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ADAM STONE



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# A typology for understanding and evaluating maps of Indigenous languages

Adam Stone

Applied Linguistics and Discourse Studies, School of Linguistics and Language Studies  
Carleton University • 1125 Colonel By Drive • Ottawa K1S 5B6 • Canada

[\[adam.stone@carleton.ca\]](mailto:adam.stone@carleton.ca)

## Abstract

Maps are valuable tools for presenting large amounts of complex information that resonate with audiences in ways text alone cannot. European colonization stimulated the use of maps as explorers and colonists tried to understand and control the peoples and lands they encountered, defining what was known about them. Even well-researched linguistic maps designed with the best of intentions can still be confusing or misleading, and Luebbering, Kolivras, and Prisley as well as Monmonier mention that there are no established standards set in place to define how linguistic maps present their information. The Evaluative Map Typology (EMT) is a Structured Observation survey tool intended to compare linguistic maps systematically to one another by identifying and describing techniques used to display linguistic information. This paper describes the research involved in producing the EMT followed by a discussion of the features it evaluates, and an account of its current application in the NETOLNEW project based at the University of Victoria, Canada. As the EMT is continuing to be developed, a discussion of necessary future directions is provided.

**Keywords:** language maps; evaluation; evaluative map typology

## Our spaces, our languages, ourselves

Our understanding of the world in which we live, be it physical, social, or based on intangible aspects such as language, is strongly based on our spatial relationships with where we and those we relate to are in some fashion situated. As spatial beings, understanding how we relate to spaces and are distributed throughout them is of great importance to our knowledge of how we relate to ourselves, each other, and our environments. With a strong drive to make sense of a large and complex world, we as linguistic beings have attempted to study and represent notions of space and the ideas contained within it long before quick and reliable communication in the present day (Lameli 2010).

## Space is both physical and social

As much as space is a physical phenomenon pertaining to an actual location of objects in a particular area, our understanding of space is also deeply social (Britain 2010). How we build and alter the spaces around us will in turn affect how we understand such places to exist. By determining where and how we build roads, bridges, villages or camps in a given location (such as a territory, province, or traditional land), we as humans have the ability to determine which spaces we visit and interact with. Our understanding of how a particular space – such as a river – exists in relation to our needs, will determine how we interact with it such as building a bridge, setting up a launching point for boats, or using it as a spot for fishing. How we interact with such a space will in turn change it: fishing sites or bridges may attract houses, roads, or services. Our perceptions of the space will in time also be altered by this change, as we may begin to perceive such a space through what it has become: a village instead of a point along a river, or a rest-stop on a road before a bridge instead of a part of the ri-

ver known to be narrow. One of the most common ways we humans have represented such spaces and the changes that happen within them is with the use of maps.

## Maps and language

Language has been fundamentally oral in our evolution as humans and societies, rather than textual. Maps are an intrinsically pictorial means of communication and can impart significant amounts of complex information intuitively, without the interference of text (Upton 2010). Here, a *map* can refer to any ‘graphic model of parts of (or phenomena related to) a physical area produced to scale for decision making purposes, and graphical representations of relationships between concepts, ideas, or knowledge’ (Stone, 2019, in press: 13). A lesser emphasis on text is not to say that maps are without language. Indeed, Gersmehl (1991) infers that like spoken language or text, maps consist of symbols which fully convey meaning only when observed in the context of all other symbols surrounding them. For the purposes of this paper, maps that are *linguistic* in nature can either focus on the distribution of languages across a given space, or the distribution of linguistic features, such as speech sounds or vocabulary items. Furthermore, *atlas* will refer to a collection of maps and other geographically-related materials. For more information on specific terminology, see Luebbering (2013). Such maps can occur in print or digital formats and can be either interactive or static (simply an image) in nature. Upton (2010) states that linguistic maps are important and meaningful, and viewers are often instinctively drawn to them. In contrast to many other media of instruction, viewers often feel they have some immediate understanding of the concepts represented. For many, a single linguistic map can convey notions of the distributions of cultures and languages in ways that far outpace text-based counterparts (Luebbering, Kolivras, & Prisley 2013).

