Learning & Technology for Just & Sustainable Futures

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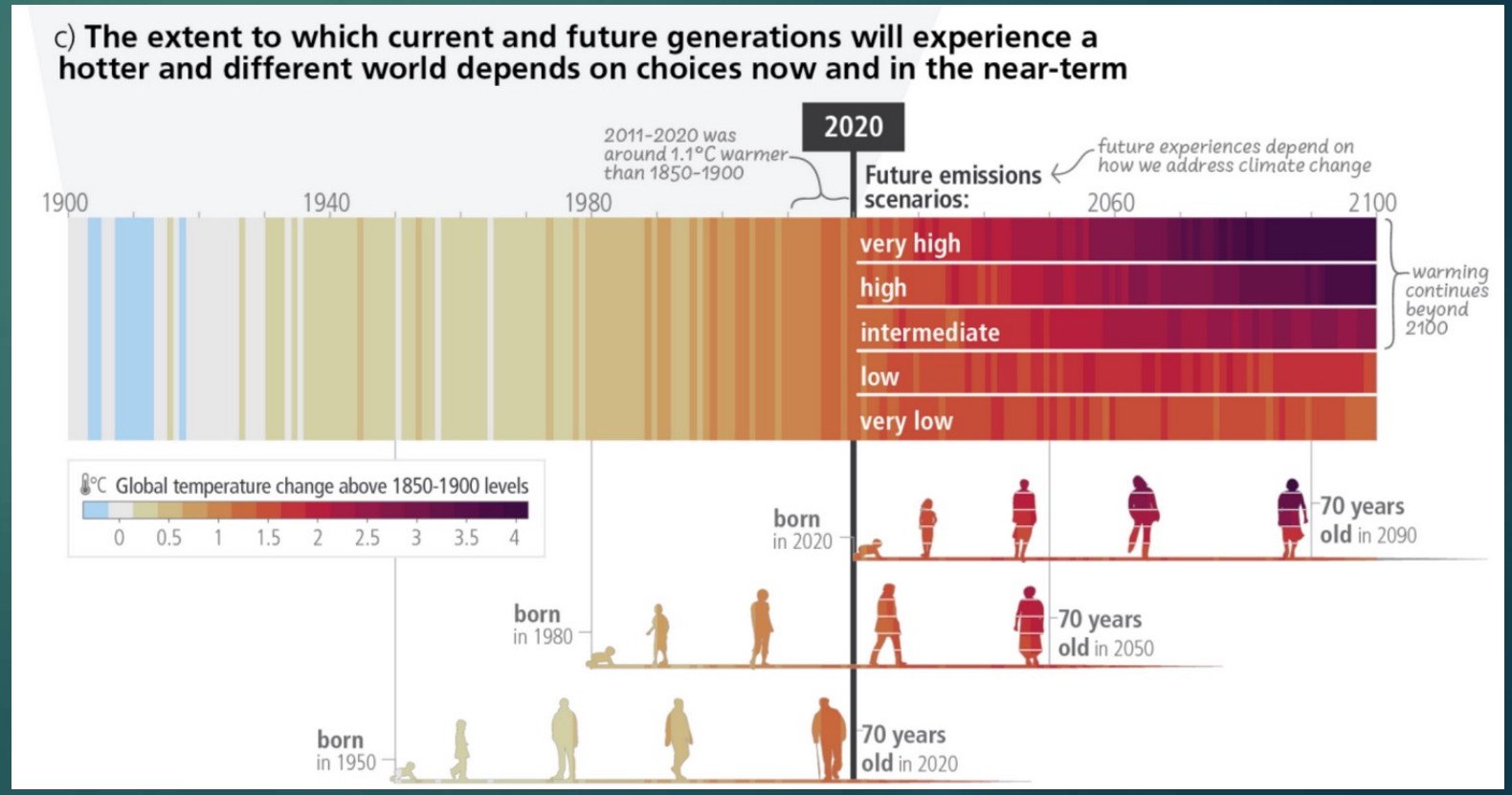
The social and ecological conditions of life are fundamentally changing.



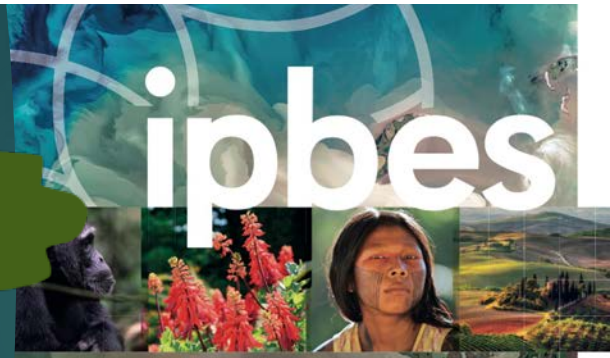
Central Possibility & Challenge of the 21st Century

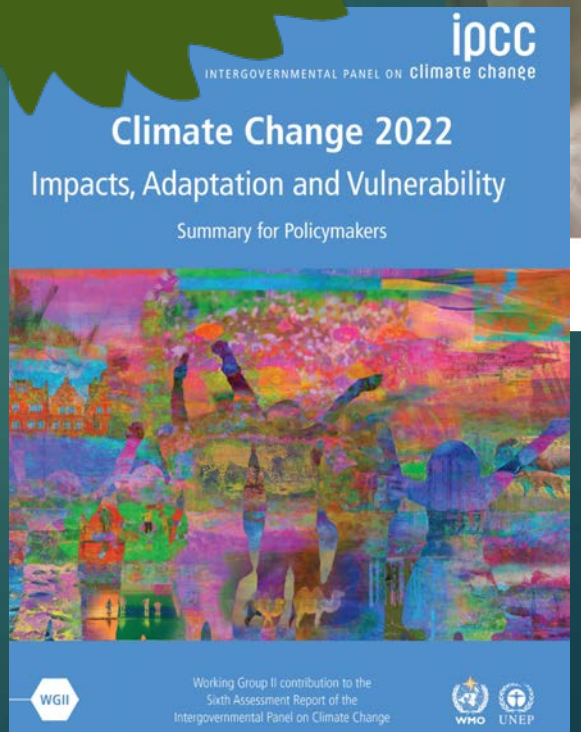
Living in and transforming the Anthropocene: Cultivating **just, culturally thriving, and sustainable** communities.

