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## *Performing Survivance (Re)Storying STEM Education from an Indigenous Perspective*

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### **Abstract**

*At this time of escalating global ecological crisis and social inequity, there is an urgent need in education for Indigenous knowledges and ways of thinking to reimagine and reshape the mainstream 'progress narrative' of capitalist-rationalist modernity that has privileged mind over body, heart and spirit; human over more-than-human; and overlooked the knowledges, worldviews and self-determination of Indigenous peoples as well as their more-than-human relations. This prevailing narrative has created and sustained a chronic systemic imbalance across many constituencies that continues to negatively impact the ethnosphere and biosphere. Mainstream Western education, as the primary export and intellectual vector of 'developed' 'northern' nations, is, overwhelmingly, an uncritical promoter of STEM (science-technology-engineering-mathematics) thinking further fuelling the state-military-industrial-education complex. This paper is a call to widen the Eurocentric knowledge base and framework of mainstream education to include as 'equivalent' Indigenous and other Other(ed) worldviews and epistemologies. This (re)storying of STEM is based on the teachings of our Indigenous ancestors and current research with Indigenous communities in British Columbia and Peru as we work to regenerate more complex, culturally-inclusive possibilities for living together on a shared and finite planet.*



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Native survivance is more than survival, more than endurance or mere response; the stories of survivance are an active presence. (Vizenor, 1998)

The world in which you were born is just one model of reality. Other cultures are not failed attempts at being you. They are unique manifestations of the human spirit. (Davis, 2009)

Politics emerged (with science) to make a livable universe, to control conflict among a single if culturally diversified humanity living in a scientifically knowable nature. The consequence is not just that politics is lettered; the problem is that it can only allow humans in its quarters – period. (de la Cadena, 2010)

*please note that the narrative form of this article reflects the orality of our Indigenous cultures how we think feel speak write act as Indigenous scholars we are taught that creation is a whole a oneness in which each member has a voice and spirit this oral speaking on the page is best read aloud so that the reader might feel and hear the different wordbodyheartmindspirit shapes sensibilities rhythms sounds and synchronies than those of standard academic prose reading aloud brings the breath of words beyond the conceptual theoretical or representational it is more than naming and juggling morphemes it is the touching of the named things with the sound and rhythm and life of one's breath and that of one's interlocutors*

on a ridge high above the Lillooet River of British Columbia the sound of birds four leggeds insects rushing water wind in trees ravens dancing snowpack shifting glaciers murmuring clouds rumbling rhythm of earth-sky-water breaths mingle spirits consort as out-of-body synapses quark waves we locate St'át'imc geo/somato/meta/positionings using paleo-technologies sort through supplies survival strategies prepare to remap a more complex terrain for educational discourses in an era of accelerating anthropogenic climate change and its causative catalytic agents including out-of-control consumerism-aka-globalization and other normalized provocateurs of development and progress

we think of the effect of science based on the classical (Cartesian/Newtonian) paradigm in the compulsory educating of St'át'imc children we think of how our learning comes from/as the living world every/thing is a teacher if one opens oneself to the world not reduce it to objective-conceptual-theoretical essences our world is a living world where spirit pervades as communal life-forces our teachers and co-learners are nodes buds peduncles rhizomes mycorrhiza stolons runners mycelia hyphae scions bromeliads epiphytes epizoics bryozoa lithophytes endosymbionts blastochoric and anemochoric disseminators the spectrum of surrounding mutually transformational spirit beings

today our children are being required to mimic the narrow myopic rationalist thinking of science-technology-engineering-mathematics (STEM) the four horsemen who carry the scroll with the seven seals 'stem' is a term we understand to mean a supporting structure purveying nourishment between root leaf bud flower and fruit but the STEM now being pushed in schools is a self contained economic system that destroys the natural world while enhancing the lives of elite species STEM thinking is an agent/agency of empire fueling and catalyzing the state-military-industrial-education complex through research and development as Weinstein, Blades & Gleason (2016) write political and business agendas overshadow and prescribe STEM education with Western scientific principles and thinking mirrored in its philosophies epistemologies methodologies axioms and goals the four disciplines act as cultivars of a common scion that is uncritically propagated and marketed