Such maps have a variety of applications in (and are not limited to) linguistic research (Cenerini, Junker & Rosen 2017), education (Luebbering 2011), and language revitalization (Stone 2019, in press). In the context of Indigenous societies in particular, the visual nature of maps as a medium echoes the traditionally oral structure of communication, knowledge and education in a way that text-based communication is not capable of doing. Herlihy and Knapp (2003) note that Indigenous communities have ‘maintained cognitive maps that are delineated verbally using place names that convey place and spatial orientations,’ (304) and that these maps provided a wealth of knowledge to Indigenous peoples in those areas as well as explorers who arrived in those areas (303). As people continue to move to new spaces, such as Indigenous individuals from their traditional communities to urban areas (Norris & Clatworthy 2003), linguistic maps will play an ever-important role in accounting for changes in the distribution and vitality (Luebbering, Kolivras, & Prisley 2013) of Indigenous languages, which in most parts of the world are experiencing unprecedented levels of decline and endangerment (Krauss 1992). Increases in human migration across lands and continents will only further complicate relationships between language and space (Mackey 1988), meaning that continuing research and development into linguistic map making practices and technologies is essential to ensuring that linguistic maps can do more for users and communities than act as what Luebbering (2013: 40) refers to as ‘generalized snapshots in time.’

### **Maps are tools of power**

Because of their communicatory strengths and propensity to model a particular reality to their viewers—whatever their motivation, basis or factuality—maps have been and continue to be used as tools of power (Herlihy & Knapp, 2003). Luebbering (2013: 49) extends this notion by inferring that ‘language maps can both convey power and be used for power.’ Whoever controls depictions of a given geographical, political or linguistic territory has the means of shaping a society’s thoughts regarding that territory, insofar as the maps are accepted as ‘top-down’ representations of the group’s claims to sovereignty (Ormeling, 2010: 28). In colonial contexts, maps were and are used as tools of ownership, in which European groups assigned names and borders to newly-created territories, hence ‘claiming’ them (Aporta et al., 2014; Ormeling, 2010). Garuba (2002) explains that colonialism as a regime of power was orchestrated through spatiality and subjectivity. Language distribution maps (see Girnth, 2010) produced by scholars perpetuate the association of language communities with European nation-state or territory-like political entities (Ormeling, 2010). This may lead to the view that territory is limited to permanent settlements rather than an approximate and constantly-shifting area, and that societies speaking different languages do not share territory for the same or different land uses (Garuba

2002). In the same way that tools are actualized in the hands of those who use them, maps also have great potential for restoration and rehabilitation in the face of a colonial legacy of damage, provided they are used sensitively and appropriately in efforts toward reconciliation (Stone 2019, in press). However, even with the best of intentions, no map can be completely objective. Any map is the product of an author or authors who have their own histories, opinions, and biases, and is received by audiences that too have their own sets of expectations (Breton 1992). Linguistic maps will in some way inevitably be controversial, as no single language map will satisfy all audiences (Peeters 1992). In any practice of mapmaking then, it is important to consider how a map has been made, why the map has been created and designed the way it has, and who the intended audiences of the map are. However, many barriers remain to understanding these fundamental characteristics due to a number of issues in this emerging discipline.