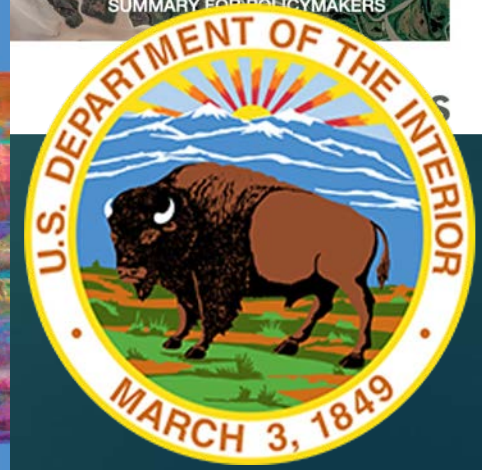
- What conceptual, ethical, and "technological" infrastructure in human communities do we need?
- How can & should education contribute to socio-ecological change? And to families, communities, and earth's thriving?
- What do we need to do as Indigenous people to ensure our collective continuance?

Indigenous STEAM

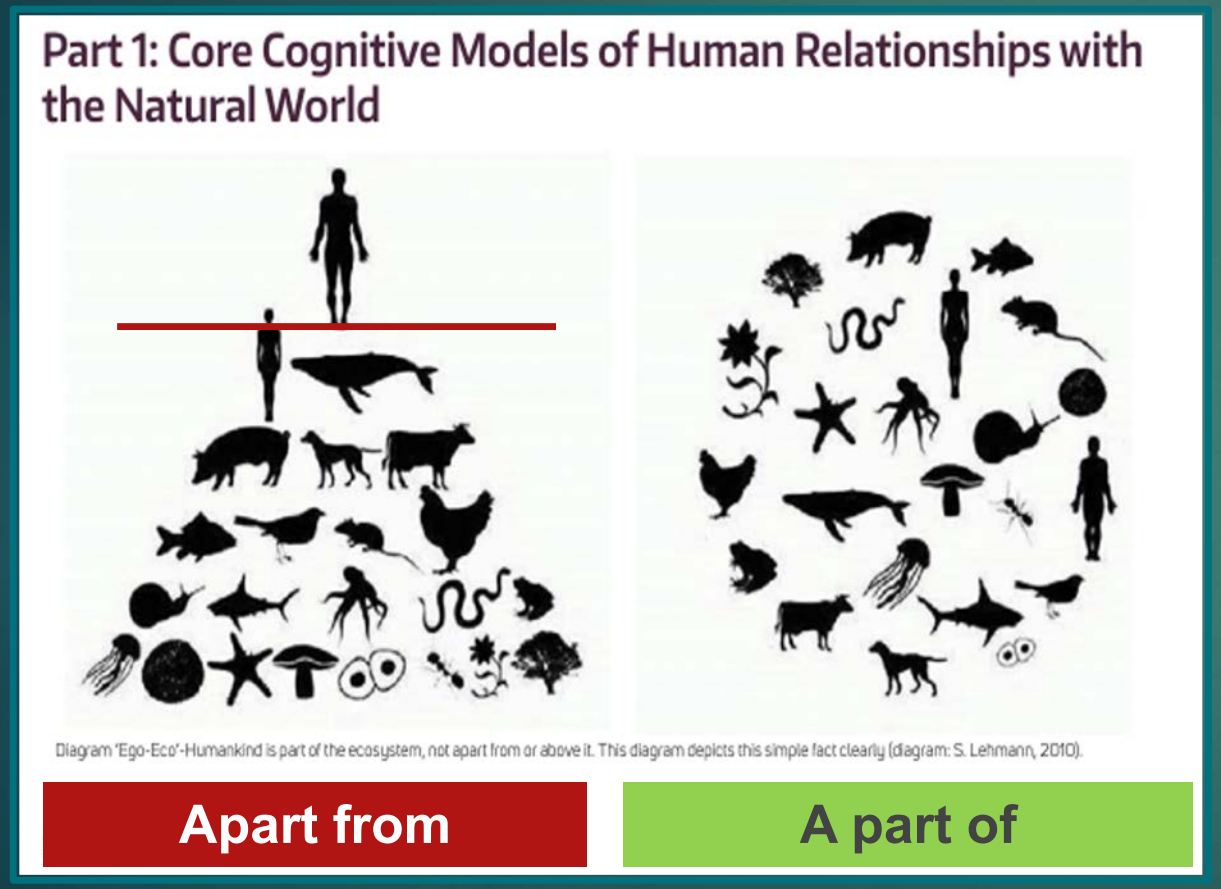
Learning in Places







Nature-Culture Relations Shape Socioecological Systems
AKA Forms of Life



Technology is a "Tool" in Activity

Cultural Historical Activity Theory

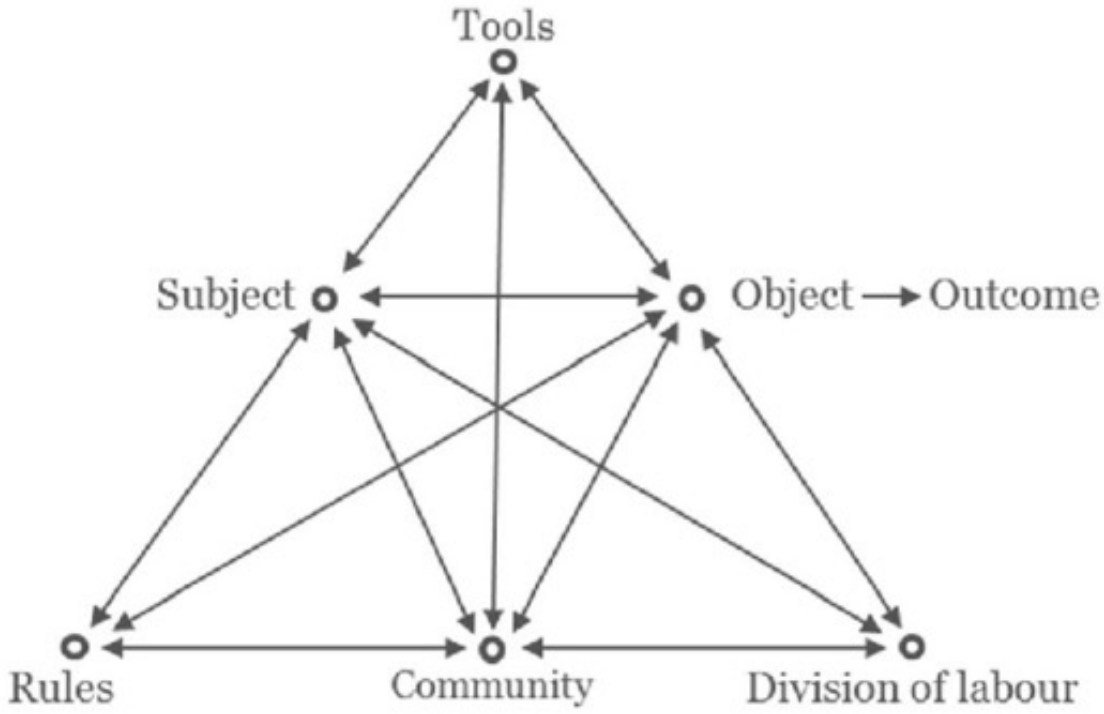
(Vygotsky, Leontiev, Luria, Cole, Engestrom, Guiterrez, Vossoughi, others…)

Humans engage in cultural activity that is historically accumulating and dynamic.