we muse on the acronym's missing vowels and transform STEM to ESTEEM *ecojust-socio-transspecies-equivalency-engendering-mutuality* foregrounding the natural world as main-stream rather than transnational corporate consumerism adding an 'e' for *ecojust* signals that the ecological responsibility is to be foregrounded *socio-* brings in communities working together add another 'e' for *equivalency* acknowledges non-Western knowings as well as the *transspecies* intelligences and agencies of non-human and more-than-human beings *mutuality* decentres the rational/representational thinking of humans to allow for mutual caring conversations between all forms of life what counts as data human words frog sounds a loon's call the sound of heating pipes snow sliding water currents hurricanes bees buzzing

the "manifest manners" (Vizenor, 1999) of STEM education absent Indigenous cosmologies knowledges and languages cutting students off from embodied interdependent relationships with land and language when land is deemed to be ownable it becomes severed from the people and with Indigenous people irrevocably tied to land through relationship owned land means owned Indigeneity sold land is sold Indigeneity severable Indigeneity severable justice settler thinking was forced on six generations of St'át'imc children in the form of compulsory residential schooling fracturing the unity of landscape-bodyscape-mindscape-spiritscape as lived reality Indigenous knowledges and cultures have been disappearing since the introduction of compulsory residential Eurocentric schooling for First Peoples Wade Davis (2007, 2009) writes of this as the loss of "ten thousand different voices" for dealing with the challenges facing the ethnosphere and the biosphere why does it take a famous settler talking about Indigeneity and diversity to have people pay attention mainstream Western education resists and refuses to advance Indigenous worldviews and knowings as "equivalent epistemologies" (Grillo, 1998) education in Canadian schools promotes one way of knowing through "cognitive imperialism" (Mentan, 2015) "knowledge capitalism" (Stewart-Harawira, 2013) and "knowledge imperialism" (Adebisi, 2014) we have had to learn to speak (in plain sight and hearing) the settler's language in ways that speak beyond it

as Indigenous scholars we are deeply concerned about the global ecological crisis marked by anthropogenic mass extinctions global pollution extreme weather systems wars over food water and 'natural resources' climate change and the loss of Indigenous ecological knowledges our scholarship focuses on widening the circle of knowledges in the academy beyond the

anthropocentric ‘progress narrative’ of cosmopolitan modernity expressed as ‘rationality’ in a mechanistic search for certainty and power over the ‘new material’ world knowings estranged from matter now rendered voiceless mindless agency-less languaged as ‘natural resources’ the spirit world erased critiquing rationality using rationality advances and reinforces rationality

our effort to unsettle the “knowledge imperialism” (Adebisi, 2014) of Eurocentric schooling has been to advance Indigenous ecological knowings and practices including those negotiated with more-than-human intelligences and agencies re-learning the interdependencies of being/becoming knowing and ethics beyond ethics

Before the triumph of modernity – sealed in Western Europe of the seventeenth century by the advent of the scientific revolution – people lived in constant interaction with a host of beings, powers, spirits who tricked us, protected us, quarreled with us, guided us, taught us, punished us, and conversed with us. We were wealthy in our human and other-than-human communities. (Apffel-Marglin, 2011, p. 3)

our research includes reclaiming the *Ucwalmicwts* language from Western-trained linguists who have modeled it using Western epistemologies making it part of the Western knowledge project where the linguist-practitioner claims expertise authority and ownership (copyright) over Indigenous knowledges/languages our very means of expressing ourselves we reclaim transformer-nouns and -verbs that are in a state of continual being/becoming like the settler notion of mass-energy time-space particle-wave or quark re-languaging knowledge as knowing(ness) allows superpositioning that creates wormhole composites within the “majoritarian” (Deleuze & Guattari, 1986) language undiscovering decoding and decolonizing *Ucwalmicwts* as a western glyph some Lakota elders (White Bird, 2016) critique the translation of *mitakuye oyasin* as 'all my relations' bringing to mind the expression 'more-than-human' which has different meanings (understandings) to different people translating across languages-cultures one needs to be mindful and respectful our elders emphasize the importance of right-speaking so as to not misrepresent when we call salmon 'salmon-people' we bring them closer to our heart-spirit being rather than anthropomorphizing them we could conversely 'salmon' ourselves recognize our salmon-being [as people-fish] that values the shade our sister cedar provides for salmon eggs not just figuratively but in the material world sharing *St'át'imc* knowings and “stories of survivance” (Vizenor, 1998) requires that we acknowledge where a story song vision or practice comes from and who acts as witness and faithkeeper oral-performative witnessing is foundational to our relationality

