Chapter 10
Connecting with People, Places and Histories Through Archaeology: Youths' Development of Sustain'abilities'



Jrène Rahm

> The world can tell us everything we want to know. The only problem for the world is that it doesn't have a voice. But the world's indicators are there. They are always talking to us. (Quitsak Tarkiasuk, quoted in McDonald et al., 1997, preface)

We seem to slowly appreciate the complexity of environmental issues such as climate change and biodiversity loss, to name two, and the need for action but also collaboration among scientists, citizens, schools and out-of-school settings. We also seem to begin to more seriously engage with the kind of pedagogy needed to address inherent wicked problems that constantly shift and change and as such "resist defining" (Wals, 2015, p. 17) and are never truly solved (Dillon, 2017). We seem to slowly engage in a quest for civic science which is not about doing, talking and being in science, but instead, about using science to promote a better world. Wicked problems have been with us for a long time but gone unnoticed, given our distance from the world and our epistemological footing in anthropocentrism that puts our needs first and attests to a disconnect from place, the land and the voice of the world that Quitsak Tarkiasuk refers to in the citation above. The "coloniality of human exceptionalism", which "asserts the epistemic superiority of Western intellectual traditions granting assimilative authority to the non-Western" (Bang, 2017, p. 122), has marginalized and attempted to erase purposefully Indigenous epistemologies and place-based ways of knowing, being and becoming. It has essentially erased an understanding of relations and collective understandings and actions in light of nature-culture relations. Western science has left us with ideologies steeped in human domination and entitlement that Quitsak Tarkiasuk's comment questions.

I ground this chapter in a vision of science as a tool for action and hence as a process and form of engagement for the common good, and not as an end in itself.

J. Rahm (✉)
University of Montreal, Montreal, QC, Canada
e-mail: jrene.rahm@umontreal.ca

© Springer Nature Switzerland AG 2021

M. Achiam et al. (eds.), *Addressing Wicked Problems through Science Education*, Contributions from Science Education Research 8,
https://doi.org/10.1007/978-3-030-74266-9_10

I invoke and build on the civic science lens numerous authors have invoked and developed and to which this book is committed. That vision assumes that we all have an important role to play as social actors in working together for the common good, in challenging science illiteracy, for instance, but also in challenging existing inequity and ignorance that supports policy and action at multiple levels in ways counterproductive to the sustainability of our planet. Taking such a stance to sustainability is necessary in light of the wicked problems that mark our times and that can only be solved through deep and critical ongoing engagement at multiple scales and levels and, even then, will only be "re-solved – over and over again" (Dillon, 2017, p. 2). Hence, the development of *sustain'abilities'* in the plural constitutes critical sustainability literacy. Sustain'abilities' imply a deep questioning yet also understanding of the systemic relations at the heart of a non-anthropocentric view of the world. Those "abilities" can only be developed through "engaged, lived experience of transformative praxis" (Lotz-Sisitka et al., 2015, p. 78). The two projects described in this chapter are understood as examples of transformative praxis of sorts, giving students some of the tools needed to develop a sense of sustain'abilities' and ways to put them into action and thereby contribute to the common good. The two projects engage students in place with history, with the land, with objects, with the past, present, and future in ways supportive of embodied learning. The projects offer students an immersion into multiple timescales, supportive of reconnections with society and culture through objects and dwelling in place. The two projects also offer students the opportunity to experience science as a social, cultural and human process and "deepen the experience of the physical place of which people are part" while simultaneously helping them understand "how science works" (Dillon, 2017, p. 5). Students are offered opportunities to reconnect with their past, with their land, with objects that belong to them. They are offered opportunities to engage in a world that is new to them and that was never made transparent to them. Learning about archaeology and being an archaeologist by doing also invites students to navigate multiple epistemologies of science and of the world (Bang & Medin, 2010) and thereby reconnect with ideas and dispositions that might have been hidden from them given the political work science implies. The two projects invite students to develop the kind of critical dispositions needed to challenge their future as stewards of the artefacts, their land, but also culture, all of which I see as critical to future well-being and constitutive of what I call sustain'abilities'. They are forms of knowing and doing that we take as constitutive of the kind of critical sustainability literacy we believe all of us need to develop in order to be able to tackle wicked problems of our times. Hence, the chapter offers insights into the manner such normative dimensions of sustainability can be developed through either innovative collaborations between formal and informal educational settings or through informal place-based science programming. In doing so, I aim to also begin a conversation about the manner informal STEM education practices, and community-based archaeology in particular (Atalay, 2012), may contribute to the development and practice of a decolonial ethic (Bang, 2017). The first partnership project emerged from an initiative to enrich educational experiences of ethnically diverse urban youth in underserved communities, and the latter emerged from a

community-driven need and commitment to engage in the preservation of the land and its artefacts and stories. As will be discussed, activities like these in collaboration with archaeologists, archaeology museums, and local communities, can position youth as agents of socioecological transformation (Bell & Clover, 2017). They also offer rich insights into ways whereby we may engage different actors in challenging existing inequity and ignorance and thereby work towards a practice of civic science in ways the book calls for.

A Word About Archaeology and Informal STEM Education

Archaeology entails the study of the human past, and even though it is part of the human sciences, it implies a dialogue with the natural and physical sciences such as biology, botany, geology, ecology, chemistry and physics, all tools to analyse and interpret the data – artefacts – collected in place (Sutton & Yohe, 2003). As such, the teaching of archaeology has been paired with the teaching of ethics and transdisciplinarity including mathematics, science, and history (Moe et al., 2002). For the most part, archaeology has relied on Western knowledge systems and methodologies despite the fact that it works often on or with Indigenous populations and ways of life. Maybe for this reason, archaeology also privileged for years "the material, scientific, and observable world over the spiritual, experiential, and unquantifiable aspects of archaeological sites, ancient peoples and artifacts" (Atalay, 2006, p. 280). The educational value of archaeology as a basis for culturally relevant science learning in and outside of school has been recognized and has led to multiple outreach projects and programmes, yet few of them have been studied soundly in terms of their educational outcomes in reaching particularly underserved youth in STEM education (see Archaeological Institute of America, 2021; Bureau of Land Management & Montana State University, 2021; Clarke et al., 2008).

