

The Math People: Unwitting Agents of Empire Who “Like to Stay in Their Lane”



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Published online: 9 June 2020

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In the first place, I, Michael Marker, remember feeling not very enthusiastic about being the discussant for an American Education Research Association (AERA) session on the M in STEM; I don't like math. Actually, that is not precise. I actually do not know if I like math; I do know that I don't like math teachers. At the same time, I do very much like Professor Cynthia Nicol. I like almost everything about her. She is a delightful, funny, brilliant, curious, and supportive colleague who has been dedicated to pulling Indigenous scholars, Indigenous scholarship, and Indigenous students out of the shadowy moraines and providing a seat at the sacred fire and a metaphoric blanket in the center circle of intellectual conversations at the University of British Columbia. What's not to like, right? And, as disruptive as she knows I can be, Cynthia really wanted me to be part of a conversation about... the M in STEM; I agreed to be the discussant for the session.

Yes, indeed, Cynthia is different from all of the other math teachers I have ever known. I am confident that I speak definitively for all the other authors when I write this. However, writing a detailed paper-by-paper review of all these reports from over-enthusiastic math teachers is something I don't really know how to do. It is also something I don't want to do. Maybe another Indigenous scholar would and could do this task; I do not think so. Instead, this essay will be a kind of retrospective on things I remembered as I “experienced” both the text and the “oral traditions” of colleagues from... the world of math and will include a couple of other math teachers, math teachers from when I was a boy growing up in my home Spokane/Colville territory, who were distinctly *not* like Cynthia.

I do understand very well that this is not the convention of what a discussant is supposed to do. I am aware that it is expected that I will write directly and specifically to each paper and evaluate salencies connecting each paper's adventures to the others and that I might find a combination of laudable and pestilential characteristics in each one of these reports on... projects having to do with the... M... in... STEM. I do not intend to do this.

I want to first briefly review what I said when I was at the podium and acting in my official capacity as discussant.

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I wanted to destabilize the normal and, as Mr. Dooley¹ of The Chicago Times was famous for, I wanted to “comfort the afflicted and afflict the comfortable.” I began my talk at the podium by asking how many people did not have a... “so called... smart phone.” Two hands in an audience of 60 people went up. I then asked, without interruption, “the hands of everyone who does not, or has not, participated in so called... social media?” Three hands this time².

I then went on to display/present four questions:

1. What should be counted?
2. How do we do the calculations?
3. What is mathematics and where does it come from; who are mathematicians and where do *they* come from?
4. Can we use mathematics to expose the hidden curriculum and hegemonies of settler colonialism? This last question was to invoke Jo-ann Archibald’s (2008) question of *thinking through stories rather than just about them*.

In these questions, I was invoking the directions of Ahenakew et al. (2014) in illuminating the distance between *soft reform vs. transformation and ontological realignment*. However, these papers do not offer such a goal—at least not ostensibly. In my discussion that followed this, I offered that in Bourdieu and Passeron’s (1977) *Social Capital and Cultural Capital*, the word Capital sounds like a quantity. We know it has relevance for understanding the xwelitem (invader, colonizer, white people, hungry ones) world view. Can it be made into an algorithm?

Real Indigenous Math

Is there a trigonometry of privilege and are there quadratics that reveal the compound interest of colonization’s confiscation of Indigenous space? Are there binomials that can help Indigenous students understand the ecological and social outcomes of a mining project on their traditional and sacred landscapes? A pipeline? A ski resort? Is all mathematics *ethno-mathematics*?

At the moment I am writing this, the Wet’suwet’en people, their Mohawk supporters, and thousands of environmentally conscious protesters are locked in a desperate battle with the government of Canada about a pipeline that is considered toxic and deadly by the hereditary chiefs of the land that the pipeline is being built on. I suspect that there are many interesting math problems to be worked out in this realm. If there ever was a more profoundly relevant time for Verna Kirkness and Ray Barnhardt’s (1991) iconic article, “The four r’s,” I do not know when it was. How could the themes of “respect, relevance, reciprocity, and responsibility” inform the present moment of cross-cultural impasse?