Tools are

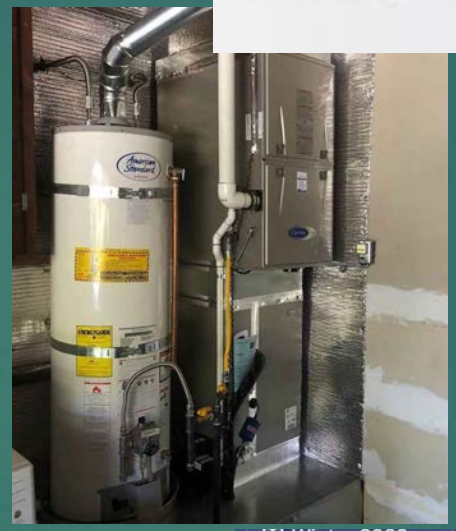
- Ideational
- Material
- Social/Cultural/Ethical/Political

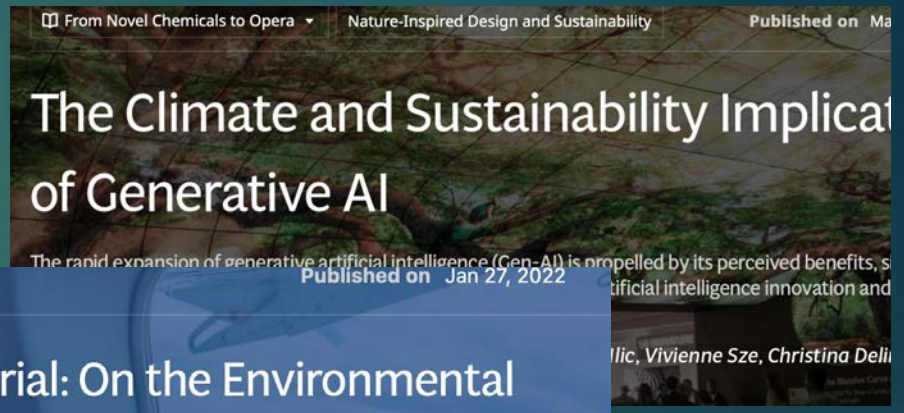
And mediate how we make meaning and life.



Technological innovation has improved life, created profound harm and is at the heart of climate change.

Digital computation (even via ICT) has material consequence.

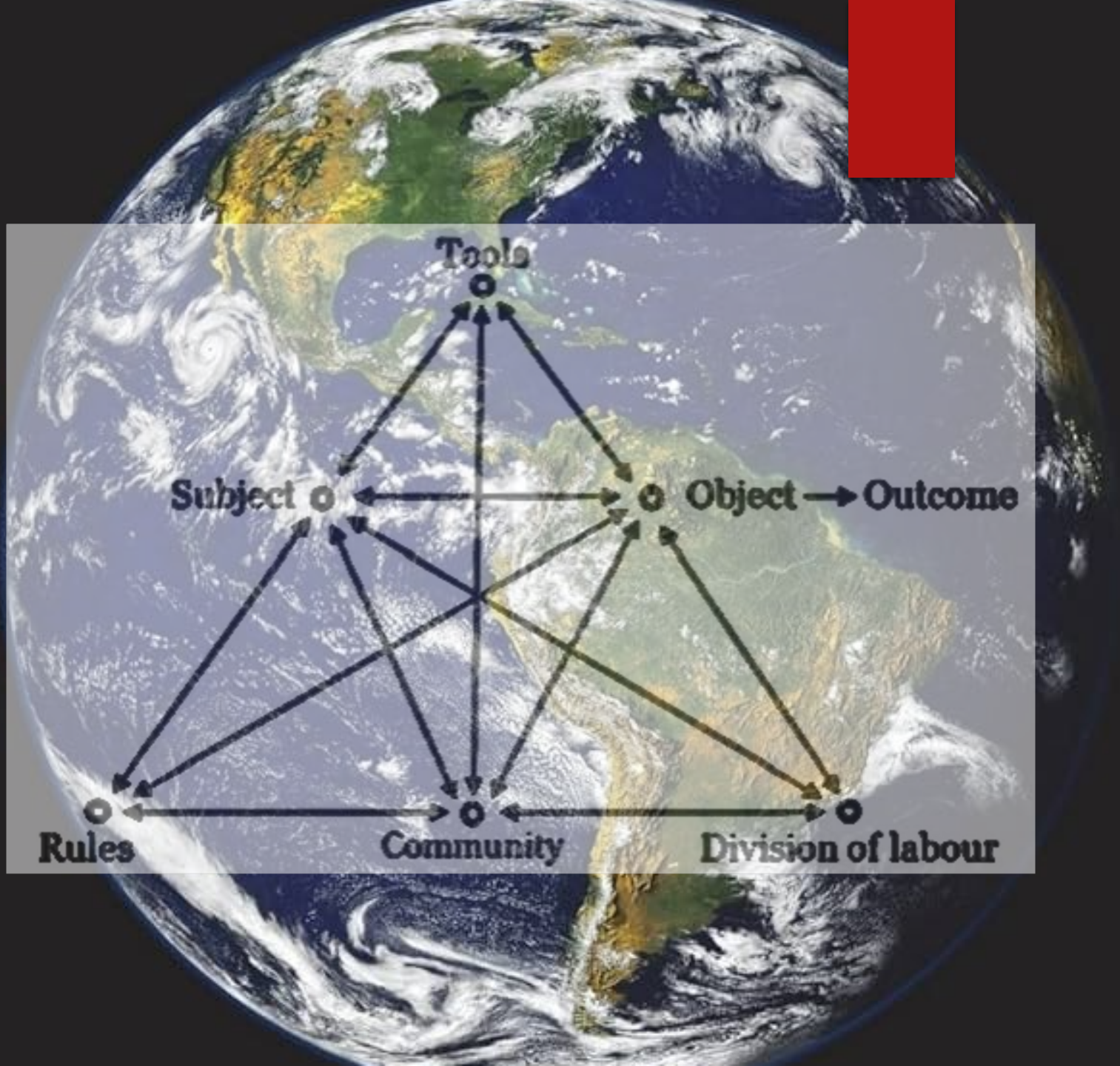




A key issue in innovative use of technology in teaching and learning:

Making the social-cultural-ethical-political dimensions of technology central and explicit in learning:

Towards what ends?