## late summer 1962

*St'át'imc* elder Sam Jim is at his creekside bush camp north of Pitt Lake in the high country of southwestern BC the gifts of land water air and spirit are being harvested the people know an uncertain winter will soon be upon them a small transistor radio with a bent antenna sits on his table crackling with static going on and off station

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his autumn gear oiled and mended Sam has time to visit and to savour the stories his mind returns to the doctor's office a few weeks back where he read *Silent Spring* (Carson, 1962) serialized in the *New Yorker* Sam likes the serial genre it reminds him of oral storytelling keep the listener waiting for the next instalment is an age-old strategy to keep the spirit of the story alive and capture the attention of the listener

birdsong insect hum sussurating stream lake lapping wind in trees grandmother moon riding wildwind and cloudbank reflections from frost and dew stars glisten this is Sam's symphony his wellness insurance his weather report his spirit-home showing compassion for the more-than-human makes *Silent Spring* powerful its poetic sensitivity is unlike any science Sam has ever read the writing speaks of things he has known his whole life changes he has seen with the coming of the *sáma* changes his parents saw with the flood of goldminers in 1858 the newcomers were not respectful toward the living world including the people of the land

reading the condensed instalments of *Silent Spring* in the midst of concrete glass brick clearcut and petrofumes brought to him in that waiting room the thinness of a bird's eggshell caused by bioaccumulation of poisons birds dying before they are born Sam had seen it in the bush for decades *thrrukkk* a raven speaks overhead when you live in the bush you don't need to be told of the existence of Western enlightenment or industrial revolution the signs are everywhere even halfway around the world globalization has always existed but its marriage with transnational corporate capitalism is recent Rachel Carson's intense love for the natural world is demonstrated in the sound and rhythm of her passages her book is written as a love letter to a suffering world of all-being earlier books gave similar warnings but her impact came from the voice and intensity with which she wrote her own mortality speaks too cancer will soon cut short her life she is desperate to make others aware of what the mainstream Euro-American lifestyle is doing to the earth her book does not just focus on human suffering from human activity but on the suffering of the whole spectrum of life scientific problem-solving that does not take into account the longterm repercussions including side-effects of science-solutions is counter-productive in the long run for the health and well-being of land-water-air and all that live on/with/by/as integral parts of it/them

the public of 1962 is unaware they are being poisoned by pesticide companies that threaten to sue Carson for publishing evidence that the poisons produced by science-technology-engineering-mathematics thinking were killing the earth filling it with chronic lingering and acute suffering Sam saw the fouling of waterways during the goldrush by miners trying to separate out the gold the assumption was that nature would dilute poisons so they were no longer dangerous bioaccumulation dispels that myth uphome we know about bioaccumulation though we have no science no rational discourse no reductive notions of life reduced to formulas and equations just participant observation and compassionate relationality

Coyote and Raven are visiting Sam Jim on their autumn walkandpaddleabout other visitors come and go in human and more-than-human form Sam has spent most of his 97 years in the bush his eco-versity he calls it in 1962 only the notion of uni-versity is in the consciousness

of mainstream education though di-versity long preceded the uni-formity of the meta-narratives and essentialisms of post-secondary learning

through the radio's static you can make out that Watson and Crick were recently awarded a Nobel Prize in science better late than never thinks Sam thinking of joined coils and repeating patterns in the natural world sturgeon lures weaving and braiding patterns parallel narratives shamanic choruses double helices in clouds in air and water climbing plants shells and the mating of snakes and eagles

someone is talking on the radio about Thomas Kuhn's (1962) *The Structure of Scientific Revolutions* which was published recently after first appearing in a science encyclopaedia there's an argument about purity and continuity in science versus paradigm shift Kuhn's paradigm notion seems to Sam to be like the argument of quantum or particle versus wave where the 'problem' is 'solved' by creating the notion of superpositionality which in science has been around for a few centuries and in traditional societies since forever including in the notion of shape-shifter and the practices of ceremony and oral narrative