I was reading the Cascadia Weekly, a small newspaper published in Bellingham Washington, while thinking about how to write this essay and I came upon a letter to the editor about math from Mr. Ryan M. Ferris of Bellingham. Mr. Ferris pointed out that, “in the state math championships held every year at Blaine High School in Whatcom County, King County’s east side school districts claim 90 percent of the medals. These medals go to the first-generation children of the employees of King County companies like Microsoft, Google, and Amazon—in a math championship sponsored by Whatcom County industries” (2020). Reading this gave me some ideas about where math teachers come from. This could be problematic... at least, I think it was for me when I was in school.

¹ Mr. Dooley (or Martin J. Dooley) was a fictional Irish immigrant bartender created by Chicago Times journalist Peter Dunne and the subject of many of Dunne’s columns between 1893–1915 and 1924–1926 (Wikipedia, n.d.).

² One of my favourite graduate students, upon hearing of my adventures while we were debriefing at an Irish pub, said, “well Dr. M., that would have been like asking, ‘how many people are breathing in this room.’” “Bill,” I said, “thank you for punctuating my point.”

“We may misunderstand, but we do not mis-experience,” Vine Deloria (1991)

I remember many things about attending Isaac Stevens Elementary School in Spokane Washington. I remember knowing that Governor Stevens made treaties with all the Indians in the Washington Territory where my family had been for seven generations. The treaties were made at the point of a gun and Stevens signed the death warrants for many of our great chiefs who were hanged, shot, and murdered slowly by his authority as the agent for the United States of America. I grew up knowing this. My mother and my grandfather who were Arapaho knew many deep things about this history and they made sure I learned the meaning of our land that had been colonized. I do not know if my elementary school math teacher knew of these things. If he did know, he never spoke of this history/reality. I remember palpably, my math teacher speculated on my prospects for advancement and on my life trajectory to me: “Marker, you are never going to understand math because you are lazy and come from lazy people. You will never go to university. It will be a miracle if you graduate from high school.” Thank you! You probably caused enough trauma and anger that somehow generated in me both a determination to go to university and a hatred of math. A few years later, I was in a sophomore geometry class at Lewis and Clark High School and I didn’t get these things called proofs. I always assumed that my high school teacher had checked in with my elementary school math teacher about me; their scripts were so textually consistent. “Mr. Marker, you are not stupid, this level of geometry is not that hard. You are just lazy and don’t turn in assignments. Anyway, I should give you a D, but I’m going to give you a C minus just out of the goodness of my heart.” Thanks to my high school math teacher, I call math my C minus subject.

Lewis and Clark High School was a famous place named after two famous guys who were the first colonizing visitors to a lot of our communities in the Pacific Northwest. In L.C. High, you learned about how smart and brave and, well, just totally wonderful these two “explorers” were. I sat in my desk and “quietly” wondered (sometimes not so quietly... oops, now it’s off to the principal’s office) what was so wonderful about a couple of bros with a lot of money and the latest outdoor gear showing up to tell you that they just bought your land... and we didn’t even know it was for sale! I mean, who knew, right? So, even though I didn’t have the “stuff” to learn math—too lazy, I guess—I had the privilege to learn another side of the Lewis and Clark glory story. I can tell you, the version I heard from my family was pretty different from what I was taught in school; definitely different... right.

So, what used to drive me crazy was that my very cool Language Arts teacher would mutter things about my high school math teacher sometimes. Like, you know, he was the baseball coach and she didn’t think too much about his approach to students like me. I don’t remember the words she said, but she was not a fan; definitely not a fan. I remember the art teachers and they were nice to me and fun to learn things from. All the humanities teachers were pretty cool. They would all talk about Lewis and Clark, Stevens, and Spokan Chief Gary, and other things that I could understand. They showed me how you could turn history and literature into art, writing, poetry, and songs. It was pretty engaging for me. The math teachers, on the other hand, made a kind of tight mutually supportive group and I remember them getting all interested in some puzzle or numbers game or things about casinos or maybe even trivia about statistics. It was pretty boring for me; they were pretty boring to me.

Now let’s return to me being the discussant for the conference session at AERA. After I raised some of these questions at the session, one of the presenters said something like, “well, to tell the truth, this Indigenizing and decolonizing math is just not something I’m really prepared to do. We math people like to ‘stay in our lane.’” I think I might have retorted something like, “it shows.”