Making the social-cultural-ethical-political dimensions of technology central and explicit in learning: Towards what ends?

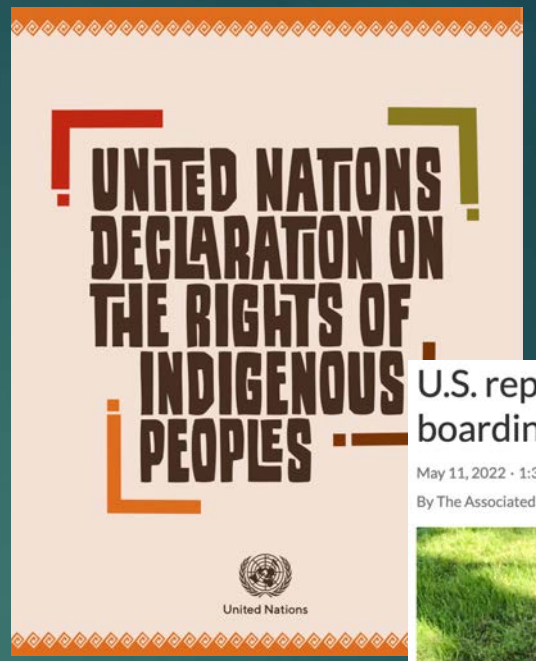
- Social technologies & material consequences
  - Corporeal arrangements
  - Indigenous presence, absence, and our knowledge systems
- Designing and implementing learning environments
  - Tech Tales
  - ISTEAM

Current schooling is a kind of social technology that reflects "Apart from" models & structuring childhood to be an indoor endeavor

- Multi-generational decline in children's (all people) engagement with the outdoors. The average American child spends **4 to 7 minutes a day** in unstructured outdoors time.
- **Shapes approaches to content learning** (e.g. the US has invested in lab-based science infrastructure, not field based)
- Our "**representational ecosystem**" (e.g. books, media, diagrams) are dominated by "**apart from**" models (Medin & Bang, 2014)
- Some technologies have infrastructured mobilities (cars, planes) – others have contributed to the "sedimentary bias" of industrialized societies(computers). However, important shifts are possible.
- Schools are a technology that infrastructures western epistemic privilege.

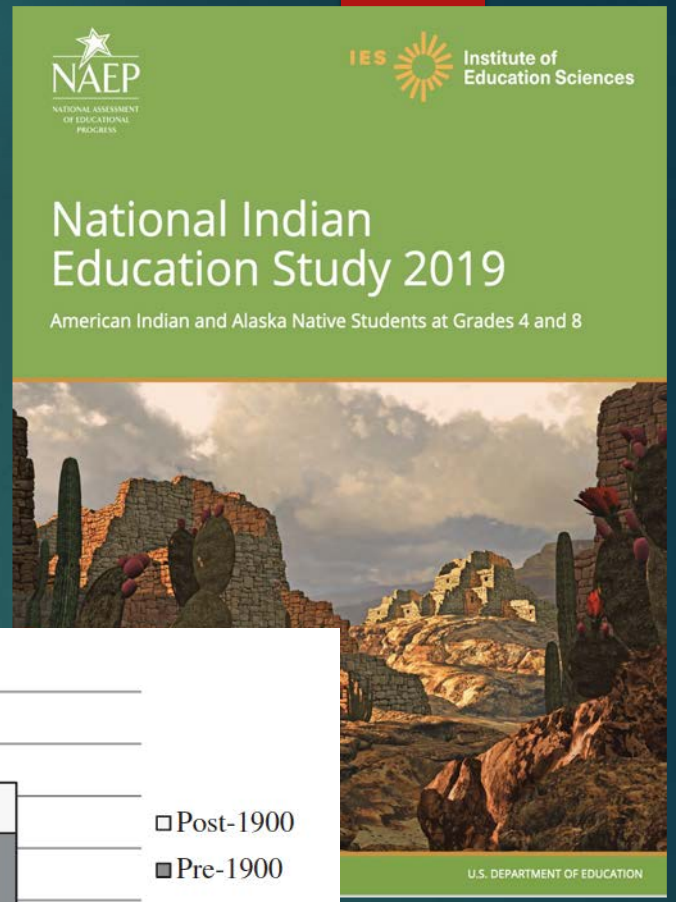
Indigenous Peoples right to exist legislated but we are structurally omitted from most of American life (and beyond)

- The genocide/erasure/assimilation of Indigenous peoples' has been a normative global socio-political order for multiple generations.
- Broad scale beliefs that Native people don't exist in contemporary contexts and if we do Native people don't experience significant racism (e.g. Dai et al. 2023; Davis-Delano et al. 2022; Burns et al. 2022).
- Persistent beliefs about that Indigenous knowledges and social systems are unsophisticated or wrong shaped by colonial legitimization (Deloria, 2004) and western epistemic preference (e.g. Noda, 2020), This has been a part of psychological sciences too (Bang, 2017).
- Indigenous peoples technologies are often engaged (If at all) through this narrative.



Education is systemically producing Indigenous absence in the present and future.

- Schools today are a main driver of Indigenous absence (aka form of systemic racism) in peoples' knowledge enabling systemic racism and challenges for Native peoples (e.g. Sabzalian et al., 2021; Shear et a;. 2015).
- 73-88% Educators report mentioning Native people 1 or none a year.
- Indigenous peoples are defined by ethnic or cultural and political standing, not race.



