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Cybercartography and education: research and teaching with the *Residential Schools Land Memory Atlas*

Abstract. This paper sheds light on intersections between teaching and research in the Cybercartographic *Residential Schools Land Memory Atlas* (RSLMA), which is the central output of the Residential Schools Land Memory Mapping Project (RSLMMP). Building on previous work in Cybercartography, the RSLMMP has further contributed to the integration of research and education and the emergence of new research and education relationships. Viewing the atlas as a project output comprised of iterative processes along multiple dimensions allows us to appreciate limitations as challenges for further iterations, including new related projects and ongoing volunteer work with students. In addition to participating in the national response to the Truth and Reconciliation Commission of Canada's Calls to Action, this project – including the atlas – provides a model for a unique blend of teaching and research and the basis for further and new collaborations with a variety of different partners, including Residential School survivors. As a reconciliation project, the *Residential Schools Land Memory Atlas* further contributes to the intercultural bridge building aims of its parent, the *Lake Huron Treaty Atlas*, as it forges on in new directions.

Keywords: Cybercartography, research, teaching, reconciliation, reflexivity, emergence, Indigenous Peoples

1. Introduction

"One increasingly common way of engaging citizens and communities is to use mapping and spatial information technologies such as geographic information systems (GIS). Mapping in this context refers broadly to any method used to elicit and record spatial data. Examples range from hand drawn sketches to group chalk drawings to community '3D' physical and computer models. In all of these cases, mapping comprises not just a set of tools, but [also] the participatory process of gathering spatial information and making maps" (S.P. Vajjhala 2006).

Although it is from an article on ground-truthing policy, the above quotation is a reflection of the growing relevance and usefulness of broad approaches to mapping as tools for participatory engagement, including in education and reconciliation contexts. An increasing number of reconciliation-oriented education initiatives are gathering steam in Canada, in a combined effort to transform relationships shaped by its Residential Schools legacy. This momentum is significantly related to the Calls to Action enshrined in the final report of the Truth and Reconciliation Commission of Canada (2008−2015), whose aims included acknowledging Residential School experiences, impacts and consequences and promoting awareness and public education of Canadians about the IRS system and its impacts (see http://trc.ca/assets/pdf/Calls_to_Action_English2.pdf). According to the Commission, more than 150,000 First Nations, Metis and Inuit children in Canada were forcibly taken to residential schools and denied many freedoms, including their right to speak their language, practice their culture and communicate with family. Many former students have reported being victims of physical and/or sexual abuse, and several generations of survivors' descendants have been plagued with the ne-

gative intergenerational effects of their residential school experiences (S. Pyne et al. 2019). Reconciliation is a process that takes time, involves many actors, and includes a shift toward decolonizing education policies to foster critical thinking skills, reflexivity and ethical awareness. The Commission was mandated to create a National Research Centre for Truth and Reconciliation (see nctr.ca), which was established to provide broad access to information and ongoing interactions with research and education partners. These efforts reflect the broader shift toward de-colonizing policy, education, art and theoretical and applied research. Educators looking at ways to foster critical thinking skills, reflexivity, and ethical awareness in students; academics are beginning to blend research with education and are increasingly applying approaches that include community generated knowledge and knowledge from other sources.

Critical approaches to cartography participate in the collective quest to de-colonize knowledge and knowledge-gathering processes. Brian Harley is often associated with deconstructive approaches to map interpretation, which question the motives and context of the map maker (1988, 1989); whereas, reconstructive approaches include challenging conventional ontologies of maps and include making maps through participatory processes and community collaboration (see S. Pyne 2019b for a brief review). Paying particular attention to technologies and mapping, D.R. Fraser Taylor recognized the new digital context of maps in his 1991 definition of cartography as "[t]he organisation, presentation, communication and utilisation of geo-information in graphic, digital or tactile form. [Cartography] can include all stages from data presentation to end use in the creation of maps and related spatial information products" (1991, 214). There is growing attention to mapping experience, emotions, and Indigenous perspectives (S. Caquard 2011; R.P. Louis, J.T. Johnson and A.H. Pramono 2012; S. Pyne 2013; S. Pyne and D.R.F. Taylor 2012; D.R.F. Taylor and T. Lauriault 2014). These approaches lend themselves well to the social ground-truthing enterprise that characterizes reconciliation-oriented research and education.