In the next section written with Shirley Anne Hardman, we discuss what challenges educators face when asked to decolonize math. I think that portion of this paper has a happy ending...well, more than this introductory lot anyway. If you ask an Indigenous scholar to be a discussant, well, you are likely to get an Indigenous response... and it might look quite different from the conventions... of academic tribal *traditions*... just sayin’...

Decolonizing math? Sounds fishy: Indigenous scholars write back to clever Xwelitem (Settler) people and their numbers games

My colleague, the luminous cultural studies scholar Handel Wright, in the hall outside our offices, once asked me, “Michael, there must be an Aboriginal approach to quantitative analysis. What does number oriented inquiry look like when it is done through an Aboriginal methodology?” Remembering how I had made statements at department meetings: *anything and everything* could be viewed through an Indigenous lens; I now wished I hadn’t made some of those uncomplicated insistencies. Handel is good, very good. He kind of knew that he had me “over a barrel” so to speak. He had asked a very, very hard question. As an ally³ and as a Black African intellectual, Handel does not ask ordinary questions in ordinary ways. His question was in complete earnest. Yet, I think he knew that I could not answer it. The question assumes some level of cross-cultural equivalency between the ways university researchers think about amounts of things and Indigenous peoples’ ways of knowing—and the choices about what to know. It is a common sense thing to think, “well, Indigenous people had to deal with numbers of fish, lodge-poles, ponies, stitches in a moccasin or a blanket, distances, etc.... um, didn’t they?” I told my colleague that I think there is a strong correlation—to speak *that number language*—between what one counts and how one counts. Even the phrase “he *counted* for something; or, he was a *no-count*... on *account* of his....un-*accountability*” is loaded with semantic assumptions about the commodification of every aspect of human reality. There are double entendres here also. I said Handel, my friend, give me some time to think about this one. Years have passed and I am still taking my time, but I have had a few ideas since my colleague and I had this little talk between our offices. This essay will contain a few of those ideas.

I share this writing with my PhD student, colleague, and Oksale (in the Sencoten language it is pronounced aahk sal’uh, and means “teacher”). I have learned a great deal from Shirley Anne Hardman of the Sto:lo (river) people. Now that I have introduced her, it only makes sense to listen to what she has to say about this question of math in STEM fields and in education; teaching and learning in schools. As mentioned in the previous paragraph, I will return to offer a few ideas about how one might “decolonize” math... if that is desirable... or even possible. I am actually most interested in who becomes a math teacher (not necessarily a mathematician). I am not interested in math itself. I am interested in how math education selects people to teach this... subject... in schools. However, first, Shirley Anne has a story to tell. I raise my hands now to introduce Shirley, hy’sh’qe siam.

Shirley’s Story of Math Teachers, Place, and the Indigenous Community Reality

As an administrator at a university responsible for Indigenous affairs, I often find myself advising on things I know little about or that I have extreme difficulty connecting to Indigeneity and my overarching goal of Indigenizing the Academy⁴. On many occasions, however, I am treated to opportunities to learn not only about myself, but I am called upon to infuse Indigenous knowledge, ways of knowing and understanding the world into programs, activities, curriculums, and events. On this particular occasion, I found myself on a planning committee for an Indigenous math symposium. I was told the gathering would appeal to K-12 math teachers (in the valley) and that this is a “really important” symposium to offer teachers since the release of the BC First Peoples Principles of Learning⁵ and the focus on teaching mathematics in the First Nations Education Steering Committee’s publication *Teaching Mathematics in a First Peoples Context*⁶

³ Professor Wright would never ever refer to himself as an ally. This, paradoxically, contains the very reason why he is an ally. I name him such; he would never name himself this and likely would even show discerning humility and self-effacing, good humour in this regard: “I am only trying to help In a good way Michael” he might say. This is what our Elders say also—same exact words!

⁴ At my university, Indigenizing means most simply to be responsive and responsible to Indigenous peoples’ goals of self-determination and well-being.