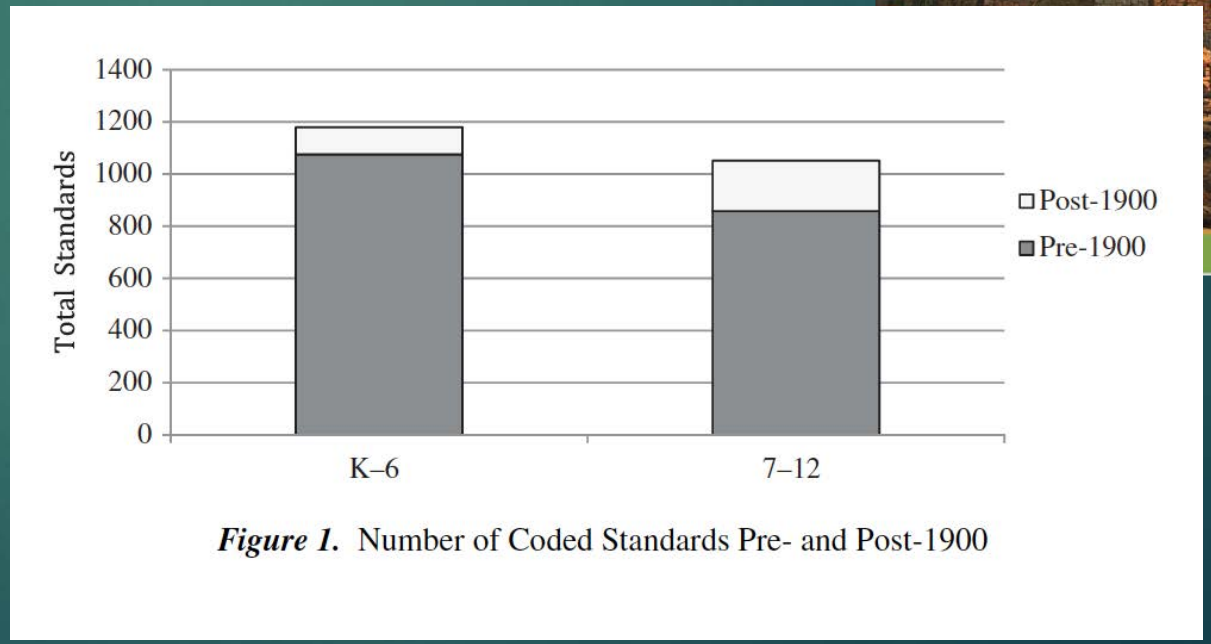
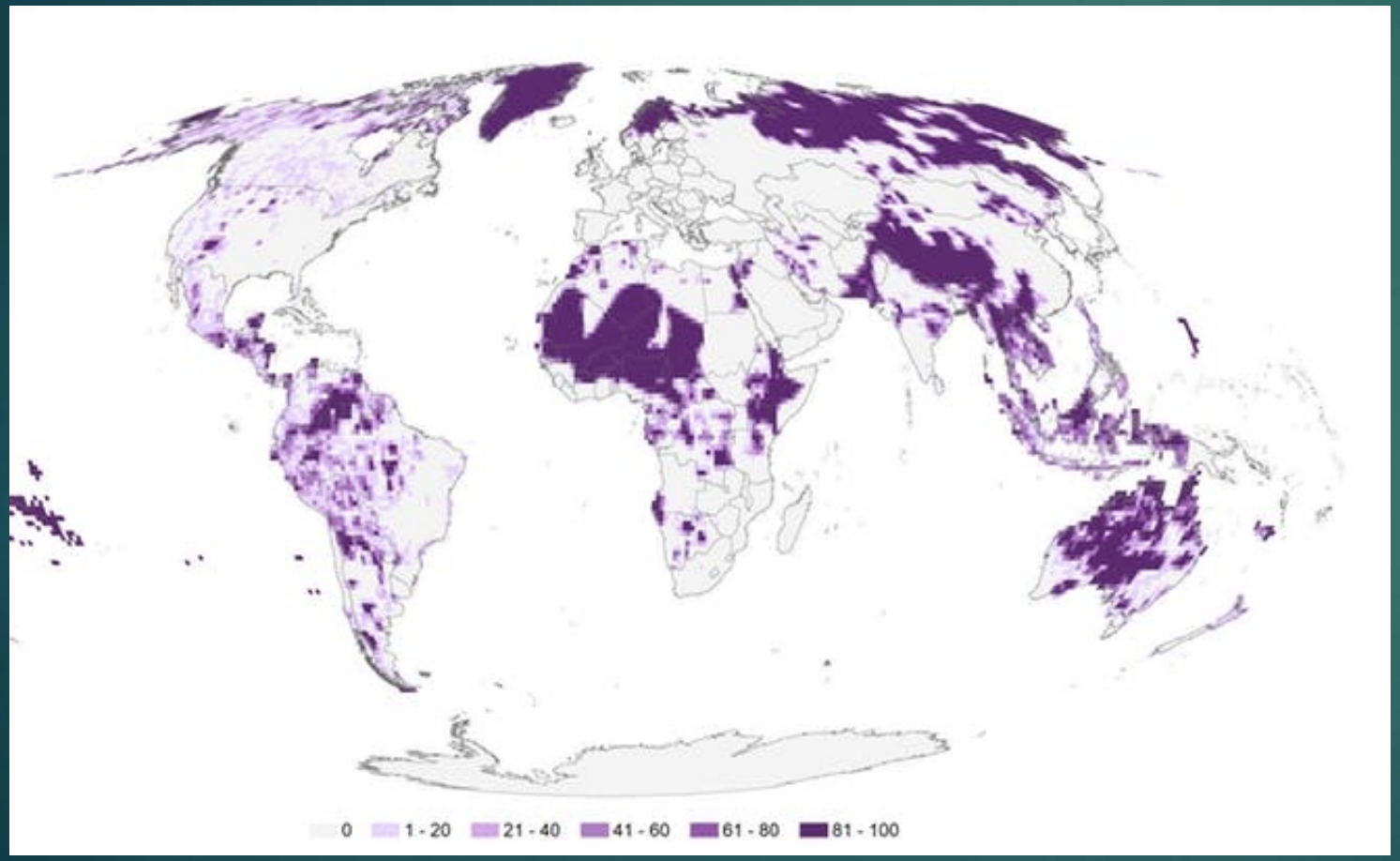


Figure 1. Number of Coded Standards Pre- and Post-1900

Indigenous Peoples, Lands, & Waters



Garnett et al., 2018

- 375 million people globally with recognized political standing in 90 countries – Indigenous peoples are "multi-racial"
- Indigenous territories contain 80% of the world's land-based biodiversity
- 1/4 of all land (outside Antarctica) is in Indigenous hands
- 95% of climate change hotspots in Indigenous communities
- Indigenous peoples' reflect the majority of human cultural and linguistic diversity.

Frechette et al., 2018; Reytar et al., 2018; Brigitte et al, 2016; Olney & Viles, 2019

Innovative learning environments could be focused on green technologies/engineering!.....