Sociology and education and curriculum studies share a common thread: the significant theoretical and practical elaborations of the concept of "reflexivity" that have come out of research on qualitative methods (P. Bourdieu, L. Wacquant 1992; N.K. Denzin, Y.S. Lincoln, L. Tuhiwai Smith 2008; L. Ellingson 2009). This concept is most commonly reflected in discussions of "positionality" in both theory and practice. Accounting for positionality in research involves acknowledging the significance of researcher and participant perspectives on research processes and outcomes; an acknowledgement that extends to critical self-reflections on the research processes themselves, especially when they involve collaborative research efforts with team members from different knowledge environments. Today's research in education and curriculum development highlights the need for approaches to teaching and learning that incorporate increased self-reflection and are more responsive to students' needs in an increasingly complex, information rich, and multicultural world (T. Basit 2013; J. Torres 2011; S. Tilley, L. Taylor 2013).

In addition to considerations of reflexivity and positionality in curriculum, education policies are beginning to reveal increased emphasis on preparing students to 'think for themselves' and be aware of socially relevant issues from different perspectives in a variety of ways. For example, the Ontario Ministry of Education's 2013 curricula documents on social studies (grades 1 to 6), history and geography (grades 7 and 8), and Canadian and World Studies (grades 9 and 10) reveal a trend toward a focus on enhanced student outcomes that include improved critical skills ability and knowledge of social justice issues, and improved motivation and familiarity with key concepts and applications in geography, including Geographic Information Systems (Ontario Ministry of Education 2013a and 2013b). When it comes to integrating geographic information systems into curricula, "work regarding the use of geographical information systems (GIS) in schools has suggested that it supports both higher level thinking processes and increased intrinsic motivation" (B. West 2012, p. 267). Cybercartography takes a broad transdisciplinary approach to science and art; and acknowledges the holistic relationship between geospatial technologies and storytelling (S. Caquard, D.R.F. Taylor 2005; D.R.F. Taylor 2019). This position guides the design and development phases of projects to create cybercartographic atlases that convey multiple perspectives, including those of Indi-

genous Peoples and students. Reflexively integrating art with geospatial technologies addresses challenges associated with multiple ontologies in critically innovative and creative ways, which can enhance awareness of different perspectives.

While at first glance, a cybercartographic atlas is an interactive multimedia website with maps, it is also the collaborative processes that go into making the atlas map modules. Cybercartographic atlases develop over time through a series of iterative processes involving design, implementation and testing phases (G. Brauen et al. 2011). Prototypes, both paper and digital, are developed throughout these phases. These atlases and prototypes are related along a variety of dimensions, including the technological, content, economic, and conceptual dimensions (S. Pyne 2013, 2019a and 2019b). The Nunaliit Atlas Framework, which underpins this type of atlas, is Free and Open Source Software and available at nunaliit.org (A. Hayes et al. 2014; A. Hayes and D.R.F. Taylor 2019). The cybercartographic approach to the *Residential Schools Land Memory Atlas* (RSLMA, available at residentialschoolsatlas. org) provides a good example of a reflexive and emergent approach to collaborative cartography that reflects the central characteristics of Cybercartography; while maintaining its own distinctive traits, which are partly a function of the educational and research relationships that developed through the project to create the atlas (S. Pyne, D.R.F. Taylor 2015, 2019).

Results of the Residential Schools Land Memory Mapping Project (RSLMMP), include (but are not limited to) interrelated journal articles, a book entitled *Cybercartography in a Reconciliation Community: Engaging Intersecting Perspectives* (S. Pyne, D.R.F. Taylor 2019), book chapters, atlas map modules (including content), and the *Residential Schools Land Memory Atlas* (RSLMA) itself. Individual map modules include the I Have a Right to Be Heard Map Module and the In the News Map Module; with a variety of additional modules focusing on different thematic scales and dimensions, including exhibitions and survivor gatherings. In addition, significant new content is reflected in the Sketch Mapping component of the *Residential Schools Map*. These outputs both reflect student contributions and comprise materials used in educating students. Building on previo-

us work, the RSLMMP has further contributed to the integration of research and education and the emergence of new research and education relationships. The *Atlas* was launched on June 21, 2020, Canada's National Indigenous People's Day in honour and dedication to Indigenous Peoples, and in the spirit of reconciliation.