⁵ <http://www.fnesc.ca/wp/wp-content/uploads/2015/09/PUB-LFP-POSTER-Principles-of-Learning-First-Peoples-poster-11x17.pdf>

⁶ <http://www.fnesc.ca/wp/wp-content/uploads/2015/08/PUB-LFP-Math-First-Peoples-8-9-for-Web.pdf>

has placed an emphasis on Indigenizing math and STEM. Moreover, another university has been hosting Indigenous Math conferences for some time now and hosting this symposium would allow for teachers to “stay in the valley.” This immediately appealed to me as I support drawing on and providing focus on local⁷ Indigenous knowledge. I quickly came to understand that, for the committee, staying in the valley was more about convenience for non-Indigenous teachers who might attend as opposed to any significant understandings around place-based learning and the importance of place in an Indigenous landscape. It was a bumpy start—in my mind only because I have learned to keep many of my thoughts for another time and place—but I set out on the journey with my colleagues. There were math instructors from the university and from the local school district, as well as an Indigenous representative from a local school district on the committee. The conversations quickly became about who might be a keynote speaker and who then would offer the workshops. And, equally as quickly, how do we indigenize our gathering: drummers, territorial acknowledgement, a name that uses the local Indigenous language, and Indigenous food? Quickly one gets the picture. And, while we are on the topic, an Indigenous logo. The intentions of the planning committee were good. Each committee member had participated in one or more Indigenous math education conference. Each was drawing on their experiences and the recollections of what was appreciated and therefore should necessarily become a part of our upcoming gathering. Ideas flowed back and forth and eventually an agenda was devised, invitations to speakers and presenters were sent, advertising for math teachers and students to attend was created and local Indigenous protocols were defined.

I tell you this story from the beginning because process is integral to Indigenizing. Moreover, it is crucial to learning about the importance of place in place-based learning. I am strengthened by the committee’s resolve to Indigenize math teaching and to inspire their colleagues teaching math in schools to do the same. I want to share only two key pieces of the planning committee’s work. The first one is about the logo and how the committee sought to have the logo reflect the local culture and the math knowledge that is intrinsic to the ways of knowing and understanding the world. The second is the committee’s exploration of the difference and importance of a focus on content versus pedagogy with a view to providing guidance and focus to the invited keynote speaker.

A beautiful logo was created by an artist with membership in the local Nation. We had met with the artist and shared with him what the intent of the gathering was and asked him to design a logo that would reflect the local Indigenous culture and likewise reflect “math.” He designed a beautiful logo that consisted of a longhouse with a weaving pattern placed in a circle infused with local shapes. His statement was sent to us as:

The Longhouse represents Native American architecture. Longhouses were made by people of the Pacific Northwest from Makah to Haida Gwaii territories. Homes ranged from 60 to 100 feet in length and were built from large cedar poles and planks.

A simple basket weaving design is a display of how our ancestors used mathematics. They wove cedar in graph form to create seemingly simple yet intricate and complex designs. The cedar basket was used for gathering foods and medicines key to our people’s preservation of life.



⁷ Local is a term that is used in Indigenous education following the release of the watershed document *Indian Control of Indian Education* (1972) (<https://oneca.com/IndianControlofIndianEducation.pdf>) published by the Assembly of First Nations (then called the National Indian Brotherhood). The document was a strong national call for “local control” of education by Indigenous leaders and educators. The AFN has published a revised version in 2010 called *First Nations Control of First Nations Education*.

The design is placed in a circle which is decorated with traditional Coast Salish crescent and oval reliefs a display of some of the earliest forms of geometry. This design as simple as it may seem is a depiction of tradition, culture, lifestyle, and the intelligence of our north American First People.

The committee was rightfully impressed with our new logo and the artists' statement. What was compelling for me was the way in which the artist was able to easily connect his cultural knowledge, skill as an artist, and the love for his ancestors to what the math planning committee had asked him to design.