### **Pervasive issues in linguistic mapping**

While linguistic mapping is by no means a new endeavour (Luebbering, Kolivras, & Prisley 2013), Monmonier (2005a) and Luebbering, Kolivras, and Prisley (2013) note a lack of standardization surrounding how linguistic information is presented geographically, and by whom. Monmonier (2005a) infers that maps are at the mercy of their producer’s skill and public expectations in part because such producers are reluctant to impose standards on what is considered an endeavour as artistic as it is scientific. One of the reasons cited explains that rules can pose a risk to a map’s design if followed blindly and applied in areas where they conflict with higher objectives. Luebbering, Kolivras, and Prisley (2013) cite an absence of common conventions surrounding linguistic mapping as being problematic due to such maps’ usefulness in geography, anthropology, and linguistics. As researchers from a variety of disciplines and research backgrounds make use of linguistic maps in their work, they will often approach similar kinds of data in entirely different ways, which risks leading their readers (or users) to come to different and unpredictable conclusions. Such inconsistencies can be exemplified in map makers’ treatment of uncertainty in their maps. Luebbering, Kolivras, and Prisley (2013: 392) note that while some map makers mention uncertainty in a text-based commentary, others indicate uncertainty through symbolology, such as nonsolid boundary lines, zipper-like boundary transition zones, or an ‘unknown’ category for language information. Such disciplinary discrepancies are further complicated by the fact that while language is in many ways dynamic and intangible, maps and mapping practices tend to rely on discrete points, lines, polygons, and distances. Maps can risk becoming too unspecific if they are rigid in their design constraints, or too unreliably produced if they are made with little or no consideration for practices in linguistics or cartography. In addition, Luebbering (2013)

notes an absence of research on the cartographic composition of linguistic maps from recent literature as a major hindrance in the discipline's ability to look inward at itself as it progresses in a time of rapid technological development:

'Research on the cartographic composition of language maps however, is noticeably absent from recent literature and the lack of cartographic guidelines for language mapping construction remains. [...] With new tools at our disposal, we are able to quickly produce language maps, but the effectiveness of those maps and the transmission of their intended messages would benefit from a thorough understanding of their cartographic composition as well as efforts to improve it.' (Luebbing 2013: 54-5)

Finally, Monmonier (2005b) states that as maps use discrete techniques to measure and reflect fluid concepts, the truths that are being mapped must necessarily be distorted for a meaningful amount of information to be conveyed to users. Without a set of guidelines in place, researchers with different disciplinary backgrounds risk varying greatly in how they choose to distort reality to deliver a message, and how distorted that message becomes. Any guidelines that attempt to regulate and standardize linguistic maps need to account for researchers' backgrounds, the conceptual gap between language and cartography, and the fact that maps produced to date have not been subjected to any guiding criteria in the first place.

### **The Evaluative Map Typology**

The Evaluative Map Typology (EMT) is a Structured Observation survey tool created by the author of this paper which contains a number of questions related to the design and implementation of a linguistic map (for more information on Structured Observation, see Creswell 2003). With this tool, individuals answer a series of questions on a fillable-PDF survey form, but the form can also be printed as a physical copy. Survey questions are categorized into five dimensions according to defining questions in linguistic mapping posed by Girth (2010):

- Purpose: The map's goals, audience, function, author, context, and metadata.
- Content: What is being mapped, variables involved; where the data comes from.
- Symbols: What kind of information is presented (e.g. the use of data points).
- Features: The map's layout, language, use of terminology, and commentary.
- Result: Messages conveyed - Power, truthfulness, and general appearance.

In addition, the EMT form contains a section devoted to metadata, which allows for a detailed account of where the map was obtained and who produced it. Most questions in the Typology are answered first in sentence-form, followed by a representative code (a one or two-word summary that categorizes features), as often used in qualitative research projects. This provides subsequent summary analyses with efficient means to convert qualitative and subjective observations into meaningful comparable values. This form of survey allows maps to be compared to one another in multiple ways for a variety of purposes: to focus on comparing structural aspects of the chosen maps, or understand how the maps differ in the implications they have for their audiences.

### **Current use in the NETOLNEW project**

#### **The NETOLNEW project**

The NETOLNEW 'one mind, one people' project, based at the University of Victoria, Canada, is a Social Sciences and Humanities Research Council (SSHRC) funded project which aims to serve as a Canada-wide network that shares adult Indigenous language learning resources, initiatives, and programs. Such a network will act as a platform where Indigenous people can build and lead their own education and revitalization efforts in ways that are appropriate for their own communities.

An important part of the NETOLNEW Project is the creation of the NILLA (NETOLNEW Indigenous Language Learning Atlas) project that shows where different Indigenous language revitalization and educational programs, initiatives, or projects are being held across Canada. As specified by McIvor and Jacobs (2017: 1):

'...[I]nformation gathered [from the documentation of significant sites of language revitalization across Canada] will ... be translated into an interactive, online map and repository to facilitate learning from and combining efforts across various types of immersion and bilingual Indigenous language revitalization projects in Canada.'