Ironically, scientists overlooked the fact that Indigenous communities acted "as stewards over their own cultural resources and history – examining, remembering, teaching, learning and protecting their own heritage" (Atalay, 2006, pp. 280–281) for years, practices that were ignored or side-stepped, yet with the rise of collaborative and community archaeology, they have become recognized anew. That work also makes evident that:

> archaeology is much more than simply a tool for understanding the past: Archaeological practice and the knowledge it produces are part of the history and heritage of living people and have complex contemporary implications and relevance for those people in daily life. (Atalay, 2006, p. 283)

In essence, archaeology can be understood as a pedagogical tool to engage youth with people, places and history but also the future. For that purpose, dwelling in place through field schools may be best understood as a form of place-based learning mediated by key holders of that knowledge such as archaeologists, elders and other community members.

The practice of archaeological fieldwork has also become marked by Indigenous and decolonizing research practices which are driven by the goal to pursue archaeological research in ways that it serves the communities "whose past and heritage is under study" (Atalay, 2006, p. 284). Meaningful archaeological research has to be understood in light of local practices, traditional knowledges and Indigenous epistemologies and worldviews. It led to a call for public archaeology in that its practices and artefacts exhibited in museums should not simply remain a practice of an elite. It resulted in "debates over who owns the past, human remains, and material culture and who has the power to speak for and write the stories of the past" (ibid., p. 289). By applying a postmodern lens to this position, the fact that multiple stories can be told about artefacts and the past is understood as the norm, and hence, as valuable and desirable. That lens helped move the field of archaeology from an objective to a subjective science and the recognition that interpretations of material culture are deeply grounded locally and globally in social and political contexts. An archaeology that matters and that is deeply grounded in decolonizing practices did not simply imply a critique of Western research practices steeped in a positivist epistemology but also called for collaboration and the building of new relations tied to identity and place. For that reason, an Indigenous grounded community-based archaeology is also essential to health and well-being of Indigenous communities. Ideally, "Indigenous forms of science, history and heritage management would be researched and then blended with Western concepts" to arrive at new practices that are "ethical and socially just" (Atalay, 2006, p. 297). Such practices also seem at the heart of a civic science committed to challenge existing inequities and ignorance (Dillon, 2017).

Most pertinent for this chapter is that community-based archaeology calls for an integration of research and education and thereby democratizes knowledge building while making research an emancipatory practice. As such, community-based archaeology is a means "to provide alternative views of the master narrative and to tell histories that might otherwise be silenced" (ibid., p. 301). It can be a tool for marginalized members of society to reconnect with their past and retell stories in ways others have silenced. Hence, community-based archaeology projects are also key tools to engage students in the navigation of multiple worldviews and in the promotion of an ethic of care for each other and our planet. Through engagement with the past by digging but also touching artefacts, youth also can come to story their lives and their relations to place and the earth in new ways, stories that tend to be autobiographical and as such are key to the construction of an identity of self but also collective and cultural identity, grounded in an appreciation of an Indigenous epistemology (Gadoua, 2014). That process can then lead to empowerment and a sense of self and sense of belonging that may reduce feelings of marginalization and lack of voice for youth, at least temporarily. It may also "enable learners to see the world more holistically" (Wals, 2012, p. 17) and think in terms of a system, an important lens to develop for engagement in civic science. To expand on some of these ideas, Case 1 offers an illustration of the educational potential of an

archaeology project in an urban centre that implied a partnership between a school, a museum, and an archaeologist.

Case 1: "It's Like Another Planet" – Archaeology in the Classroom and in the Field

> I learned how desperate children are about culture, about getting out of their surroundings… where they live, the gangs and all, it's really like another planet that they visited [through this project]… the thing that surprised me was their level of attention, their questions, their observations. [Teacher 2, Archaeology, Interview, 2007]

"It's like another planet they visited" summarizes well the manner one teacher and her students experienced the archaeology project that was offered to them. It is one example of multiple initiatives developed by the Montreal School Program in existence since 1997 and supported by the Ministry of Education with the goal to enrich the educational opportunities offered to students living in underserved communities. It was initiated as a means to ensure equity and social justice in schools in urban centres that struggle to respond to the needs of their diverse student body. As such, the programme offers rich learning opportunities supportive of academic progress and achievement to all students (Archambault & Richer, 2014).

Description of the Programme

The Montreal School Program consists of seven measures of which we[1] explored the one offering access to cultural resources (Ministère de l'Éducation, du Loisir et du Sport, 2009):

> This measure is intended to instill in students a taste for the arts and sciences and to promote visits to cultural organizations. It is also designed to enrich education by creating ties between classroom teaching, cultural objects and people involved in the arts and sciences. (p. 15)

The measure consists of two components, the first – "*Jeune Public*" – is mandatory and offers financial support to schools to fund one museum visit or participation in some other cultural event per year for all students. The second component of the initiative, the *Innovative Model*, is optional. It consists of a range of activities that promote project-based learning through partnerships between schools, scientists, artists and cultural organizations, while schools are also invited to present their own projects, many of which are later offered as new models.

[1] I thank my research assistants Mathieu Hébert, Audrey Lachaîne and Marie-Paule Martel-Reny with their help in data collection and analysis and use the plural to denote the work we pursued together.

Description of the Activity

In this chapter, I focus on Archaeology, a model that implied four meetings in the classroom, assumed by the archaeologist, spread out over time and ending with a museum visit and mock archaeological dig on the museum grounds outdoor. We followed two sixth grade elementary classrooms' participation in this project (i.e. 45 students, 9–10 years of age, and 2 teachers) (Rahm, 2006).

The Role of Student Questions

A discourse analysis of exchanges between the archaeologist, the teacher and the students, next to interviews, led to interesting insights into the kinds of learning opportunities that emerged naturally, given students' questions and actions during the mock excavation, some of which are listed here:

But how did humans lose their fur?
How do dead people mummify themselves usually?
But an archeologist, what does he do? Is he supposed to find old stuff?
And those objects they find, are they supposed to send them to the museums?

These questions attest to the level of curiosity and engagement we observed among the sixth-grade level elementary school children in two of the six participating schools, as they met with an archaeologist who brought with her images, objects and many stories grounded in and bringing alive her various fieldtrips to different places in the world. The questions also make evident how little students actually knew about the kind of work an archaeologist pursues. Accordingly, the four meetings with the archaeologist in the classroom, followed by a mock excavation and visit of a museum, supported multiple learning goals – the demystification of archaeology and the work of archaeologists, the appropriation of the scientific method through the mock excavation and the development of subject-object relations mediated by the material culture visited and excavated.