says Sam if the settlers would listen to their original instructions they would know they have to listen to their bodies and feelings there would be no need for synthesizing beta blockers to regulate angina pectoris but the pharmaceutical companies love it take pills forever the people are mesmerized by science medicine and technologies of plugging one hole while springing five others with side effects and alternative variable sets the 'byproducts' diffusing into the environment and bioaccumulating in everything that is alive

says Coyote if you treat the whole world as being either dead or subservient to human beings you destroy your relationship with everything

long pause during which Sam chews sockeye jerky mindfully as though gaining insight or inspiration from it what I learned from my great grandma and from the bush is you need to keep track of who you're related to and how you fit in that way you learn what your responsibilities are the radio crackles on a story in the New York Times on the possibility of a personal computer Sam smiles points to his head frowns then to his heart nods you don't need to compute when you know from here

voice-over from within the campfire smoke *give more than you take take nothing* an ember explodes and shoots into the bush Coyote stomps it out with her bare paw *yeeoow*

that fire's got an attitude says Raven smiling you've got to watch how you build a fire my friend where and with what fire is our relation we need to be respectful speak gently and never blow or turn your back on it unless you are prepared for the consequences every fire is a sacred fire

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says Coyote there's a story in the paper about a scientist talking about molecular clocks inside us inside everything ticking away

hmm says Sam smiling I guess nobody told that person clocks were obsolete before they were invented by people who believe in time the *sáma7* has divided the world into so many parts they don't know how to put it back together they name every piece so their languages are filled with words and meaning and there's no room for sense *sensate*

Coyote retorts that's heavy thinking for a Sunday morning Sam you've been reading those science magazines again your mind will be haywire before you're 100

*crackle crackle tlr* it's NASA news network time

all hail says raven

more radio static then

Ranger 3 space probe misses the moon by 22,000 miles

they're aiming at their own finger says Raven

John Glenn orbits the earth in Friendship 7

back in time to take out the garbage *more crackling*

AT&T telstar satellite beams tv across the Atlantic to the UK

but nobody's home or has a tv or they're doing things with their bodies

NASA Mariner 1 spacecraft flies erratically has to be terminated  
more crazy ideas trying to get out of this world

Ranger 4 crashes into the moon

flying under the influence of Western hubris

Aurora 7 orbits the earth with Scott Carpenter aboard

more space junk from tech ed inc

Canadian satellite Alouette 1 launched from American airforce base in California

*je te plumerai le bec*

Mariner 2 flies past Venus

*en route* to nevernever land

Raven says Coyote and I were at the barber shop and got to talking about how people come to know what they know when what they know is mostly unrelated to the world they're part of

information says Sam is like knowledge and education it's contagious you turn your back and it reproduces like mushrooms after rain

fairy circles of knowing says Coyote smiling joined at the mycellium

says Sam the water land and sky work together with their original instructions the scientists talk about gravity and water cycles now they're seeding them with chemicals the cloud mothers are pregnant with rain you respect that by not poking around

the *sáma7* calls the coming together of contrary ideas or actions *interference* says Raven we are taught that places of transition are places of learning and transformation

the confluence of fluidities says Sam stream becomes river becomes lake

funny thing says Raven the *sáma7* don't call stealing our land *interference* they call it development discovery compulsory residential schooling they call education they want to make us rational thinkers I wouldn't visit that on my worst enemy

says Sam the *sáma7* invented reason to combat religion according to the blackrobes the ancient Greek and Roman philosophers who influenced the early Christians with their own brand of 'correct' thinking were sinners infidels retroactively

Raven adds the church higherups said the Greeks had too many gods frolicking with youths and maidens transforming them into swans trees flowers or constellations it messed up the divinely ordered universe with hybrid categories that are hard to sort and analyze if you create a god and make that god the creator of universal truth and you are 'his' mouthpiece you and your successors have a transgenerational job no matter how the economy is performing

says Sam taking a sip of tea the *sáma7* is confounded with the *time* s/he created while fashioning truth on her/his '*conceptual space*' chopping block where universal laws operate laws held together by causal notions

says Raven the *sáma7* notion of *nature* is a product of that chopping block there is no mention of the tree the block is made from or that it was home for birds insects spiders moss lichen fungus STEM ideas and thinking are rational binary and anthropomorphic creation exists only to benefit 'man' rational man civilized man Western(ized) man