The purpose of this paper is to contribute to further knowledge regarding the reflexive relationship between research and teaching that is possible in Cybercartography, with particular consideration given to examples from the making of the RSLMA. The paper takes a historiographical approach, first setting some context with a brief discussion of Cybercartography that highlights some examples of its educational aspects; and second, elaborating on some recent examples from the Residential Schools Land Memory Mapping Project. This approach helps to appreciate intersections between teaching and research in collaborative cybercartographic atlas-making processes, in addition to highlighting the significance of these processes in a reconciliation context.

2. Cybercartography and education: a brief overview

First introduced by the second author in 1997, "Cybercartography" was discussed in relation to the need to view mapping as a process, with "the map" becoming increasingly important in the information era and bringing with it the requirement for changes in thinking and an increased awareness of the opportunities. Emphasizing the need for imagination, foresight, and effort, the second author argued for a concept such as Cybercartography as a "move away from narrow 'technological' normative and formalistic approaches to cartography to a more holistic approach where both mapping as a process and the map as a product are expanded" (D.R.F. Taylor 1997). The second author emphasized how intuition and practice preceded the theoretical development of Cybercartography where the initial definition of Cybercartography was strongly influenced by practice rather than theory (D.R.F. Taylor 2019, p. 4). This is paralleled in J. Crampton and J. Krieger's (2006) characterization of critical cartography as a "one-two punch of practice and theory", which can be seen to interact in a reflexive manner in the context of map and atlas development (S. Pyne

2019b, p. 221). The second author has most recently written about the importance of (1) considering process aspects of cybercartographic atlases, where materiality extends beyond the realm of digital outputs; (2) including new forms of cartographic products such as performance and art; and (3) viewing the capacity to map as a basic human instinct and means of telling stories (D.R.F. Taylor 2019).

As noted elsewhere (S. Pyne 2013, 2019b), the most obvious characteristic of Cybercartography is that involves a focus on the development of atlases as compendia of map modules, in addition to the creation of individual modules. The atlas context reflects multiple dimensions through cartographic practices that tie together a collection of maps with a narrative logic that contributes to understanding and interpretation of both the atlas context and relationships between maps (D. Akerman 1991). As a compendium, it is inherently reflexive since it is both comprised of maps, and about them. Cybercartography has been inspiring and supporting the development of a diverse yet related family of atlas projects since at least 2003, with emphasis shifting to a focus on mapping with Indigenous peoples, outreach and education in 2005 (D.R.F. Taylor, S. Pyne 2010; D.R.F. Taylor 2005; D.R.F. Taylor and T. Lauriault 2014), and including sustained efforts to improve the Nunaliit Atlas Framework (A. Hayes et al. 2014; A. Hayes, D.R.F. Taylor 2019). All cybercartographic atlases are unique instances of Cybercartography that are nevertheless related to the other atlases in a family resemblance manner (S. Pyne 2019b; L. Wittgenstein 1953). By allowing for the development of emergent methods within a general set of shared guidelines and a core technology platform, the cybercartographic research framework both guides atlas development projects, and is further reflexively developed through them. For example, six key features were added to Cybercartography's initial "seven elements" as a result of insights emerging from about eight years of work on the atlases relating to Indigenous Peoples (D.R.F. Taylor and T. Lauriault 2014). These features reflect a broad approach to learning styles, a concern with empowerment and respect for diversity in education (D.R.F. Taylor 2020).

The use of Cybercartography for education was first described in "Cybercartography for Education: The Case of the Cybercartographic Atlas of Antarctica" (S. Baluch et al. 2005). The *Atlas of Antarctica* was designed for high school students and included inputs from high school students involved in the *Students on Ice* expeditions to Antarctica. The *Students on Ice* participants provided observations from their field studies for inclusion in the high school course module that was developed through the *Atlas* project. This included interactive game playing and the use of augmented reality. Following the work to create the *Cybercartographic Atlas of Antarctica* as an educational resource and relationship building exercise with the Students on Ice Foundation (P.L. Pulsifer et al. 2005; *Students on Ice* 2013), the *Inuit Sea Ice (Siku) Atlas* (see sikuatlas.ca) project took "the educational applications of Cybercartography in new directions by looking at its application to both high school and community college education in Canada's most recently created Territory Nunavut" (D.R.F. Taylor et al. 2014, p. 298). For example, collaborative work on the *Siku Atlas* resulted in a new course for community to Nunavut communities; whereas other work under the atlas project was aimed at inclusion of the community-generated atlas in Nunavut high school courses.