A Unique Learning Opportunity

The project became a valuable learning opportunity for the involved students, teachers and archaeologist:

> Working with the students, seeing their thirst to learn, the sparks in their eyes, that's very valuable, it's great to see that the children are still interested in all kinds of things, after all, it's about archaeology and I was amazed to what point that intrigues and interests them, and they knew quite a lot already, yes, I learned a lot from them, their frankness too, it makes you question yourself. [Archaeologist, Interview, 2007]

Most students in this classroom did not have the financial means to visit museums and, according to their teacher, ventured little beyond their classroom and community. The teacher saw these activities as an excellent opportunity to take her students places that were new to them and thereby "visit a new planet". She perceived leaving the community as an important learning opportunity for her students, made possible by the partnership and financial support for such activities in her school system. Yet, she was the only teacher in her school who participated in these activities which other teachers perceived as extra work as she shared with us during an informal conversation.

Struggles Students Experienced

Discourse analysis also made evident the students' struggles with the kind of timeline that the archaeologist and the artefacts brought alive. It makes evident their detachment from place but also the manner whereby the project implied "another planet" in terms of its content. It was challenging for students to distance themselves from the present and their cultural practices and material culture as they engaged in meaning making of the past, as the following dialogue makes evident:

Student 2: But the pyramid that is here?
Scientist: Yes
Student 2: Is it made out of metal?
Scientist: No, it's all made out of rocks, out of blocks of rocks. There was no metal in the constructions of that time period.

It left us wondering about how often material culture actually is engaged with in those ways in classrooms and how often students are offered opportunities to navigate timelines meaningfully, instead of simply remembering factual knowledge tied to specific time periods. The following question about the importance of "knowing about the past" for the present and future by another student further attests to a disconnect with time and place:

Ahlia: My first question is, why is, why is that the past and since it will not really be necessary? It's like...
Jayne: It changed...
Ahlia: It's the past, you cannot change it, it's like now we are not in 2002 [anymore].
Scientist: You cannot change what's in the past, that's right, but in understanding how people lived before, what happened before, you can understand a bit better who you are, or where society is coming from.
Ryan: Really?
Scientist: And you can also, while making sense of the errors that were made in the past, we can try not to reproduce them in the future.
Sue: Oh yes?

Teacher: Yes, but has it brought you something learning about the life of slaves in Haiti? Like, are you now prouder to be Haitian, and of your past? For instance, I give you an example: understanding who your ancestors were, what they knew how to do, how they fought, doesn't that give you something extra as a human being when you say "I am Haitian"?
Ahlia: [I feel] normal.
Sue: Every person is...
Teacher: Shhh... What?
Ahlia: For me, it's like, it's like everybody is transparent, everybody is the same color.
Teacher: No, but I am not talking about color here, I am talking, for instance, in Quebec, we learn about things of the past, we talk about the first World War and how we were involved, but that changes something, it changes, the fact that somebody knows how we got to where we are now today, and that's what she [the archaeologist] is trying to explain.

Ahlia was at ease to challenge the archaeologist about the pertinence of archaeology and "knowing about the past" which had no relevance to her present or future. That link was something both her teacher and the archaeologist tried to make her understand, yet in different ways. Her teacher built on the argument the archaeologist had developed in that knowing about the past and its errors may help us understand the present. Knowing Ahlia, the teacher personalized the argument for the student, referring to the student's past, referring to her roots in Haiti and a family history tied to slavery which may have had an impact on her family and may still have an impact on her today. She assumed that Ahlia identifies as a visible minority and with pride assumes her identity as a descendant of a family that fought against slavery and that despite that history survived given their resilience and activism against an oppressive system and racism. Yet, Ahlia was not ready to take on that positioning, at least not in class, in public. She distanced herself from that history and the positioning by her teacher as a visible minority, noting that for her, "everybody is transparent" and "everybody is the same skin color". Her teacher then offered another explanation that was more locally grounded in that she referred to the history of Quebec, as discussed in class, referring to the war and how understanding that history can help everybody understand the present in Canada. That interesting teachable moment ended after those exchanges, however, as the archaeologist tried to get back to her presentation and cover more content. It was a very complex opportunity for the archaeologist and the teacher to build on and help students understand the role of archaeology as a tool to understand the past, present and future.

Both adults tried to make the case that archaeology helps "put phenomena into perspective" which should result in students' "openness to the world", as emphasized by the school curriculum (Ministère de l'Éducation, du Loisir et du Sport, 2001). In fact, one of the competencies the students are asked to develop in the elementary school system in Quebec is to construct a representation of space, time and society, a competence that could be nurtured through archaeologist-school-museum partnership

projects as the one described here. Hence, despite a heavy focus in the social sciences curriculum on relating the present to the past, the students' questions seem to suggest that they struggled with the framing of the present and past. On the other hand, as noted earlier by the archaeologist, she felt "they knew quite a lot already" and, in turn, argued that their "frankness" was actually a valuable means to "question yourself", suggesting that the dialogue grounded in archaeology led to meaningful learning opportunities, at least in the eyes of the archaeologist and teacher.

Getting Out of the Classroom: The Excavation

Once we visited the museum, the students had an opportunity to engage in a mock excavation and become engaged with objects of the past through touch. As the other teacher that we followed noted, her students worked quite diligently, trying to carefully scavenge for artefacts in their squares in ways modelled by the archaeologist:

> What I noticed is that my students, the weakest academically in class, in French, in Math, they were the best in that project. Really, they did their work with much patience, worked slowly and carefully, they were the first to finish with the fewest errors. They were really proud of it and happy. They were applied and for once, they were concentrated on what they were doing. [Teacher 1, Archaeology, Interview, 2007]

As shown in Fig. 10.1, the students' practice of archaeology implied the mapping of the space to be excavated. Students were then given trowels to start to remove layers of the soil. That soil was later passed through a screen to ensure no artefacts were missed. The students then also cleaned the artefacts, labelled them and described them. They were given some prototypes to match them with. The excavation and visit to the museum were the "best parts" for all participants. The activity offered students an opportunity to "put into practice" all the "theory that was presented in class" in the words of the archaeologist, who added, "to really understand the work of archaeologists, they had to have an opportunity to engage in an excavation". She added:

> The excavation, the practical part, they really loved it. There were some students who were less inclined to get dirty while others enjoyed getting their hands in the soil. There was really a role for everybody, some could take notes and measures, and others excavated. There was something to do for everybody, we were meeting their multiple interests and strengths. Some students are more practical than auditory and so they really liked to use their hands, it is a part of the activity that is crucial and should never be removed from this activity, in my opinion. [Teacher 2, Interview, 2007]

To get out of the classroom and to have students manipulate something was also highly valued by both teachers. As one teacher noted, "these activities help children to discover themselves, figure out who they are, [and] live an experience that is different from the rigorous academic work in class" [Teacher 2, Interview, 2007]. Yet, this can also mean for children to discover that they do not enjoy digging in the soil, as was the case for Kevin, one of the participants who was fascinated by the stories about the past in the classroom but felt that the excavation did not mean



Fig. 10.1 Students' practice of archaeology during the mock excavation

anything to him. Other students preferred the excavation while listening to the archaeologist in class felt long. Still others noted how much they "loved learning about the past". Yet another student noted, "I enjoyed digging, and taking the time to dig", while another peer felt that "identifying the object found is difficult". It shows just how diverse students are and how challenging it is to offer them activities that nurture their interests and help them develop to their full potential. As one teacher noted, "teaching and learning really comes from the child who is ready to listen, who wants to learn and who is interested, and then the system has to be able to respond to those interests". She added that projects as these are particularly important for children and youth in underserved communities, so they have the opportunity "to be stimulated, to have positive experiences where they feel good and useful, where they feel they accomplished something, and which leave them with an interest to still learn more". She perceived a tight link between these kinds of projects and her students' perseverance in the educational system. This suggests that partnerships are crucial to support the diverse needs of students. They enrich the standard and often very academically oriented programmes with hands-on activities as described here.

Visiting the Museum

In addition to the mock excavation, students had an opportunity to visit the "Maison le Ber-Le Moyne", a designated historical site that was built between 1669 and 1671 for the fur trade and that now exhibits objects that were used in trading with First Nations at the time, objects tied to agriculture, commerce and navigation. The students visited the museum in two small groups with their guides, listening to stories the objects evoked while asking questions. They were passionate about the past, a way they typically learn about Indigenous populations in Québec. Yet, it can also be understood as a missed opportunity to make connections with current activities and practices of Indigenous peoples in Québec. It would have positioned archaeology as relevant to future generations and our future as a society, a dimension the second case addresses in part. At the same time, the project helped students deepen their experience of a physical place, constitutive of civic science (Dillon, 2017). By doing archaeology work, they also learned first-hand how tedious scientific work can be and the methods it implies. And as also shown in the next example, the experience helped them understand the work of archaeologists.

Case 2. "What I Dug Up in My Community Is Here!" Public Recognition Through Photography and Community-Based Archaeology

> To see them excited, and pointing at pictures, and talking about things, remembering what was going on at the time that the pictures were taken, and telling stories to each other, it was nice for me to see that, because usually, they are so shy about sharing their work. [Interview Amber, 2014]

The photography exhibit the teacher is referring to offered visual depictions of the field school in which 12 Inuit youth participated on *Qikirtajuaq* or Cape Smith island, located close to Akulivik, one of the 14 communities of Nunavik, in Northern Quebec. The exhibit (Fig. 10.2) also showed pictures of the land and the community, taken by different students at the local school later that year.

Description of the Project

The photography project was initiated in the context of a 5-week excavation on the island. The whole team, including 12 youth (ranging in age from 14 to 17 years), 4 archaeologists, 3 geologists, 2 hunters and a cook, camped on the land to pursue a dig of an Inuit sod house or *Inuit Qarmaq* with tunnel entrances. *Qarmaq* is the Inuit term for a single room dwelling. Depending on the season, the lower portion was



Fig. 10.2 Photography exhibit in Montreal and in school in Akulivik

constructed from snow blocks or stone, while the upper layer consisted of skins or canvas. They were used in the cold season and as early as the Thule people period. The *Qarmaq* to be excavated was built on top of a Late Dorset house structure, attesting to the high level of activity on the island. The community asked for an excavation to ensure the documentation of the rich history of the island which was the home of many families during the nomadic lifestyle period of Inuit. In the context of a survey 2 years prior to the excavation, some families were also consulted and stories shared about different activities on the island. That survey also helped confirm that the site was suitable for a field school with youth. The photography project entailed the documentation of the field school, the land and the community (Fig. 10.3). For the latter, the whole school was invited to participate.

Following the field school, two archaeologists and the educator returned to the community together, to share artefacts and stories from the field school with the entire school and to select pictures for the photography exhibit that was planned for the spring (Fig. 10.4).

In the spring the following year, some of the youth from the field school came to Montreal for a week and spent time at the Cultural Institute of Inuit, known as *Avataq Cultural Institute*, the Inuit cultural organization of Nunavik. They learned about what happens to artefacts once excavated, and the actual steps involved in preservation, while they also assisted in the inauguration of the photo exhibit in a local museum. Later, the exhibit was returned to the community and shared through its display in the school.



Fig. 10.3 Visit of the community, selection of pictures for exhibit



Fig. 10.4 Visit of Avataq, the Cultural Institute of Inuit in Montreal

From Dwelling in Place to Public Recognition

I like to summarize the project as follows: From dwelling in place to public recognition – a theme that really came through as I looked over all the data I collected over time as I mediated the photography project on the island and its transformation into an exhibit (Desrosiers & Rahm, 2015; Rahm et al., 2019). In many ways, the field school offered all of us with an opportunity to dwell in place and engage in storytelling, occasioned by objects and landmarks and tied to place. Take, for instance, a walk on the island, at the beginning of the field school. We came upon a place that seemed to depict a Dorset house given the rectangular shape and demarcation still noticeable upon careful observation of the slope, marked by its shallow depression. The *Qarmaq* became alive as the archaeologists with us guided our gaze towards it. Those structures are dug deep into the ground with a tunnel at the entrance and a bed platform in the back. "Inuit usually preferred to dig their houses on the edge of a slope while Dorset people installed their houses on a flat area" according to one of the archaeologists who was with us. Other landmarks in the area were left-over assembled rocks indicative of tent structures, next to secondary structures such as stone caches to store food and fox traps or *Tigiriaq* – an igloo-like structure of carefully assembled rocks with overhanging walls:

> A tigiriaq looks like a small igloo constructed entirely of stone. The only opening is at its top. You throw in through this opening an old hunk of meat unfit for man or dog. The fox smelling a free meal scampers up the side of the tigiriaq pokes his head into the hole and jumps down to get his reward. Later, try as he may, he cannot get out again and dies. Eventually the hunter/trapper comes by, the fox's skin goes south and his remains go to the ravens and dogs. The construction of the tigiriaq amidst the remains of the old houses suggests that it was constructed after the site was abandoned as a place to live.[2] (see Figure 10.5)

These landmarks and objects mediated storytelling on the land in the present while also mediating connections with the past and what came before. Without these stories, these objects and landmarks would have remained meaningless. That challenge is also raised by Myrna Pokiak, an Inuvialuk and now trained and recognized female Inuk archaeologist and educator, who described her learning of archaeology through participating in two different field schools in high school in a story about her educational pathway (Pokiak, 2010). Pokiak (2010) referred to the learning of the methods of excavating and handling of a trowel as tiring and at times boring, until she started to dwell in place and come into contact with objects in a site "full of treasures":

> Until my participation in the dig at Cache Point, I knew little of my ancestor's way of life, even though I grew up practicing traditions passed down from them. I knew the current Inuvialuit culture, at least as I experienced it, but had very little knowledge of earlier times.

[2] An excerpt from a Geological Survey of Canada, describing a fox trap on Central Baffin Island located on an Inuit site populated 200–300 years ago. http://gsc.nrcan.gc.ca/baffin4d/index_e.php; see also Parent (2012).



Fig. 10.5 Tent structure and stone cache or *tigiriaq*

> I was intrigued by the thought of Inuvialuit living in sod houses and astounded by the huge number of sod houses at Cache Point and in the surrounding Tuk area. I was able to picture the sod house and the setup of the home after each area was uncovered. The midden was interesting, as it contained a lot of bone and broken tools that helped piece the puzzle together. Another student from Tuk uncovered five harpoon-head points in the midden: it was as if someone hid them in a bundle and between the logs in the wall for later use. The whale skulls, which were found in large numbers in and around the houses, were almost eerie. The presence of the whale bone helped me to see the importance of this animal and area to the Inuvialuit, both in the past and today. (p. 253)

It is this kind of weaving together of cultural practices of the past with the present through objects that dwelling in place and a field school support. The educational value of the field school is certainly greatly enhanced by material objects of the past which in turn become important mediational tools for youth to experience pride in their history and in themselves. Yet, the latter became further reinforced in this project through the photography project and exhibit of some of the artefacts the team excavated. They were presented to the public at large, sending a strong message to youth, according to one of the involved teachers:

> What I dug up in my community, it's being shown to other people that I've never seen before and I've never met before. … it's like getting validation for what they actually did, 'cause a lot of the times, they'll be involved in an activity or they'll do something, but they won't really see the outcomes of it, and they don't really see that what they did has an effect on others… so it kind of gives a sense of pride, in their work. [Amber, Interview, 2014]

That resonates with Michael Drew's experiences, summarized in the 2017 winter issue of the Inuit Art Quarterly. Michael Drew, a well-known mask maker in Alaska, briefly speaks about his experience at the Nunalleq archaeological excavation site in Ouinhagak, Alaska, and the manner it helped him reconnect with the past as a Yu'pik and Inupiaq, showing a picture of him with one of the masks that was excavated:

> Being there connected me to my homeland in a way that I have never experienced before, and it affected me profoundly. As I was digging, I felt like I was getting to know the different generations of people who lived on this land. I found a small wooden mask that is probably around 500 years old. As a mask maker, it was surreal. I kept pinching myself because I couldn't believe what I found. The experience has been influencing my work; there is a deeper spiritual connection in the stories that I am telling. (Drew, 2017, p. 14)

Michael Drew's reflections about his experience make evident quite eloquently how he felt "physically, spiritually and culturally" by being on and part of the land and through his contact of a wooden mask of the past. That connection then also fuelled the creation of new knowledge and became embodied and expressed in his current art.

Connecting History and the Past with the Present

Connecting with history and the past while also taking pride in current practices and selves are also dimensions the other teacher noted, who participated in his second trip to Montreal with students from the field school:

> The first time we went, it was the year that Patrick was there, he actually found an artefact that was then at display at Avataq (Inuit cultural organization of Nunavik, in Montreal), they just had a small glass cabinet with it. It was so cool! It was like 'hey, I found that!' … now it's behind a glass and people are not allowed to touch it anymore!" [Randy, Interview, 2014]

The artefacts implicitly positioned youth and their culture and ways of knowing as important given the display in "a small glass cabinet". Having gone through the excavation and then "seeing" the objects on display, all cleaned up, made both the teacher and students take pride in their work but also their history. As Randy added:

> I think they learned that their history is important, and that it's really important to understand your history. And I think that they enjoyed seeing things from the past, what was… important… I think… what they liked a lot is that people had an interest in them, about something that they're doing, or something that is part of their history. [Randy, Interview, 2014]

Not only the artefacts mattered but also the pictures that were on display in Montreal in a public space and that were appreciated by visitors and strangers to youth with whom youth from Nunavik rarely come into contact or conversation otherwise:

> It's empowering. It's kind cool to be able to see those pictures, there are a hundred people here… [they look at] my home, my land, things that are important to me, to us! [Randy, Interview, 2014]

That kind of a dialogue and sharing of worlds with others implied important travel in terms of epistemologies. The material objects and pictures naturally invited exhibit visitors into a dialogue with cultural practices tied to Indigenous ways of knowing and thereby facilitated in certain ways navigations among Indigenous and Western epistemologies in ways central to science education (Bang & Medin, 2010).

Not only did it portray implicitly ways whereby science is a cultural process, but invited the involved teachers and museum visitors to engage in the navigation of epistemologies implicit in the world that was depicted.

Development of Shared Experiences

As both teachers noted, the project also helped them – teachers and students – develop some common ground and knowledge which could then be leveraged in other ways once back in the classroom:

> Through classroom discussions and extracurricular, you start having shared experiences, you start to share your background a little. It gets better because you start to understand, to start sharing experiences that you can then draw on in class. [Randy, Interview, 2014]

The project became a tool to establish shared experiences and form new relationships that could then be leveraged, once back in the classroom, for further learning and teaching. The project also encouraged to renew relationships in place, among youth and elders as well as youth and their parents. The latter became apparent to me as I was packing up artefacts with the curator working with us in town. Two youth were helping us with the task. As we sorted through some of the wood artefacts that were kept moist by packing them in moss, one of the girls found a needle. It was so fragile and beautiful and made us all stop and wonder what stories that artefact embodied and could potentially tell us. The needle eventually became an excuse for Louisa to invite her mother to our house and show her the needle and other artefacts dug up from the land (Fig. 10.6).

