often did not focus on the research project, they were opportunities to more broadly explore each other's understandings of ecology and culture. One student expressed interest in going to university and all students appreciated the learning opportunity that the trip provided. In short, there was a sense of satisfaction (relational ethics) among the research team over the level of student interest.

Phase III—Continuing relationships

Over the life of the project we submitted short jargon-free updates on research progress to the Band management. Final results will be shared during a visit with the community in the summer of 2013. This may take the form of in-class visits, a discussion with Chief and Council, and/or a multi-media presentation followed by discussion open to all community members. Precisely what format of engagement will occur remains to be seen, but our course of action will be undertaken with guidance from Band leadership. Having begun developing this community-university relationship, we desire to maintain it and continue to find ways to work together and share our passion for geography with this Dene community.

Bridges and barriers

Bridges

It is incumbent on us as Canadian geographers, most of whom are non-Indigenous, to engage Indigenous peoples in research when they are potentially affected by our research processes or results, especially in light of the fact that geography has played a significant role in the colonial encounter here in Canada (Godlewska and Smith 1994). Such research must be "relevant to community priorities and have the potential to produce valued outcomes from the perspective of the community and its members" (CIHR et al. 2010, 124). As such, it behooves researchers to modify their traditional arms-length and "objective" approaches and accommodate potentially affected Indigenous communities' interests and inputs. This, in addition to the constitutionally protected rights and Treaty obligations, the details of which are beyond the scope of this paper.

It is important that researchers "offer the option of engagement, [but also recognize and accept that] a community may choose to engage nominally or not at all, despite being willing to allow the research to proceed" (CIHR et al. 2010, 121). It is well known that disciplinary silos have a history of speaking past each other in the academy and that the jargon of academic discourse is often uninviting to the uninitiated. Thus, it is not surprising that the same lack of engagement has been known to occur in the public domain, including Indigenous communities (Taylor 1995). We should endeavour to make our science accessible and open ourselves to the value of Indigenous science as we try to respond to the pressing environmental issues of the twenty-first century.

Barriers

The time and funding required to assure our conduct was ethically responsible during this project were major limiting factors. Funds for community engagement were difficult to secure, and although such funding can be built into larger grants, smaller pools of funding dedicated towards these ends are limited. Time and money were often cited as barriers to engaging in CBPR in *The Canadian Geographer* (56:2) (Ayers et al. 2012; Castleden et al. 2012a; Leeuw et al. 2012); this is a tension that needs to be grappled with, not only in the TCPS2 guidelines but

also in Tri-Council funding architecture. The process of relationship building and the mutual understanding required to adapt a research project to suit a community's interests is long, and the academic pay-out, in the form of data leading to publications, is small (Castleden et al. 2012a). However, the measure of a study's success is more than that granted within our own self-selecting academic circles; there is a larger, more important social landscape surrounding us that we are ethically obliged to be involved with and validated by as well.

Closing thoughts

Geographer Brad Coombs of Aotearoa (New Zealand) noted in *The Canadian Geographer* (56:2) that Canadian geographers are too often focused on "diversifying research dissemination and not disseminating research production" (Coombes 2012, 291); his critique is valid, and something we recognize as a weakness in our research. That said, considering the track record of research relations between Indigenous peoples and non-Indigenous physical geographers, the dissemination of results is perhaps a prerequisite to greater mutual understanding and engagement in research design and production. Like our fellow human geographers, we need to get out of the ivory tower, into the community, and "listen (listen, listen) respectfully to the community members, leaders, and Elders concerning issues that are important to them" (Castleden et al. 2012a, 173).

Geographer Renee Pualani Louis, a Native Hawaiian, also offered a commentary in *The Canadian Geographer* (56:2); she noted that "[f]rom an Indigenous perspective, speaking about any experience should be considered a secondary source while engaging in that experience is a primary source" (2012, 289). There is a constant tension in the academy between theory and practice, and the danger of rhetoric rather than meaningful action is real with respect to research involving Indigenous peoples (Castleden et al. 2012b). In our view, developing a CBPR approach to physical geography research is effective practice and an *ethical* way to respond to INM calls for respect and accommodation of Indigenous ways of knowing.

Building strong relationships with Indigenous communities enables researchers to carry out research "in a good way" (Ball and Janyst 2008). While this project was unable to develop a fully equitable collaboration with the community, we hope our first steps will create space for the development of future research partnerships with shared decision-making, shared ownership, and bi-directional capacity-building, knowledge-sharing, and benefits in the future.

References

Ayers, C., P. Dearden, and R. Rollins. 2012. An exploration of Hul'qumi'num Coast Salish peoples' attitudes towards the establishment of no-take zones within marine protected areas in the Salish Sea, Canada. *The Canadian Geographer* 56(2): 260–274.

Ball, J., and P. Janyst. 2008. Enacting research ethics in partnerships with indigenous communities in Canada: "Do it in a good way." *Journal of Empirical Research on Human Research Ethics* 3(2): 33–51.

Beckford, C., C. Jacobs, N. Williams, and R. Nahdee. 2010. Aboriginal environmental wisdom, stewardship, and sustainability—Lessons from the Walpole Island First Nations, Ontario, Canada. *Journal of Environmental Education* 41(4): 239–248.