Concurrent with the *Siku Atlas* project, a two-part project to collaboratively create and develop the educational outreach potential of the cybercartographic *Lake Huron Treaty Atlas* (see lhta.ca) was underway (2009−2013). Educational outreach and interactions between research and teaching were diverse and exploratory in this project, where "education" included yet went beyond institutional settings. With a focus on contributing to individual student development and capacity-building, several high school students were able to fulfil diploma requirements in their capacities as volunteer research assistants for the LHTA project. For example, in one case a high school student created an original soundtrack to accompany a video included in the atlas; and in so doing was able to engage in a meaningful exercise and fulfill the criteria for the high school volunteer hours; in another, a high school student was able to work full time for one semester on the *Atlas* project in fulfilment of four co-operative education credits. In addition to having a rich and challenging learning experience, this student contributed in a significant manner to the

Atlas. This approach of dove-tailing atlas development with existing high school programs was repeated several times in the project (S. Pyne 2013), and provided a basis for further work intersecting teaching and research in the project to collaboratively develop the *Residential Schools Land Memory Atlas* (RSLMA) (S. Pyne, D.R.F. Taylor 2015, 2019).

3. Research and teaching with (in and through) the *Residential Schools Land Memory Atlas (RSLMA)*

The RSLMA is the central output of a five--year project funded by the Social Sciences and Humanities Research Council of Canada (SSHRC), which aimed to enrich awareness of Residential Schools, their sites and Survivors' perspectives; expand research, education and community networks; and increase awareness of the broad relevance of critical approaches to cartography. Work under the project involved a cybercartographic approach to the collaborative creation of maps that incorporated both archival and experience-based knowledge of residential schools, sites, and survivors' stories in relation to these. It welcomed a broad base of contributors with distinct tasks and functions in collaborative processes related to cybercartographic maps and atlas development. This included importantly students as research assistants and students enrolled in university classes. The relationship-focused approach taken in this project has involved reciprocity; engaging people in the production of cybercartographic maps; giving these maps back to communities for education and further input; and intersecting with community and academic partners by building on already established relationships and developing new research relationships.

Throughout this project there has been ongoing integration of research and teaching in relation to courses representing a diverse range of subjects at both the undergraduate and graduate level and including one recurring International MA course. This integration is continuing beyond the funded project in several cases. In addition, there has been significant strengthening of ongoing partnerships and development of new partnerships to build on the educational potential of this project, including with the Shingwauk Residential Schools Centre, the Children

of Shingwauk Alumni Association, Algoma University, the Legacy of Hope Foundation; Jeff Thomas (independent photo-based artist); ISchool (University of Toronto) with respect to its graduate-level experience-based workshop series. Significant research assistant training results were achieved, including the maintenance of volunteer working connections with many research assistants who were funded under this project. These volunteer working connections extend to a group of former students who contributed to the atlas through their course work. In addition to the value of the research experience, which included interactions with literature, archival research, design and development research and transdisciplinary research, several students have graduated and obtained employment in fields related to their work on the project. In addition, one PhD thesis and one MA thesis were produced by project research assistants that reflected links to their work on the project.

The RSLMMP grew from the *Lake Huron Treaty Atlas* (mentioned above), which included a *Residential Schools Map* component developed in collaboration with the Shingwauk Residential Schools Centre (SRSC) at Algoma University. Early in the process of creating the *Residential Schools Map* with SRSC staff and one student intern, ideas began to form through discussion about one day expanding on this component to benefit the Residential Schools' research, education and outreach community (S. Pyne 2013, 2019a; S. Pyne, D.R.F. Taylor 2015). Following the launch of the LHTA in August 2012, we began work with the Aboriginal Healing Foundation and the Assembly of First Nations on a map component for the National Indian Residential Schools Commemorative Marker Project (https://www.cbc.ca/player/play/2441644659). In consultation with our partners, we initiated pilot participatory outreach activities and refined some of the school coordinates in the *Residential Schools Map*; through this process, we became more aware of the diversity of school sites, and the rich potential for education and outreach associated with them. During this time, the vision for the RSLMMP began to crystallize, in part due to conversations and collaborative mapping activities with the survivors who participated in pilot outreach activities. This process inspired deeper questions into the role of Residential School sites in