There was a conversation that took place, in part on email and again in person as the committee struggled with providing direction to the Indigenous academic that would deliver the keynote. One member asked, "So I wonder about the difference between finding indigenous content that has math incorporated and teaching in a way that honours indigenous ways of learning. What is our goal with mathematics, especially at high school? How does a teacher *know* they are going in the right direction? I hear many questions that focus on content in their teaching topics and guilt if they don't have the indigenous content. Is it really all about content? Or is it deeper than that? And how does that look in a math classroom or any classroom for that matter?" The discussion led the committee to agree that having the keynote be about pedagogies and the facilitation of learning environments that are complimentary to indigenous culture would be preferable to content. In this way, the keynote would appeal to and reach teachers of all grade levels, including the university faculty.

This discussion gets at the crux of Indigenizing math teaching. What is the goal of and how do we encourage and support teachers? How do we honour local knowledge keepers? And, we want to reflect and include Indigenous learners while at the same time open the minds and the hearts of all students to respecting place, history, and ways of knowing of Indigenous peoples.

Last summer, really late last summer, my university was approached to teach a math class to some teacher candidates in a remote Indigenous community. My boss and subsequently the Department head both informed me that the community should have asked much sooner. I knew the reason the community was asking at the eleventh hour is because they had only just secured funding for this project. This "fly—by funding" as I call it is the state of much of Indigenous education. Funders put out a call for proposals with tight deadlines—sometimes only two or three weeks' turnaround. Indigenous communities and institutes all jump to grab the promise of these dollars as it flies by. These funders then take copious amounts of time reviewing the submissions and more often than not inform the recipients of their successful proposal long after university deadlines. This places programs contingent on this funding at huge disadvantages and sometimes it means that the proposed program, courses, or services cannot actually be undertaken. So it is August, nearly the September long weekend. I know my boss is correct, and the Department head is being reasonable. She/he cannot reasonably ask an instructor to stop mid-stride and prepare to teach an additional class in a remote community. Adding to the challenge, in order for this to happen, and the invitation from the community was clear, the course would need to be delivered on extended weekends (Friday, Saturday, and Sundays). This would require the instructor to balance an already full teaching schedule with weekends away from their family and weekend obligations (not to mention social/pleasure activities). Still for some reason, I thought that these two decision makers were not doing everything they could to help this community. I trotted across campus to speak with a math instructor. I knew this instructor from his service work on one of our Indigenization committees. I also knew that he identified as Indigenous—though not as an Indigenous person from Canada—with a village experience that would make him empathic to the goals and needs of the remote community that was asking for a math class. Long story short, this instructor cleared off a weekend a month to travel to the community and then just as quickly set about to Indigenize his class with what he referred to as "local relevant" curriculum and assignments. I am continually strengthened by the resolve of Indigenous people and our allies to go the extra mile and to undertake work that might not otherwise get done. Oftentimes, Indigenizing will take us out of our comfort zone, it will ask us to think about things differently than we have in the past, and more often than not, it will take longer and cost more.

The math instructor in preparation for his travels was determined to incorporate local knowledge keepers and to learn for himself about the culture and more importantly the everyday life of the community he was

about to visit. I arranged for the requisite local introductions to Elders and key educators in the community as well as to a couple of past students that had returned to the community. The instructor and I also worked together on the development of a research assignment that would ground the math students in their own culture and require them to seek out answers either from their Elders/knowledge keepers or from published research. The instructor asked students to undertake a short investigation into pre-colonial numeracy or counting, then write a summary (analytical report) of the findings and make a poster presentation. The students were told the goal was to demonstrate their knowledge of numbers and its representations, oral language, symbolic, or other forms—particularly in a practical setting.

This exploration set students on a path to consider weaving patterns, drum beats, trade, the building of longhouses, house posts, and extended to how money was introduced and how colonization impacted the pre-colonial practices and moreover the evidence of how these pre-colonial practices are reflected in these things today.

This university math instructor came back after his third weekend in the remote community not only with stories of bear sightings in town, but proud of students he had known only ten short weeks and armed with the posters his students had produced. The instructor's tenacious desire to ground his students learning in place led him to understand "how my singular Math for Teachers research project allowed the Indigenous teacher candidates to experience authentic learning that is "place-based", to find out for themselves that mathematical (and other) learning was embedded in the project and in any of the cultural activity they chose to explore, and also that learning (including mathematical questions) emerged out of their new-found curiosities.