#### **The application of the current EMT analysis**

The analysis in this paper originates from a report created as part of the author's research assistantship duties with NETOLNEW, which aimed to identify what kinds of functions and features of maps should be available to users, and how future maps created by the project should be structured. Such recommendations are based upon a survey of existing digital maps and atlases that for the most part focus on Indigenous knowledge, but other kinds of maps have also been included.

The maps in this study primarily involve Indigenous knowledge, be it language, place names, natural resour-

ces, or the geographic location of (and in) traditional stories. These maps are analyzed to show how previous mapping projects have approached the representation of Indigenous knowledge. However, other maps focus on a variety of subjects, including the distribution of scientific research projects, and are necessary in such an analysis as they indicate how other forms of knowledge can be represented in digital maps as well.

### The map selection process

The first exploratory way maps were first gathered for the Typology with convenience sampling: the EMT was applied to digital maps and atlases that were already known to the author. Once those maps were exhausted, additional maps were then selected based on a cursory search of digital atlases and maps found on Google. Here, keywords such as ‘digital atlas,’ ‘digital Indigenous atlas,’ and ‘online Indigenous atlas’ were used.

Following this method, digital maps were then accessed more methodically through larger map and atlas repositories, such as the University of Victoria’s Ethnographic Mapping Lab and the Nunaliit Cybercartographic Framework. In addition, some maps were referred to the researcher by others working in similar areas. A total of 15 maps were used in this analysis.

While this Typology is designed to evaluate both digital maps and those found in other media (such as globes or paper maps), the maps chosen for this current analysis are all digital online, as this is the medium of choice for the NILLA map. In addition to maps and atlases, other accompanying information or features on a website where the maps are featured is also explored. This additional information can also be important in determining how users interact with the maps and situate themselves in relation to the information they convey.

### The EMT analysis process

The maps’ positive and negative features were organized into tables of coded attributes. Each code was ranked according to how frequently it appeared across maps, as to quantify this qualitative information in a way that is meaningful in determining which features are most important to consider in map development (for more information on Magnitude Coding, see Saldaña 2015).

Strengths	# occurrences
Intuitive	10
Minimalist	7
Layers/transparency	5
Professional	4
Community input	4
Interactive	3

Table 1: Ranked Frequencies of positive map attributes

Weaknesses	# uses
Missing information	3
Not engaging	3
Tricky interface	3
Dead links	2
No context	2
Difficult access	2

Table 2: Ranked Frequencies of negative map attributes

From this ranked frequency table, a series of positive and negative attributes found in the map sample were acquired that will inform the NETOLNEW project’s future atlas development. Some outstanding attributes are mentioned below.

### Positive attributes of the map sample

Intuitive maps have minimal amounts of features immediately visible, ensuring that the user/reader does not become overwhelmed. If too much information is present on a map, users will spend too much time and energy learning how to navigate the interface, and too little time actually exploring the information. As a result, the NILLA map should strive to present as much information as possible through the fewest mechanisms possible.

While maps are good tools of communication that allow users to access large amounts of information (Ormeling 2010), issues with how well a digital map functions arise when information is embedded directly in the map. Digital maps, especially interactive ones, require large amounts of processing power to run the way they were intended to (Marie-Odile Junker 2017, personal communication). Storing large amounts of information directly on maps thus can cause interactive functions to become slow or stop working altogether. Connecting geolocated information to an easily accessible but separate database would be a powerful tool in both referencing information better and making information easier to find.

Many legends were observed to not only indicate to the user what symbols are used to represent information, but also serve as a control mechanism for determining what appears on the map and what is rendered invisible. Here, a *legend* refers to a guide found on many maps with a list of symbols and their meanings. This is more of a relevant concern in maps where users are free to explore different features and manipulate particular elements, as opposed to in a more structured tour-based interface. Finally, as a way of controlling how much appears on the map at any given time, legends are especially important when researchers have little choice but to include large amounts of information on the interface.