Global Climate Change Policy and Strategies for Just Energy Transitions are Replicating Previous Eras Coloniality and Harm…

Overview of Energy Transition Materials by Indigenous Territories & ”Peasant land” (Owen et. al, 2023)

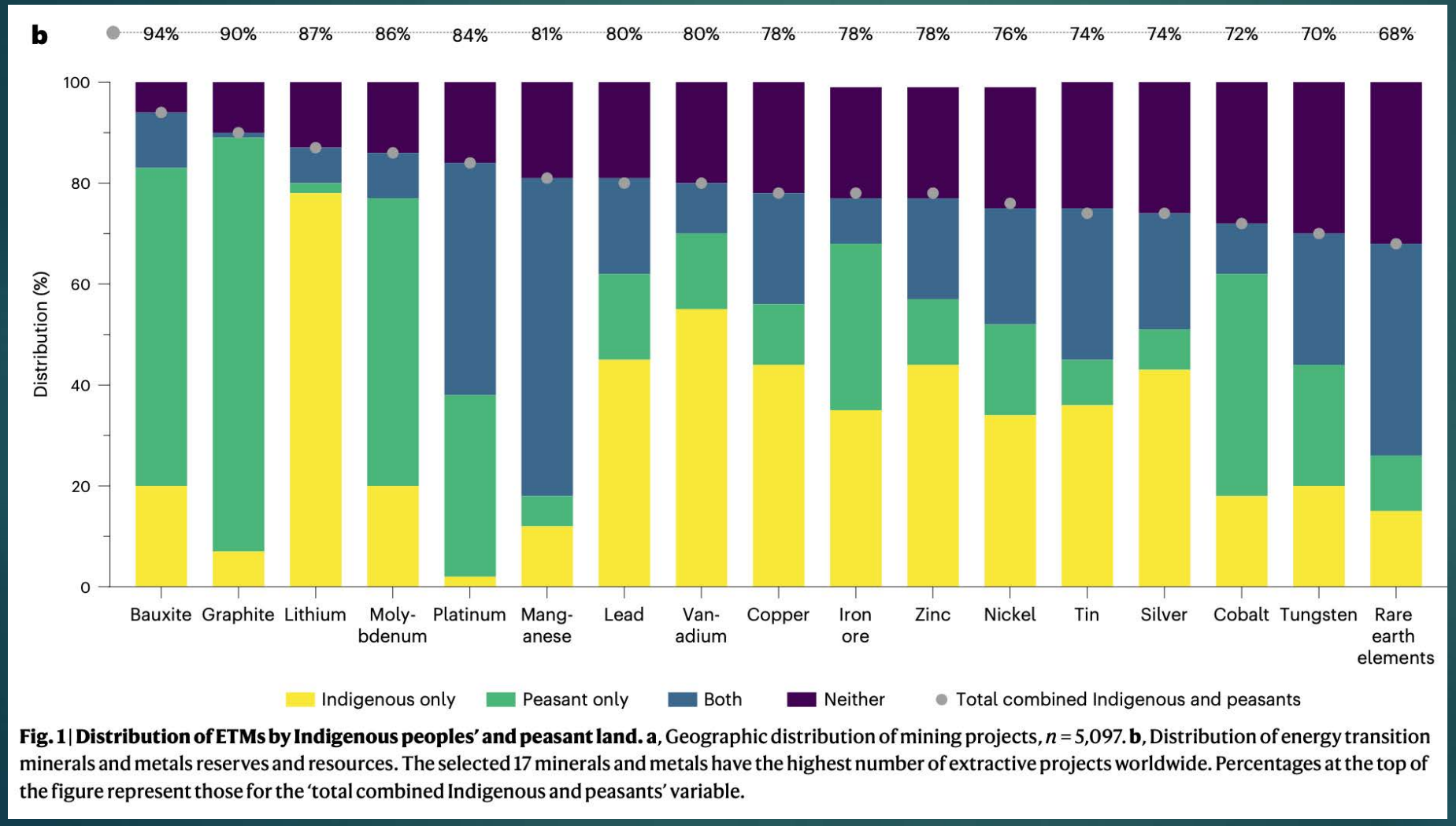
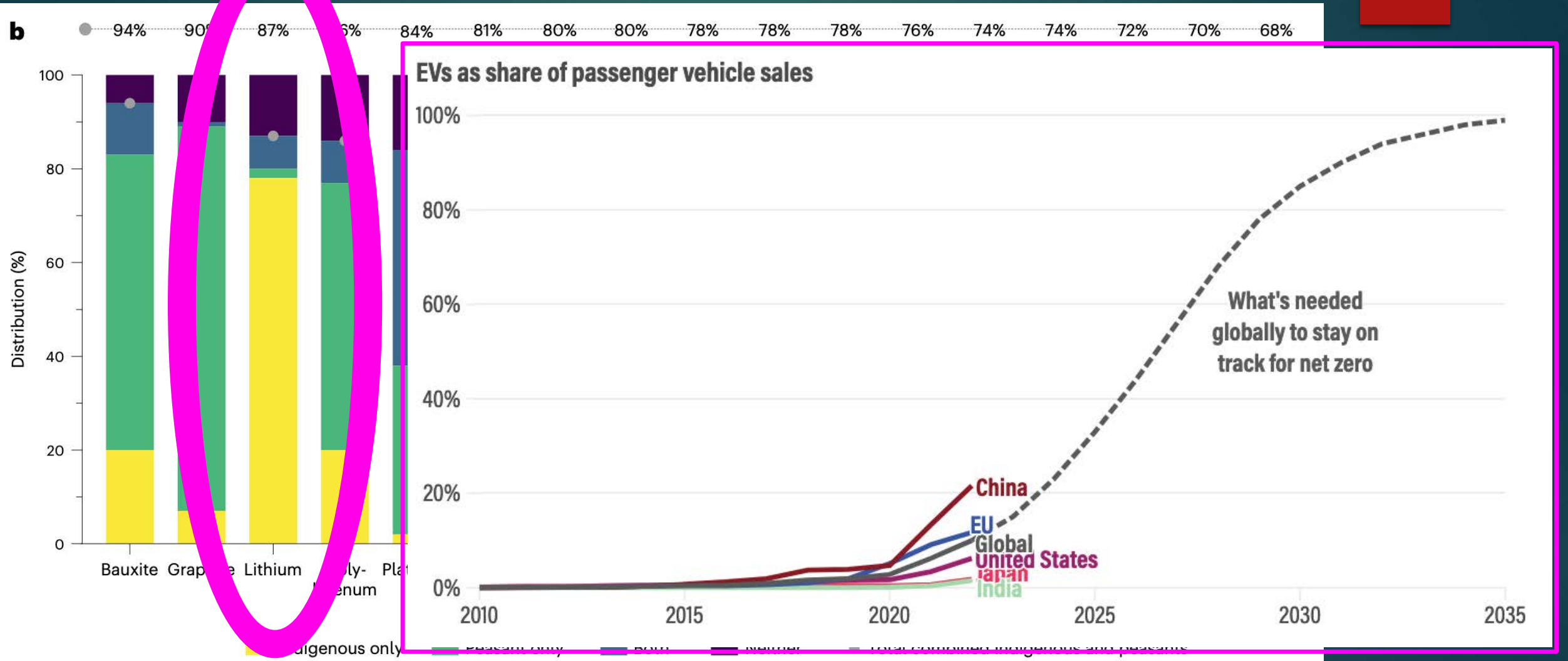