Taken together, the dwelling in place made possible through the field school and photography project led to the sharing and appropriation of "the way things are" even though these project dimensions and facets probably worked "pedagogically beneath a conscious level" (Bang et al., 2014, p. 44). It became a way to fully integrate Indigenous knowledge into education and fully "embrace and celebrate" who Indigenous youth are "instead of making them doubt themselves" as is so often the case (Battiste, 2013, p. 180). The fieldschool and photography project also became a means to engage others in a dialogue with Indigenous knowledge and ways on the land, with the past and present, while leaving youth with pride and hopefully new aspirations for the future in ways Pokiak experienced through her involvement in field schools as a youth growing up in Tuktoyaktuk, an Inuvialuit hamlet in the Inuvik Region and part of the Northwest Territories.

Youth Voice

The photography project also gave voice to youth to depict their present in ways meaningful to them. It went beyond the folkloric depiction of their ways and communities so typical of photography projects conducted by Qallunaat (non-Inuit).



Fig. 10.6 Doing archaeology in the field

Pictures of nature, the sky, plants and shells, so typical of their community and often collected, but also country food featured prominently. Megan, one participating youth who was well-known for her photography skills, often caught special cloud formations while playing with contrasts that she picked up on naturally. She also took a picture of country food that she described as tasty, namely, sea urchins and star fish. Pictures of their community depicted everyday ways of life but also places and objects important to the youth. Other pictures depicted the place where the umiuak (a type of open skin boat used by Inuit, resembling a kayak) rested for the winter, a cabin where youth hanged out in the evenings, the water truck, the school bus and the school itself. Left out were pictures from their friends of which there were plenty taken but, in the end, were judged as inappropriate by them for the exhibit (Fig. 10.7).

It was about the development of a work ethic in place in that stories, but also objects of the past had to be handled with great respect (Moe et al., 2002). The storytelling also led to the preservation of a history so many of the participating youth

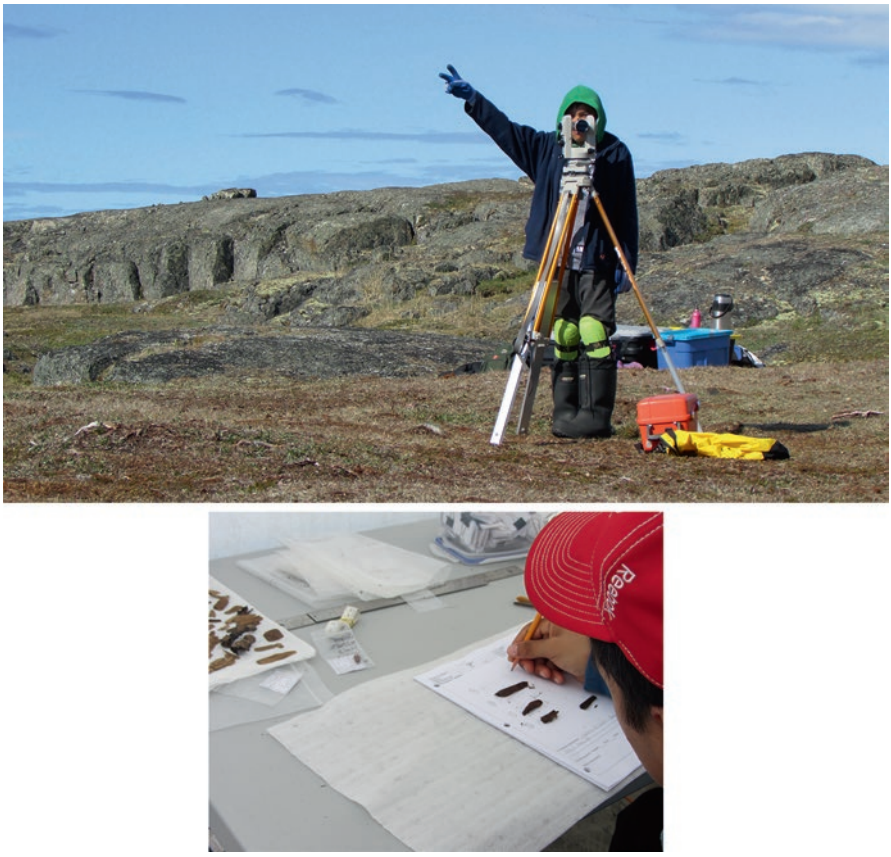


Fig. 10.6 (continued)

knew little about. By exchanging with elders in the context of archival pictures from the island and maps, youth gathered many insights into the dwellings on the island in the past. Yet, that history did not stay in place but travelled with the artefacts to other places and touched the lives of other people.

Implications for Teachers

In terms of the project's implications for teachers and school practices, it is clear that even though the teachers were not involved in the actual field school, they had an opportunity to engage with their students in a new kind of discourse and build meaningful relationships across epistemologies and cultural practices that used to be hidden to them and not understood. The two teachers who were present at the inauguration of the exhibit were struck by the students' affective reactions to the



Fig. 10.7 Youth photography of their community and environment

exhibit. For one, the pictures in the exhibit brought alive many memories the youth had experienced together on the land during the field school. In addition, students who could not travel to Montreal were also present through pictures, sharing pictures of their community and the land with visitors through the exhibit. Hence, teachers and exhibit visitors could engage with the youth in a dialogue across epistemologies.

Discussion

To continue the process of decolonization, Simpson (2014) called for the need to:

> create a generation of land based, community based intellectuals and cultural producers who are accountable to our nations and whose life work is concerned with the regeneration of these systems, rather than the overwhelming needs of the western academic industrial complex. (p. 13)

I argue that youth who engage with archaeology in ways described here, at the elbows of community members and others committed to community-based archaeology, are given an opportunity to then act upon that experience further in their future and become a voice for marginalized stories of the past, present and future. Atalay (2012) calls current moves towards community-based archaeology as a "movement towards inclusivity" (p. 54), which makes it such a powerful

pedagogical tool in informal and formal science education committed to civic science. It supports engagement with multiple worldviews and epistemologies in ways most students never experience. In such excursions, material objects serve as pivot points and thereby open up archaeology. As such, archaeology can become a tool for action and transformation, identity work and dialogue, across cultures. It can also become a tool for the process of decolonization and the telling of stories about lives, the land and relationships with the land that have been pushed to the margin. As such, it begs questions about *who can* tell those stories.