## Negative attributes of the map sample

Many maps rely on existing interfaces such as Google to be displayed. Though this does allow for a consistent experience on both the developers' and users' ends, does this create issues of ownership and intellectual property rights when applied to Traditional Knowledge? What if Google discontinues the service in the future, or changes the software in such a way that the maps are no longer able to function as they once did?

Much like making an open-source map and database would allow individuals with diverse skills and knowledge to make important contributions to the map's inner workings over a theoretically infinite amount of time, allowing users to directly upload information would greatly improve the map and database's sustainability. However, doing so would greatly compromise the project's ability to control the kind, quality, and relevance of information being uploaded. While improving sustainability and representation, the map portion of the project would risk becoming inconsistent and fraught with incomplete data. However, by not providing a simple and convenient means to upload information, the project could risk sacrificing a number of ways of reaching out to communities and directly sharing their voices.

## Recommendations for map design

As a result of these findings, the following suggestions can be established:

1. Information on the map should be represented with multiple layers, and users should be able to easily access and turn on or off such layers.
2. Accompanying commentary or information should be included in the map and should either be located in accompanying web pages that are easy to access, a pop-up window that appears at the beginning of each use of the map, or in a panel adjacent to the map. In the case of a pop-up window or adjacent panel, the user should have the option of being able to either move the item or delete it (and be able to easily access it again).
3. Users should have the option of either navigating the map with the help of a structured and introductory guided tour, or freely explore the map and all the features it has to offer.
4. A hideable horizontal slider at the bottom of the screen that contains all the necessary accompanying information or materials would allow users to more readily and easily access the information they are looking for. Features such as a horizontal data slider could be made available in a 'Tools' menu.
5. A link should be available and easily apparent to users that allow them to learn more about how they too could contribute information to the map.
6. Basemaps upon which information is plotted should come from a source which is stable and will not

change too drastically in the future as to not be able to support a current mapping system.

## Discussion

### How the EMT addresses pervasive issues

In its current state, the EMT offers a means through which maps produced in different ways by different researchers can be compared to one another in a systematic fashion. As observed here, such comparisons are important in the design phase of new maps and atlases, but could also find relevance in the development of formal training curricula for students of linguistic mapping, which is lacking (Williams 1988).

The EMT's systematic comparisons address Monmonier's (2005a) observations that the map producer ultimately controls the map's design, as a map's information is reduced to individual (and categorized) aspects that can then be integrated into figures and tables. While the EMT cannot control how a map producer designs a map, those who are using the EMT can deconstruct design features to critically analyze how space is used to convey meaning. In doing so, the map producer's techniques and intentions become more transparent.

Though the EMT itself is not a set of guidelines for the production of new maps, it does have the potential to lay the groundwork for a future set of formal conventions. Such a groundwork can only be established by understanding first what tools and features can enable linguistic maps to clearly communicate meaningful messages while avoiding techniques that promote the author's bias. In understanding the different ways linguistic maps use points, lines, and polygons to convey messages of power, ownership, and authority, future guidelines can encourage map producers to account for marginalized perspectives that may otherwise not be heard.

When reflecting on the role of cartography in changing how we think about certain topics, Bollmann (2010: 43) notes that cartographic research by nature looks inward at 'the function and impact of the various cartographic media,'; 'the perceptive and cognitive capabilities of the potential media users, as well as their communicative needs,' and; 'the informational gain while and from using the media'. At a time when digital mapping practices such as Cybercartography (e.g. Taylor 2014) and Geographic Information Systems (GIS) offer unprecedented opportunities in the creation of interactive and multimedia maps, reflecting on standardization is important to ensuring new maps can responsibly and ethically communicate stories of knowledge and language. However, linguistic cartography has missed much of the introspective discussion surrounding standards that is typical of other disciplines that rely on mapmaking, such as geology (Luebbering, Kolivras, & Prisley 2013). Because of the way individual maps' designs are compared to one another, the EMT has the potential to offer the discipline an introspective window

into current practices and techniques that comprise linguistic mapping.