Fig. 1 | Distribution of ETMs by Indigenous peoples' and peasant land. a, Geographic distribution of mining projects, $n = 5{,}097$. **b**, Distribution of energy transition minerals and metals reserves and resources. The selected 17 minerals and metals have the highest number of extractive projects worldwide. Percentages at the top of the figure represent those for the 'total combined Indigenous and peasants' variable.

- 70-95% of ETMs are currently being mined on Indigenous & "peasant" lands – often the name for Indigenous peoples without political standing

84% of Lithium…key to electric cars….



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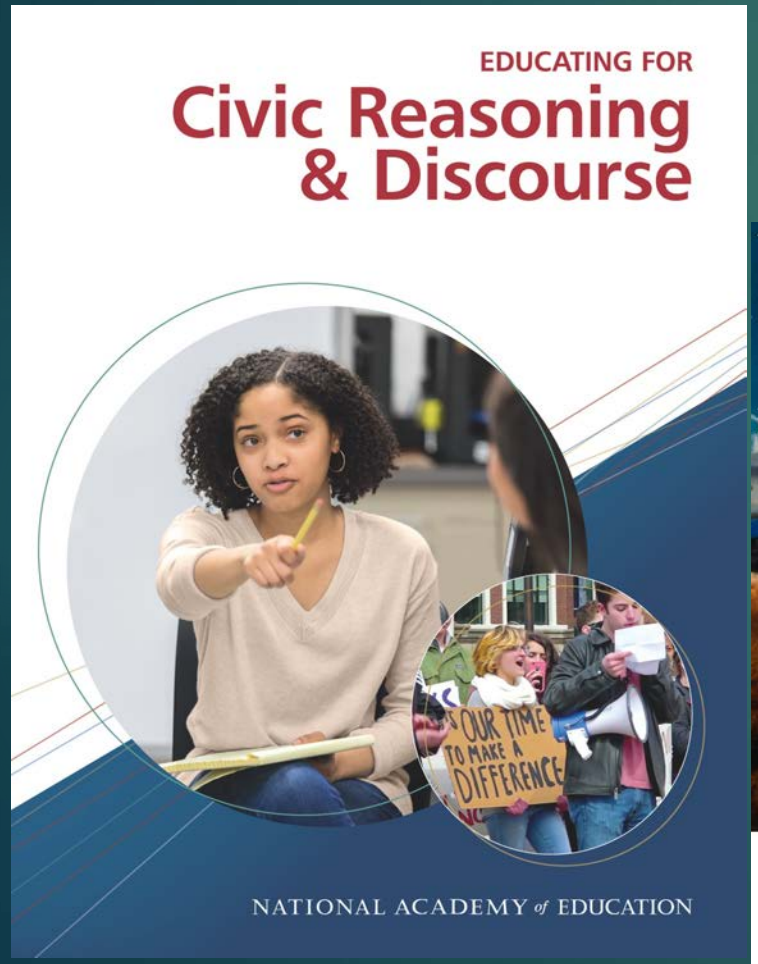
Preparing learners to engage to "civics" of technology.



Creating Learning Environments Towards Indigenous Thriving: Technology as Tool in Activity Not the Activity

ACCESS MAY BE ANOTHER NAME FOR ASSIMILATION.

INDIGENOUS TECHNOLOGIES

Tech Tales: Connecting robotics with family-centered storytelling

- Focus on engineering in NGSS
- Robotics & e-textiles as a way to center culturally-based engineering learning
- Re-positioning non-dominant families and their own knowledge-making practices in relationship to science

What is Tech Tales about?

- A series of 5 family workshops
  - Once a week for 5 weeks
  - 3 hours each week (including food!)
- Centering **storytelling** (a cultural and familial practice) to learn about robotics and coding
  - Session 1: Getting to know each other, algorithms, storytelling
  - Session 2: Storytelling through robotics: outputs (LEDs, motors, sounds)
  - Session 3:Storytelling through circuits: inputs (sensors)
  - Session 4: Putting it all together
  - Session 5: Showcase & community celebration

Learning experiences hould grow out of the lives of learners

Families' cultural histories can drive their work with the technology (rather than the technology defining their experiences). Products and design processes are deeply personal & filled with family history.

Promote multiple ways of knowing & making

There is no "right" way to make—families engaged technologies in many ways meaningful to them.

Robotics and computing in the context of family and communal storytelling transformed the normative experiences with technology and learning. Contributed to community – not felt experienced as an assimilative endeavor.

Co-designing, implementing, and studying land and water-based learning environments that cultivate Indigenous wellbeing with families, community members, elders, scientists, artists, and educators.

Indigenous STEAM

Communal Relations & Collaborative Partnerships Over Extended Time

- Chicago Native Community
- Menominee Nation
- Seattle Native Community
- SeaAlaska
- Spokane Nation
- Tulalip Tribes
- Little Traverse Band of Odawa Indians
- Illinois, Louisiana, Michigan, Washington. New Mexico, Colorado, Oregon
- Many other Tribal Nations now!