The two cases in this chapter also underline that such dispositions – being able to navigate multiple worldviews and epistemologies and tell stories that used to be marginalized given place-based practices and engagement with people, places and histories yet also materials that then become pivot points for action – are essential to and part of the kinds of sustain'abilities' that need to be developed in order to solve and resolve wicked problems or tackle new emergent problems of our times (Dillon, 2017). They are the kinds of praxis we need to encourage through new partnerships between formal and informal education. The two cases underline the role STEM education with an informal content lens can play in supporting the development of youths' critical sustainability literacy. That literacy was developed in Case 1 through a re-storying of the past, present and future in collaboration with youth and by giving them a voice. Engaging with STEM in this manner was initially understood by the youth as "another planet". Yet, the joint creation of a safe space between the teacher, archaeologist and participating youth, the latter had opportunities to voice their struggles in understanding history in place and notions of time, or question the relevance of the work of archaeologists. While Ahlia at the time did not seem to grasp or even oppose the positioning of herself by her teacher, that dialogue might have done some work beyond that moment too, leaving that student with questions about her own history and the manner that history is tied to her identity as a first-generation immigrant living in Canada and identifying as Canadian. It might have helped her develop a new lens, a critical disposition to the world, implying new forms of "learning about, learning to do, and learning to be" (Wals, 2015, p. 22) in STEM, supportive of engagement in civic science – the learning about archaeology in ways that it may transform the present and future.

In contrast, Case 2 makes evident the educational potential of community-based archaeology with Indigenous youth. As the first case, it offers Indigenous youth with opportunities to live the scientific method if you will, through their involvement in all aspects of an archaeological dig, which in this case also implied travel with artefacts from their community in Nunavik to Montreal, which in the end supported a sense of empowerment and pride that youth could experience and bring back with them and share with their community. To what degree that incited an interest in future engagement as stewards of their lands and community is difficult to assess, yet it certainly makes evident the educational potential and value of archaeology and a form of place-based STEM education that was relevant to the participants involved. In particular, we see archaeology as a powerful pedagogical tool to go beyond simply "sprinkling cultural materials into approaches designed for southern systems" (Vick-Westgate, 2002, p. 15). It naturally calls for stepping

outside of the Western-based educational system and engaging with multiple epistemologies and epistemology-ideology dimensions (Bang, 2017). It also supports the experience and practice of an ethic in ways described by Bang (2017), tied to the land and relations and to the subjective experiences of artefacts and not simply the objective. It could help erase space-time constructions that have positioned humans at its centre and that resulted in a deep disconnect of humans from the land and each other, leading to a lack of care of the earth in ways discussed at the beginning of this chapter. It helped recentre learning around "culture and dialogic development" (p. 133) as did the photography project and its exhibit which literally got different stakeholders and strangers into conversation. The project also positioned youth as part of that conversation and as stewards of their past, present and future, leaving them with a sense of agency as actors of science driven by a civic goal in ways the book calls for. The project brought together "scientists, educators and the public" and linked "science and society with place and identity" (Dillon, 2017, p. 5). That kind of a science practice can equip youth with the skills, worldviews and dispositions needed to tackle the kind of wicked problems of our times or as I referred to in the beginning, sustain'abilities'. That kind of STEM practice certainly has the potential of moving us beyond "narratives of division, dread and despair" (Bang, 2017, p. 134), towards inclusion, equity, action and transformation (Wals, 2015). The two projects helped students experience, play with, and live a relational approach and feel what a non-anthropocentric worldview implies.

Implications for Out-of-School Science Education

Returning to the theme of this book, namely, the role of STEM education and the informal content lens in addressing wicked problems, we believe that both projects pushed the participating youth towards forms of engagement deeply rooted in place, made possible through people and cross-disciplinary engagements and the sharing of histories through contact with a material and physical world most youth in our sample otherwise never have access to. In light of this, we clearly see the potential of an informal content lens to the practice and development of civic science and the development of sustain'abilities'. As noted, involvement in such projects can be empowering and transformative for all members involved. Involvement in such projects also makes possible an immersion into a decolonial ethic which I take to be at the heart of the kind of civic science wicked problems call for. If we do advocate for a joint learning process around wicked problems, we also need to ground such work in respectful navigations among disciplines, epistemologies and practices, many of which are still Eurocentric and exclusive, and as such, badly equipped to deal with the kind of complex and controversial problems the wicked implies. Returning to the beginning, we have to equip youth and society with the kinds of literacies needed to listen to the world, reconnect with it and work together in ways

to eliminate inequity but also ignorance. Archaeology as I lived it with youth through these two projects seems like a promising pedagogical tool to do so. Archaeology does not simply belong into a history or social studies course, but deserves to be developed further through a STEM education and informal content lens.

Maybe most important, building on some words by Atalay (2006), "Indigenous archaeology situates itself to work from the place of the 'local'…" (p. 34). Yet, place-based STEM has become the exception to the rule today. In fact, our engagement with Indigenous archaeology has made quite evident just how disconnected most STEM education has become from place. It has created a disconnect from STEM for many students. It also left us wondering about the relevance of STEM for the kind of wicked problems the youth we work with face daily. Why would they even "dare" look towards STEM when in need for a solution? We used the two case studies in archaeology as tools to unpack issues of STEM while implicitly making the case for the potential of informal science practices to engage learners in place-based STEM practices grounded deeply in a serious and critical unpacking of monologic visions of epistemology and practice and thereby bring into the conversation issues of privilege and power. The two cases also brought together multiple places of learning and diverse communities and essentially engaged both, the formal and informal content lens. Thereby, the chapter makes the case that joint projects of this nature are essential to the building of new narratives of socially just science practices and sustain'abilities' and essentially literacies that are empowering instead of silencing and deeply grounded in respectful relations.