reconciliation processes and led to the vision to expand the Residential School component of the LHTA into an atlas of its own. Until this point, thanks to the Truth and Reconciliation Commission of Canada, increased attention had been paid to gathering survivors' stories and other events that took place at Residential Schools. However, there remained a gap in broad awareness concerning the ongoing histories and geographies of the schools and the school sites themselves; and a corresponding need for education materials and approaches in relation to both Residential Schools and geography. The RSLMMP was envisioned to respond to these needs by intersecting in a transdisciplinary manner with ongoing projects related to Residential Schools' reconciliation and education.

Part way through the atlas project, group writing commenced for the book surrounding the project, *Cybercartography in a Reconciliation Community*. A group effort, this book includes both conceptual and applied dimensions and provides a good example of a reflexive approach to both research and knowledge dissemination. The positionality aspect of reflexivity is reflected in the chapter contributions made by project team members (including students) and others affiliated with the project and by the chapters concerning various aspects of cybercartographic atlas design and development research. The book contributes to theoretical and practical knowledge of collaborative transdisciplinary research through its reflexive assessment of the relationships, processes and knowledge involved in cybercartographic research, and has been incorporated into the curriculum for university courses relating to intercultural reconciliation. Closely related goals of the book include contributing to a broader ontology of cartography and providing insights into reconciliation and education processes. Its style is primarily narrative, which is consistent with the storytelling approach that characterizes many Indigenous approaches to knowledge dissemination and enhances its accessibility amongst a broad audience.

Chapter three of the book (S. Pyne, J. Thomas 2019), considers the holistic relationship between art, narrative and maps such that art can both include narrative and be constituted by it, and maps can be seen both in form and function in terms of art and narrative. The I Have A Right to Be Heard Map Module in the RSLMA (https://residentialschoolsatlas.org/index.html?module=module.i_have_a_right_to_be_heard) emerged from writing of the chapter, as it also contributed to the creation of the chapter in a holistic and mutually reinforcing fashion. The chapter tracks work in Cybercartography with Indigenous photo-based artist Jeff Thomas; plays with possibilities at the intersection of art and cartography; and explores and expresses the relationship between Jeff's broader work and his work on the Residential Schools Legacy. The map module emerged in a reflexive manner along several dimensions once a decision was made to "map" an essay written about Jeff's work as curator for the Where Are the Children Exhibition (http://legacyofhope.ca/wherearethechildren/), an extensively travelled exhibition, which has undergone several iterations over its almost 20-year life and developed by the Aboriginal Healing Foundation, the Legacy of Hope Foundation and others. The essay was then included in the chapter with screenshots of the corresponding map as the both the chapter and the map began to take shape (S. Pyne, J. Thomas 2019). This reciprocal and mutually reinforcing process between mapping and writing proceeded in an iterative fashion beyond the writing of the chapter and resulted in the renaming of the original module. In addition, this process catalyzed the collaborative development of a new map module to "geo-chronicle" the travelling Where Are the Children Exhibition, in conjunction with a new working partnership with the Legacy of Hope Foundation and new atlas design ideas. In addition to these developments, which emerged through a collaborative, reflexively holistic map-writing process, an interesting and rich approach to 'map design as pedagogy' also began to develop with respect to 'artistically' sketch mapping a series of survivors' stories presented on the Where Are the Children website (http://legacyofhope.ca/wherearethechildren/stories/).