### **The EMT and Indigenous mapping**

As demonstrated in preliminary research conducted with NETOLNEW project, the EMT may have a specific application in the assistance of designing maps of Indigenous knowledge and language that restore the balance of ownership and power to the rightful communities. As the EMT questions the techniques used to display spatial information and the consequences thereof, consideration can be devoted to understanding how maps can be made that reflect Indigenous communities' worldviews. Such a feature is important to account for in any project similar to NETOLNEW, whose primary objective is to build capacity among Indigenous people and ensure the control of educational resources remains in the hands of the communities that need them (McIvor & Jacobs 2017). It is important to note that such a tool should not be used in isolation, but in integration with emerging practices such as the use of Volunteered Geographic Information (Engler, Scassa, & Taylor 2014) and projects that are created *for*, *with*, and *by* Indigenous communities (Czaykowska-Higgins 2009).

### **Limitations of the current EMT**

As the EMT is still very much in a preliminary stage of development, there is ample room for improvement. Though not exhaustive, this paper will account for several outstanding issues that will need to be resolved in order for such a tool to prove useful.

A major limitation in the context of Indigenous languages and mapping is that the EMT has been developed with little Indigenous input aside from the careful considerations of Dr. Onowa McIvor from the NETOLNEW project. As the author does not have Indigenous ancestry, the EMT will require ample Indigenous input and collaboration if it is to be useful in Indigenous contexts.

While the EMT's design has been informed and reviewed by multiple researchers experienced in the fields of linguistics, mapping, and education, it has solely been implemented and reported on by the author. As a result, much of the current EMT has been developed with the single researcher's bias and opinions, and the results obtained from the NETOLNEW collaboration are but one individual's interpretation of the EMT's dimensions. This issue is especially salient in the use of coded attributes and the magnitude coding technique, which ultimately is the result of subjective interpretation. An immediate solution to this issue would be to have multiple researchers (or research assistants) apply the EMT to an identical assortment of maps.

In addition, the majority of the EMT's questions and layout have been informed by Girnth's (2010) five defining questions in linguistic mapping, and could stand to be informed by additional sources. Any future develop-

ments of the EMT would greatly benefit from the collaboration of Indigenous and non-Indigenous scholars with a variety of perspectives, training, and backgrounds.

### **Future directions for the EMT**

While the first application of the EMT with NETOLNEW indicates that the Typology can be of use in determining guidelines for more responsible map and atlas production, further research and refinement needs to occur in order for such a typology to make sizeable impacts in cartography, linguistics, and the lives of those who can benefit from its services. Further refinement will strive to eventually adapt the EMT to act as a set of guidelines and conventions in the production of linguistic maps, both in the contexts of Indigenous language revitalization and in linguistics and cartography more generally. In response to Monmonier's (2005) concerns related to blindly following design rules, such formal conventions ought to be flexible and receptive to producers' interpretations, while still offering a sound framework from which to operate. Such a set of conventions will ideally be accessible to cartographers and linguists alike and assist in narrowing the disciplinary gap that exists between linguistics and cartography. Necessarily, such a set of conventions will need to include the continuous input of many scholars and enthusiasts with varied perspectives, perhaps through similar ways as the Open Language Archives Community (OLAC) ([www.language-archives.org/](http://www.language-archives.org/)), which relies on multiple stakeholders to reach consensus on best practices in documentation.

### **Conclusion**

While linguistic maps are used widely in multiple fields for conveying large amounts of information in easy-to-understand ways, linguistic mapping as a discipline has remained largely underdeveloped and continues to lack a system of guidelines and conventions. Such a system is especially important when linguistic maps focus on Indigenous knowledge, as cartographic practices have historically been employed (and continue) to control knowledge and shift the balance of power in favour of colonial forces. Though still in its preliminary stages of development, the Evaluative Map Typology (EMT) has demonstrated through its implementation in the NETOLNEW project that it can be used to catalogue cartographic techniques in linguistic maps, indicate how they are used to communicate notions of power and authority, and provide recommendations regarding both user-friendliness and ethical considerations. Though there is a great need to continue to research and extend the tool's applicability, a future form of the EMT could have the potential to act as a set of conventions, allowing for linguistic maps to be made more consistently and thoughtfully.

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