References

Archaeological Institute of America. (2021). Educators. https://www.archaeological.org/programs/educators/

Archambault, J., & Richer, C. (2014). Leadership for social justice throughout fifteen years of intervention in a disadvantaged and multicultural Canadian urban area: The supporting Montréal Schools Program. In I. Bogotch & C. Shields (Eds.), *International handbook of educational leadership and social (in)justice* (Springer international handbooks of education) (Vol. 29, pp. 1023–1045). Springer.

Atalay, S. (2006). Indigenous archaeology as decolonizing practice. *American Indian Quarterly, 30*(3–4), 280–310.

Atalay, S. (2012). *Community-based archaeology: Research with, by, and for Indigenous and local communities*. University of California Press.

Bang, M. (2017). Towards an ethic of decolonial trans-ontologies in sociocultural theories of learning and development. In I. Esmonde & A. N. Booker (Eds.), *Power and privilege in the learning sciences: Critical and sociocultural theories of learning* (pp. 115–138). Routledge.

Bang, M., Curley, L., Kessel, A., Marin, A., Suzukovich, E. S., III, & Strack, G. (2014). Muskrat theories, tobacco in the streets, and living Chicago as Indigenous land. *Environmental Education Research, 20*(1), 37–55. https://doi.org/10.1080/13504622.2013.865113

Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education, 94*(6), 1008–1026. https://doi.org/10.1002/sce.20392

Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit*. UBC Press.

Bell, L., & Clover, D. E. (2017). Critical culture: Environmental adult education in public museums. *New Directions for Adult and Continuing Education, 153*, 17–29. https://doi.org/10.1002/ace.20218

Bureau of Land Management & Montana State University. (2021). Project Archaeology. https://projectarchaeology.org/about

Clarke, J., Moe, J. M., & Algeria, C. B. (2008). *Teaching archaeology as culturally relevant science curricula: Building scientific and archaeological literacy*. Paper presented at the 73th Annual Meeting of the Society for American Archaeology, Vancouver, BC.

Desrosiers, P., & Rahm, J. (2015). Sivunitsatinnut ilinniapunga: l'archéologie inuit et l'apprentissage. *Études/Inuit/Studies, 39*(2), 259–283. https://doi.org/10.7202/1038150ar

Dillon, J. (2017). Wicked problems and the need for civic science. *Spokes, 29*, 1–9.

Drew, M. (2017). Nunalleq Culture & Archaeology Center. *Inuit Art Quarterly, 30*(4), 1.

Gadoua, M.-P. (2014). Making sense through touch. Handling collections with Inuit Elders at the McCord Museum. *The Senses & Society, 9*(3), 323–341. https://doi.org/10.2752/174589314X14023847039719

Lotz-Sisitka, H., Wals, A. E. J., Kronlid, D., & McGarry, D. (2015). Transformative, transgressive social learning: Rethinking higher education pedagogy in times of systemic global dysfunction. *Current Opinion in Environmental Sustainability, 16*, 73–80. https://doi.org/10.1016/j.cosust.2015.07.018

McDonald, M., Arraguitanaq, L., & Novalinga, Z. (1997). Voices from the Bay. In *Traditional ecological knowledge of Inuit and Cree in the Hudson Bay Bioregion*. Ottawa: Ont. Canadian Arctic Resource Committee.

Ministère de l'Éducation, du Loisir et du Sport. (2009). *Programme de soutien à l'école montréalaise*. Gouvernement du Québec.

Ministère de l'Éducation du Loisir et du Sport du Québec. (2001). *Québec education program: Approved program: Preschool education, elementary education*. http://collections.banq.qc.ca/ark:/52327/bs41449

Moe, J. M., Coleman, C., Fink, K., & Krejs, K. (2002). Archaeology, ethics, and character: Using our cultural heritage to teach citizenship. *The Social Studies, 93*(3), 109–112. https://doi.org/10.1080/00377990209599892

Parent, N. B. (2012). *Contested domains of science and science learning in contemporary Native American communities: Three case studies from a National Science Foundation Grant titled, "Archaeology Pathways for Native Learners"*. Doctoral Dissertation, University of Connecticut. ProQuest Dissertations Publishing.

Pokiak, M. (2010). Being an Inuvialuk archaeologist and educator from Tuktoyaktuk. In G. Nicholas (Ed.), *Being and becoming indigenous archaeologists* (pp. 252–257). Routledge.

Rahm, J. (2006). A look at meaning making in science through school-scientist-museum partnerships. *Canadian Journal of Science, Mathematics and Technology Education, 6*(1), 47–66. https://doi.org/10.1080/14926150609556687

Rahm, J., Desrosiers, P., Kotierk, J., & Weetaluktuk, T. (2019). Sivunitsatinnut ilinniapunga (for our future, I got to school): A description of an archaeology field school and photo exhibit project in Nunavik, Northern Canada. *Canadian Journal of Native Studies, 41*(1), 122–145.

Simpson, L. B. (2014). Land as pedagogy: Nishnaabeg intelligence and rebellious transformation. *Decolonization: Indigeneity, Education & Society, 3*(3), 1–25.

Sutton, M. O., & Yohe, R. M., II. (2003). *Archaeology: The science of the human past*. Allyn and Bacon.

Vick-Westgate, A. V. (2002). *Nunavik: Inuit-controlled education in Arctic Quebec*. University of Calgary Press.

Wals, A. E. J. (2012). *Shaping the education of tomorrow: 2012 Full-length report on the UN Decade of Education for Sustainable Development*. UNESCO Education Sector. Retrieved: https://library.wur.nl/WebQuery/wurpubs/fulltext/246667

Wals, A. E. J. (2015). *Beyond unreasonable doubt: Education and learning for socio-ecological sustainability in the Anthropocene*. Inaugural address, Wageningen University. https://arjenwals.files.wordpress.com/2016/02/8412100972_rvb_inauguratie-wals_oratieboekje_v02.pdf

Jrène Rahm is Full Professor in Educational Psychology at the Université de Montréal in Canada. She studies diverse youths' learning and identity work in science through a space-time lens, documenting their educational pathways but also agency and transformation in and through a vast array of educational opportunities. Her current work implies partnerships with community organizations to support teacher education, an interest in youth voice and empowerment through co-creation in urban centres, as well as the documentation of environmental stewardship in Nunavut and Nunavik in collaboration with Inuit. She is an editorial member of the journal Mind, Culture, and Activity, and has published widely in English and French, including two books with Sense.