Bill, L. 2006. Traditional land-use and occupancy study of Cahcakiwsakahikan (Pelican Lake) First Nation: A Woodland Cree Community in Northern Saskatchewan. Masters thesis, University of Manitoba, Manitoba.

Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council. 2010. *Tri-council policy statement: Ethical conduct for research involving humans*. www.pre.ethics.gc.ca.

Castleden, H., T. Garvin, and Huu-ay-aht First Nation. 2009. Hishuk Tsawak (Everything is One/Connected): A Huu-ay-aht worldview for seeing forestry in British Columbia. *Society & Natural Resources* 22(9): 789–804.

Castleden, H., V. Morgan, and C. Lamb. 2012a. "I spent the first year drinking tea": Exploring Canadian university researchers' perspectives on community-based participatory research involving Indigenous peoples. *The Canadian Geographer* 56(2): 160–179.

Castleden, H., M. Mulrennan, and A. Godlewska. 2012b. Community-based participatory research involving Indigenous peoples in Canadian geography: Progress? An editorial introduction. *The Canadian Geographer* 56(2): 155–159.

CBC News. 2013. Idle No More protesters stall railway lines, highways: 5-hour blockade of railways between Toronto, Ottawa and Montreal. *CBC News*, Ottawa, January 17. http://www.cbc.ca/news/politics/story/2013/01/16/idle-no-more-lookahead.html.

Coombes, B. 2012. Collaboration: Inter-subjectivity or radical pedagogy? *The Canadian Geographer* 56(2): 290–291.

Feldman, S. 2004. The culture of objectivity: Quantification, uncertainty, and the evaluation of risk at NASA. *Human Relations* 57: 690–718.

Gearheard, S., and J. Shirley. 2007. Challenges in community-research relationships: Learning from natural science in Nunavut. *Arctic* 60(1): 62–74.

Godlewska, A., and N. Smith. 1994. *Geography and empire*. Oxford, UK: Blackwell Publishing.

Grimwood, B., N. Doubleday, G. Ljubicic, S. Donaldson, and S. Blangy. 2012. Engaged acclimatization: Towards responsible community–based participatory research in Nunavut. *The Canadian Geographer* 56(2): 211–230.

Hein, F. 2000. *Historical overview of the Fort McMurray area and oil sands industry in Northeast Alberta*. Earth Sciences Report 2000–05. Edmonton, AB: Alberta Geological Survey, http://www.ags.gov.ab.ca/publications/abstracts/ESR_2000_05.html.

Korsmo, F., and A. Graham. 2002. Research in the North American north: Action and reaction. *Arctic* 55(4): 319–328.

Idle No More. 2012. Calls for change. Meekis Designs. http://www.idlenomore.ca/calls_for_changehttp://idlenomore.ca/ (Accessed March 19, 2013).

Kershaw, G. 2013. Talking to trees: A dendrochronological assessment of the atmospheric pollution effects of Athabasca bitumen mining downwind from the industry. Masters thesis, Dalhousie University, Nova Scotia.

Kew, J. E., and J. R. Griggs. 1991. Native Indians of the Fraser basin: Towards a model of sustainable resource use. In *Perspectives on sustainable development in water management: Towards agreement in the Fraser River Basin* ed. A. H. Dorcey. Vancouver, BC: Westwater Research Centre, University of British Columbia, 17–47.

Koster, R., K. Baccar, and R. Lemelin. 2012. Moving from research on, to research with and for Indigenous communities: A critical reflection on community–based participatory research. *The Canadian Geographer* 56(2): 195–210.

Leeuw, S., E. Cameron, and M. Greenwood. 2012. Participatory and community–based research, Indigenous geographies, and the spaces of friendship: A critical engagement. *The Canadian Geographer* 56(2): 180–194.

Louis, R. 2012. Timely, tasteful, rigorous, and relevant. *The Canadian Geographer* 56(2): 288–289.

Meekis, D. 2013. Press Release: January 10, 2013 for immediate release. Meekis Designs. http://idlenomore.ca/about–us/press–releases/item/83–press–release–january–10–2013–for–immediate–release. (Accessed April 28, 2013; site no longer active).

Mgbeoji, I. 2006. *Biopiracy: Patents, plants, and indigenous knowledge*. Vancouver, BC: UBC Press.

Mulrennan, M., R. Mark, and C. Scott. 2012. Revamping community–based conservation through participatory research. *The Canadian Geographer* 56(2): 243–259.

Parkes, M. 2010. *Ecohealth and Aboriginal health: A review of common ground*. Prince George: National Collaborating Centre for Aboriginal Health, http://nccah.netedit.info/docs/Eco–health_Margot Parkes 2011 – EN.pdf.

Rapport, D., and A. Singh. 2006. An EcoHealth–based framework for state of environment reporting. *Ecological Indicators* 6(2): 409–428.

Struthers, R., and C. Peden–McAlpine. 2005. Phenomenological research among Canadian and United States Indigenous populations: Oral tradition and quintessence of time. *Qualitative Health Research* 15: 1264–1276.

Taylor, J. 1995. Non–Native teachers teaching in Native communities. In *Redefining science education for Aboriginal students: The circle unfolds* ed. M. Battiste and J. Barman. Vancouver, BC: University Press of British Columbia, 224–244.