In the winter term of 2019, while the chapter was in its final stages of being written, students in INF1005 and INF1006 (Truth and Reconciliation Commission, Museums and Archives, ISchool, University of Toronto) were already starting to connect with survivors and their stories through sketch map creation. Following this, research assistant, Annita Parish (Concordia University), in addition to students from

two further classes, were assigned the task of exploring sketch mapping processes further.[1] All engaged with the survivor stories in a reflexive manner that involved sketch mapping with attendant reflections. In addition, curriculum in all settings – research and classroom – included exploring Indigenous perspectives and ways and Indigenous-settler interactions over time and space. Furthermore, INF students interacted with Annita remotely in an in-class knowledge sharing session regarding the sketch mapping process, which included discussion of the sketch mapping process as a meaningful way to connect with survivor experiences; and students in all classes were exposed to Annita's ongoing sketch mapping work via digital sharing. Sketch maps relating to individual survivor stories were in turn digitized and uploaded to the *Residential Schools Map* of the RSLMA.

While it requires a paper in itself for a full tour of the sketch map component, suffice it to say plenty of talk has occurred in relation to the creation of over 100 sketch maps, including most importantly, the 'talk' of the survivors who so generously shared their stories publicly; templates were created by all who created a sketch map; and a new tradition has emerged in integrating research with teaching in a holistic manner that creates transformation in many spheres. Appreciating these aspects of the collaborative map-making process is made possible by adopting David Turnbull's "talk--template-traditions' view of development as "arational", a view that is consistent with decolonizing approaches (D. Turnbull 2000, S. Pyne 2019a and 2019b).

Students in the above mentioned classes made another valuable contribution to the RSLMA (in the In the News Map), with an extensive series of summaries and reflections of news articles related to various dimensions of the Residential Schools Legacy; and several students were motivated to make significant extra-curricular contributions of time and effort. For example, one student developed a customized Python script to enable more efficient addition of selected content to the atlas. In addition, there is potential for the continuation of student volunteer work, and there is interest by former students in an emerging former student volunteer network to continue content-related work in the *Atlas* project. This interest demonstrates a commitment and connection to the material being mapped, and to the broader goal of intercultural reconciliation.

4. Conclusion

Involving students simultaneously in learning about aspects of the Residential Schools Legacy and in creating content for the *Residential Schools Land Memory Atlas* has given rise to new insights with respect to intersections between research and teaching. The *Atlas* development process has involved a variety of interpersonal interactions and knowledge exchanges related to the Residential Schools "story" and to atlas design, development and use. Similar to the case with its parent, the LHTA (lhta.ca), the line between the Atlas as a material object and the design and development processes involved in its making is blurred; the dichotomy is diminished. Insofar as the Atlas is being designed to allow for ongoing critical input and contributions, the map user can also become the mapmaker. In this respect, designing, developing and using the atlas are all intertwined (G. Brauen et al. 2011; S. Pyne 2013). In this regard, it is important to note the institutional contexts were welcoming and amenable to the integration of research with teaching, in part due to the national response in education to the TRC Calls to Action referred to at the beginning of this paper.

Viewing the RSLMA as a project output comprised of iterative processes along multiple dimensions allows us to see limitations as challenges for further iterations. In this vastly scoped project, design ideas emerge in an iterative fashion and not all tasks end up being implemented according to their original fuller and more complex visions. Taking a holistic and reflexive view of the launched Atlas as being a significant iteration in its ongoing life allows limitations to be transformed into possibilities for future iterations. For example, the student sketch map component of the Residential Schools Map is somewhat of a catalogue; while more complex design work and concepts emerged through work with MA research assistant, Anita Parrish. Although this important

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[1] INF1005/1006 in 2019 and 2020 (TRC, Museums and Archives, ISchool, University of Toronto) and SOWK 4000 (Social Work and Indigenous Peoples), School of Social Work, Carleton University also in 2020.

work occurred under the project to create the RSLMA, the complexities associated with implementation meant it fell outside the scope of the atlas as a deliverable. Interpreting this work in the context of a transdisciplinary and iterative approach, it is a valuable template for further work with the Legacy of Hope Foundation referred to above.

In addition to addressing an important set of Truth and Reconciliation Commission of Canada's Calls to Action, this project – including the Atlas – provides a model for a unique blend of teaching and research and the basis for further and new collaborations with a variety of different partners, including Residential School survivors. As a reconciliation project, the RSLMA further contributes to the intercultural bridge building aims of the LHTA, as it forges on in new directions in an emergent manner (R. Kitchin, M. Dodge 2007) that incorporates and is consistent with Indigenous ways, perspectives and knowledge.

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