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says Sam a conversation is like tributaries entering a stream from springs rainwater dew transpiration humidity tears and exhaled breath each on its own journey each part of limitless shared journeys add the compassion of the moon in her phases needing to hold that water embrace it like a grandmother holding her grandchild the embrace is mutual

says Coyote Raven and I were having a coffee and these professorial *sáma7* were going on about science strangeness numbers and particle decay

says Raven how did their ideas become generalizable in their conversation and to whom

Raven says they were talking about high energy waves half-lives and time dilation I asked about time dilation

the *sáma7* professor says it's just time slowing down

oh says Sam universal truths like when the teacher talks about *right* answers or the priest talks about sin or the politician talks about justice

says Raven one of them said you have to understand mesons time and particle decay

says Sam strangeness is part of their charm let them work it out it's their story

says Raven I was carving a paddle with a home-made knife sanding it with a rock fellow looks at me says this Indian doesn't know physics he's living in the stone age gotta go

Coyote and Raven say good-bye to Sam Jim Coyote howls Raven wraacks full moon rises

### **survivance spirit whisperings from Canada and Peru**

with our ancestors and generations to come with our *St'át'imc* research partners in British Columbia (BC) Canada and the *Kichwa-Lamista* of the High Amazon of Peru we traverse the Cartesian-Newtonian turbulences that privilege mind over bodyheartspirit human over more-than-human analysis over synthesis while devaluing Indigenous knowledge systems we unfold shake out refold posthumanist poststructuralist and quantum theories mix in *St'át'imc* and *Kichwa-Lamista* experiential knowings to provide a more culturally inclusive language to enact "survivance" (Vizenor, 2008) – survival and continuance – toward more complex

transculturally interspecifically diverse geological geographical narrative practices in education speaking in myriad voices

for more than twenty years we have conducted research with the *St'át'imc* in the regeneration of their/our traditional language knowings and practices while participating in an *Ucwalmicwts* language class in 1996 our Elders spoke of the urgency of recording *St'át'imc* ancestral knowledges and practices renewing them for the next generations and sharing them with the larger society thereby contributing to the narratives needed for survival and continuance of human and other lifeforms on Earth phase one of our research was with the four Lower *Stl'at'imx* (*St'át'imc*) communities to regenerate the stories and traditional knowings and practices this involved co-designing culturally appropriate research methodologies using participatory action research *St'át'imc* methodologies and protocols one challenge was each community spelled words differently and standardization was not an option self-empowerment was more important

our current study is a joining of hands and voices in solidarity with our *St'át'imc* and *Kichwa-Lamista* research partners we met the *Kichwa-Lamista* in 2011 when visiting a colleague in Peru who has been working with the communities for over two decades on the regeneration of the *Quechua* language and their traditional knowledges and practices the *Apus* (Elders) invited us to bring our university students to their communities so that they might learn how climate change and resource extraction are affecting their land water and way of life and to share with the students a cosmology deeply connected to the land and to the sun moon and stars that they see as missing from Western 'schooling' we offered the *Peru Summer Institute: Ecology, Technology & Indigeneity in the High Amazon* in 2013 2015 and 2017 through seminars and immersion learning in the communities the undergraduate and graduate students have an opportunity to engage mindbodyheartspirit as they experience worldviews knowings and cultural practices that value other than global capital and geopolitical systems enactments of *ecojust-transspecies-equivalency-engendering-mutuality* (ESTEEM) students reciprocate by doing hands-on service work in the *chacras* (fields) and the communities they especially love spending time with the children in the village