- Northwestern University
- University of Washington – Seattle
- TERC,
- UCLA,
- WWU

Community Epistemologies & the Natural World (2001-2003)

Living in Relations (2004-2011)

Early Science Learning (2011-2015)

Community Based Citizen Science (2011-2016)

ArtScience (2014-2018)

Nature-Culture Relations in Complex Ecological Systems (2017-2021)

Cultural Processes of Learning About Ecosystems (2021-2025)

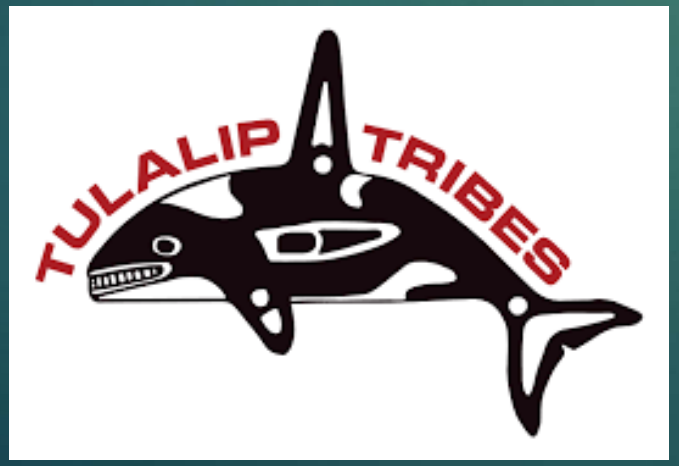
Learning in Places (2016-2027)

RED EAGLE SOARING

VALUES IN ACTION SEALASKA

NSF

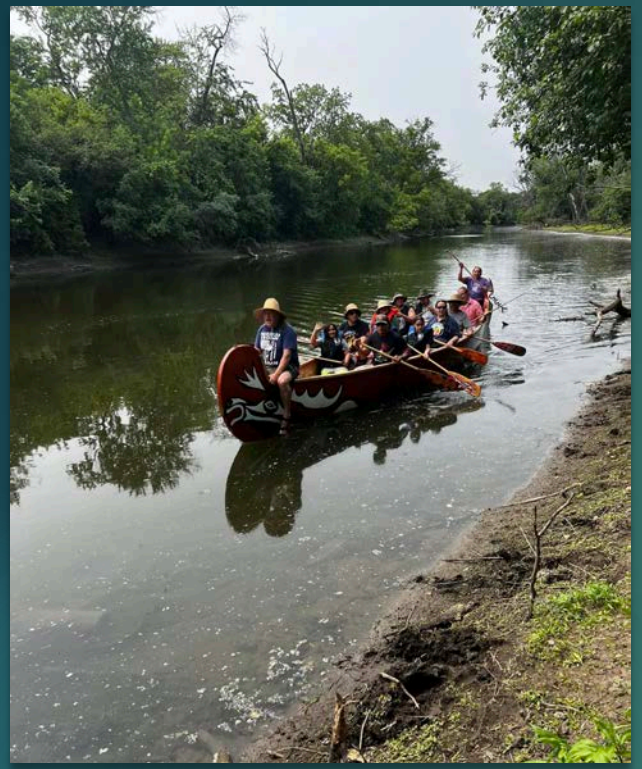
Current Iteration



- 5-year project timeline
- Serves k-12+
- 3 Leadership communities
- Expand to additional communities through "professional learning"

Core structures

- Cross-community Work
- Community Specific Work
- Community exchanges
- Seasonally organized



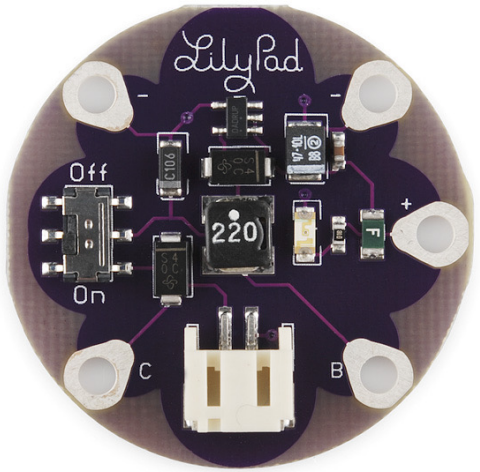
Cultivating attention to many forms of technology

Energy, Plant Relatives, and Etextiles: Setting the Ground & Making Digital Mocassins

Cultivating Pedagogical Self-Determination is Central to ISTEAM

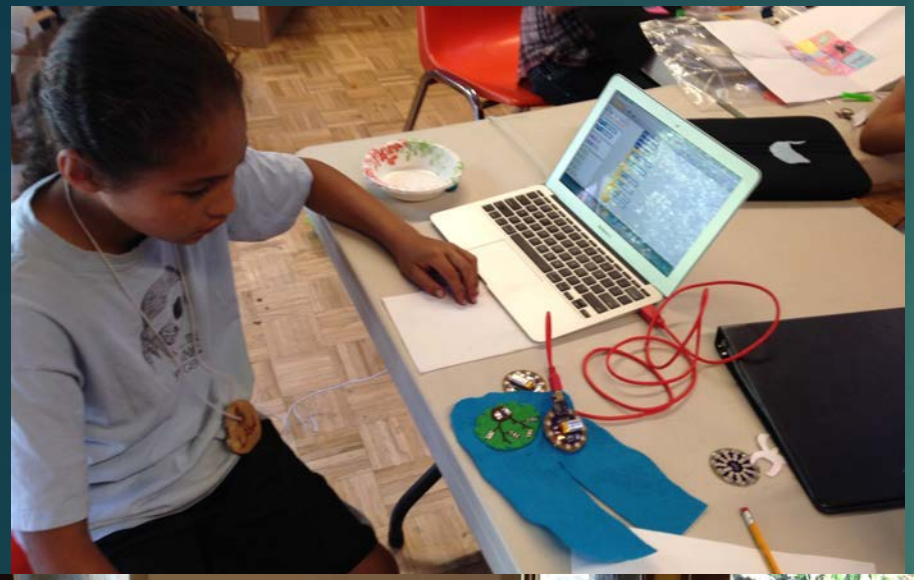
- Whose terms – knowledge systems are elevated?
- We started with learning about energy & electricity
  - Project was framed by:
    - How does electricity and programming impact our community?
    - How do we walk in the world? What are our roles & responsibilities?
- Partnered with community members to do this!

Key project materials



Example of DistributedRoles

Project Steps	Teacher led	Comm Led	T-C	Comm S
Energy and Spirit			X	
Storytelling		X		
Plants and Medicine				
Electricity, Circuits, and Light	X			X
Project framing: How does electricity and programming impact our community? How is math part of these? How do we walk in the world? Focused on tribal values?	X**		X	
Make a etextile project – NDN sketchers, others as well using hummingbird - Math, Computer Science - Community practice (moccasins)	X X			X X
Extend to jobs/departments in community			X	



Expanded to other forms of making. Technology and computing became an avenue for cultural and political expression and action.

Making the social-cultural-ethical-political dimensions of technology central and explicit in learning:

Towards what ends?