When I hear the excitement, the conviction, and I see an instructor's satisfaction with their undertaking of Indigenization, I am strengthened. I know that as an instructor, they are transformed. More importantly, they will continue to transform the minds and hearts of their students in all of their classes on campus and off, indigenous and non-indigenous.

Marker back

I love this story from Shirley. I have written (Marker, 1998) about how transformational things can happen when instructors travel to the Indigenous community to teach:

A professor from Western Washington University told me this story. He was teaching a journalism class on the reservation and had given an assignment to the Lummi students to do an interview with someone; an elder, a friend, a family member, anyone. He said that "it was a standard beginning journalism assignment." Well, the first week went by and no one had done the assignment. I wanted to be especially patient and not appear coercive so I didn't say anything. The next week, and once again nobody turned anything in. After the third week, I became frazzled and I said to the whole class, why hasn't anyone done an interview? There was then an extraordinarily long pause of silence; I just kept waiting. Finally, the most outspoken member of the class called me by my first name and said, "I don't think you understand us yet. From the time we were all very small and ever since, most of what we have learned has come from listening, not from asking questions. It is our way that we don't ask a lot of questions—we are taught to be quiet and listen to what our elders have to say. People only speak when they have something important to say, not to ask a bunch of questions. Our people are suspicious of someone who asks a lot of questions. That's why we're having a hard time doing this interview assignment."

At this point, the professor paused reflectively before he resumed again saying, "I learned something then that I never forgot. As I drove from the reservation back to my classes at the university I thought about how different these two worlds, these two cultures were. The mostly white students at Western always, always were full of questions, but most of them hadn't learned how to listen very well" (pp. 477–478).

When I think about the cross-cultural context of math education, I restate the questions I asked at the beginning of this essay here to emphasize their centrality:

1. What should be counted?
2. How do we do the calculations?
3. What is mathematics and where does it come from; who are mathematicians and where do *they* come from?
4. Can we use mathematics to expose the hidden curriculum and hegemonies of settler colonialism?

Can we contemplate Bourdieu and Passeron's, (1977) concepts of social capital, cultural capital, from an Indigenous lens? Capital sounds like a quantity such that people have different amounts of capital. We know it has relevance for understanding the xwelitem world. Can it be made into an algorithm? This is not to invoke a highly problematic—from an Indigenous viewpoint—Marxist analysis. Neither is it to employ a semantic *tricksterism*. We consider this all a very common sense cross-cultural questioning. Is there a trigonometry of privilege and are there colonial quadratics that might reveal the compound interest of the confiscation of Indigenous space? Are there binomials that can help Indigenous students understand the ecological and social outcomes of a mining project on their traditional and sacred landscapes? A pipeline? A ski resort? Is ALL mathematics ethno-mathematics?

Can we, as Jo-ann Archibald (2008) instructs us, begin *thinking through stories rather than just about them*? I know that I promised, at the beginning of the article, that I would share a few ideas about Aboriginal ways of mathematics. Sometimes early forms of ideas manifest as questions. I would like to spend some time with these questions. Let us *all* spend some time together with these questions.

Let us return to the question about Aboriginal ways of doing quantitative analysis. Well, I might just have an answer for my colleague Handel. Think of this *question* about Aboriginal math in the same way we might think of a fishing net for catching salmon. The strands are woven just tight enough to capture salmon. However, this net will not work if you are trying to catch oolichan, which are much smaller fish. The oolichan would simply swim through the holes between the filament in a salmon net. Just as one can use the wrong net for catching fish, one can use the wrong question for catching... truth. I doubt this will satisfy Professor Wright, but it's the best I can do at the moment. Let's keep asking questions. Let me repeat myself; let us *all* spend some time together with these questions. Let us see if they are the right questions that might make an appropriate net for *catching truth*; Indigenous truth.

As Indigenous scholars, in academic spaces, we are frequently asked questions that do not make sense to us. We often wish that Settler colleagues and Settler students would ask different questions. Decolonization will require that math educators and STEM faculty do more listening to Indigenous voices. And ultimately, when Indigenous educators are presented with normative interrogations that are just simply the wrong questions for capturing our truth about reality, don't be surprised if we simply say, "go fish."

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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