concerned about how anthropocentric Western-centric schooling global warming and resource extraction are destroying their way of life and their lands the *Kichwa-Lamista* expressed an interest in working in solidarity with the *St'át'imc* to help document and share their traditional ecological knowings including their ceremonial and ritual practices with the wider world before they disappear the *St'át'imc* and *Kichwa-Lamista* are keenly aware that a radically different paradigm beyond the 'progress narrative' is urgently needed if a catastrophic ecological crisis is to be averted they wonder why the dominant society with all their 'schooling' and 'advanced technological prowess' is privileging STEM learning while doing so little in education to address climate change accelerating global social inequities and the loss of biodiversity they see sharing the profound significance of human and more-than-human "intra-actions" (Barad, 2007) as critical to the global climate change conversation if we humans are prepared to individually and collectively "dance a new world into existence" (Simpson, 2011, p. 149)

data collection with the *St'át'imc* includes ceremonies and ritual practices relating to fishing hunting gathering preparing food and medicinal plants pit-house (*s7istken*) construction and weaving as well as birth naming coming-of-age burial and burning and potlatch ceremonies with the *Kichwa-Lamista* we are looking at ceremonies and ritual practices relating to the regeneration of pre-Colombian anthropogenic bio-char (*terra preta*) *Ikarada* protection rituals planting ceremonies *Inti Raymi* (Festival of the Sun) and ritual offerings to *Mama Quilla* (moon spirit) ritual practice has been common to humanity throughout history in Buddhism Christianity Hinduism Islam Judaism and other practices such as Druidism shamanism “songlines” (Chatwin, 1998) and Indigenous spirituality (Cole, 2006; Kimmerer, 2015; Simpson, 2011; Stonechild, 2016)

The multifarious beings of the world .... taught us that the wealth of the plant beings, the tree beings, the water beings, the soil beings, the mineral beings, was not only ours, was not there for the sole purpose of satisfying our needs. They had their own reason for existing, their own requirements, and their own agency. We needed to ask permission, to share, to give back, and to give thanks. (Apffel-Marglin, 2011, p. 3)

outside of education mainstream efforts on re-awakening human spirituality and ecological interdependencies have been largely articulated in relation to aesthetics (Morton, 2009) sensuality (Abram, 1997) religion (Grim & Tucker, 2014) spiritual ecology (Vaughan-Lee, 2013) ecofeminism (Gaard, 2011) posthuman discourses (Haraway, 1991) and human-animal bonds (Haraway, 2007) some scientific disciplines now acknowledge more-than-human agencies and intelligences in part because of the breakdown of the foundations of classical Western science in the early 20th century the groundwork for quantum physics thinking led to radical revisioning of classical notions of physics and other sciences for example Niels Bohr's principle of “complementarity” (1937/1958) put forward the revolutionary theory that a quantum of energy cannot be separated from the apparatus and system seeing all of life as connected for evolutionary biologist Richard Lewontin (1993) organism and environment create each other Karen Barad builds on Bohr's “complementarity” and Donna Haraway's “posthumanist performativity” (1991) in her articulation of “agential realism” (2003, 2008) as interdependent entanglements of knowing and being of mindbodyspirit

the “new materialism” as articulated by Barad (2007) and DeLanda (2012) is not new in our communities although it is not the terminology used by the Elders and knowledge keepers when Indigenous scholars articulate what is now called “new materialism” majority scholars including STEM scholars do not regard what they say with as much enthusiasm we are however encouraged that it is getting some airtime in the academy as it offers potential for more holistic learning that involves interdependent relationalities among humans non-humans and more-than-humans where ethics justice and responsibility are intertwined our concern is that if “new materialism” is framed in predominately STEM epistemologies and methodologies it will not be inclusive of anything outside the Western mainstream other voices will simply be

chorus members and extras of the Western knowledge opus/opera we are concerned by the strong push by industry and many STEM proponents to have students so heavily influenced by the allure of new media technologies that is pulling them in a very different direction than learning entanglements of material-discursive intra-actions and down a ‘virtual’ rabbit hole where lived reality is an insular world without flesh feeling or spirit

## from knowledge imperialism to equivalency of epistemologies

it has been a struggle to motivate the academy to walk its talk on equity in relation to cultural inclusivity disrupting its knowledge imperialism necessitates creating vibrant spaces of epistemological democracy and epistemological multiplicities inviting and celebrating *equivalency of epistemologies* across worldviews a thread throughout our teaching and research in the performance of survivance has been *equivalency* a re-generative concept and practice to disrupt knowledge capitalism as Andean scholar Eduardo Grillo writes “everyone (be it man, tree, stone) is a person, complete and indispensable, with its own inalienable way of being ... with its specific responsibility in the keeping of the harmony of the world. It is in such condition of equivalence that this living world relates with each one and the other” (p. 224) *equivalency* invokes *ecojust-socio-transspecies-equivalency-engendering-mutuality* (ESTEEM) multi-dimensional spiritual-ecological enactments between human and more-than-human – intimate pedagogies of the land that profoundly affect life and cycles of interdependent living on earth and else/where other/wise

our study is a step in “explor[ing] the thousand other ways of learning that still exist all over this planet” (Black, 2014) “non-anthropocentric collective actions ... bring[ing] about not just a common world, but a livable common world” for all (Apffel-Marglin, 2011, p. 162) advancing Indigenous ecological wisdom and practices as *equivalent* is not about transplanting Indigenous knowledges into the mainstream rather it is recognizing that the mainstream is made up of myriad tributaries (Cole & O’Riley, 2011)

the research methodologies for the study acknowledge the challenges and opportunities of working across different Indigenous worldviews knowledge systems and ways of thinking as well as across four languages (English *Ucwalmicwts* Spanish *Quechua*) *reciprocity* is integral to the project ensuring that the Indigenous communities the academy and the public benefit from the study critically important to the enactment of *reciprocity* is that the research protocols are informed not only by the ethics and guidelines of the academy and funding agency but also the cultural customs and protocols across both Indigenous communities guided by an elders’ advisory council at each international field site

*equivalency* is demonstrated by having graduate research assistant/community research assistant teams conduct the data collection to encourage a cultural exchange of research methodologies the data collection includes *St’at’imc* ritual practices relating to fishing hunting gathering and preparing food and medicinal plants *s7istken* construction weaving birth naming coming-of-age and potlatch ceremonies in the *Kichwa-Lamista* communities we are looking at

regeneration of pre-Colombian anthropogenic bio-char/*terra preta* (Amazonian dark earth) to increase food security sequestering CO<sub>2</sub> and replacing slash-and-burn agriculture as well as *Ikarada* protection rituals planting ceremonies *Inti Raymi* (Festival of the Sun) and ritual offerings to *Mama Quilla* (moon spirit)

this study works to unsettle essentialized Indigenous research methodologies framed within Western scholarship requirements specifically in regard to data dissemination although Indigenous Peoples are to be the primary beneficiaries of this research into their lives as per the principles set out by the *United Nations Declaration of the Rights of Indigenous Peoples* (UN, 2007) the academy continues the practice of valuing peer-reviewed journal publications as the pinnacle of data dissemination these are not easily accessible or 'readable' to non-academic audiences including the communities with whom we are conducting our research

one of the goals of all of our research has been to 'do data other/wise' by advancing narrativity and orality as *equivalent* forms of dissemination to Western mainstream academic writing a key outcome from this study is highlighting documentary filming as the primary format for data dissemination so that the Elders can speak for themselves and the research results will be made more accessible to the Indigenous communities and the general public as well as the academy the elders' advisory councils will be the peer-reviewers of the documentaries to ensure the knowledge presented is accurate and reflects the urgent conversations they wish to share with the larger global society

### **re(storying) STEM**

we draw no blueprint for an indigenizing or decolonizing remapping of STEM education rather our hope is that this paper has offered some insights and non-anthropocentric non-Western-mainstream incitements and potentialities for those who wish to be engaged in disrupting the knowledge imperialism perpetuated through Western education including mainstream academic publishing and media and in particular focussing on STEM education in part this regeneration is carried out by creating vibrant spaces of epistemological diversity and epistemological democracy the ongoing struggle for more culturally inclusive and epistemologically robust education requires widening the knowledge base in education to include not only Indigenous and other Other(ed) worldviews and knowings but to also value narrativity and orality as *equivalent* genres for creating and sharing knowledge this paper is a call for educators to seek ways of creating holistic curriculum so that the pedagogical spaces can be places to (re)learn how to hear 'a thousand voices singing' including the voices of the ancestors and those not yet born the collective and individual voices of all our relations

*kukwstum'c nia:wen hiy hiy*

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