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Landscape Keeps Score: Empire, Waste, Deep Time, and Art

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INTRODUCTION

To my high school students, any event before their birth is the equidistant past: dinosaurs and payphones seem equally premillennial. This perspective of the near and far future as an equally nebulous cloud can be attributed to both youth and trauma. 169 young people have been killed in Richmond City since I began teaching here, almost all of them students from our school district. [1] This trauma of losing classmates, friends, and family to violence has rippled through our school system, noticeably in a "sense of a foreshortened future", a recognized symptom of trauma. [2] Some students don't see a point in planning for a future that may not come. Yet we are in the direst phase of the Anthropocene, and their choices will majorly impact this future.

I believe this problem can be reckoned with through our study of history. In this curriculum unit, students will establish what a millennium truly means - a millennium in the past by looking at the artistic legacy of the Pre-Colombian city of Cahokia, and millennia in the future by looking at the Waste Isolation Pilot Project. This will better equip students to both truly understand the depth of the past, the depth of the impact of the past on today, and the depth of their responsibility to the future.

RATIONALE

Humans have been present for a minuscule portion of Earth's history, yet our impact on the environment has had global, life-ending ramifications. I find the proposed term 'Anthropocene' to reflect our current time of human transformation of earth to be an apt one. [3] To understand how much the Anthropocene has been an aberration, we must first understand how short our time on Earth really has been, and how wide reaching its effects will be.

For example, in the 1950s Virginia "became the first atomic power generator to produce electrical energy for the U.S. power grid." [4] Nuclear power creates nuclear waste, and while this nuclear waste has only been being generated for over sixty years, designs for how to safely store this waste must be effective for at least ten

thousand years in the future, with scientists nonetheless acknowledging the waste will pose a health threat to humans beyond even then. [5] Imagining the state of humanity ten thousand years in the future much less planning for that future seems unfathomable when you consider that ten thousand years in the past, humans had only just begun to domesticate animals. [6]

We benefit from nuclear power today, but our descendants will bear the cost. The choices of my students today will impact the safety and health of the world, not only their world, but the world of their descendants. To be good ancestors, we must understand the weight of that time to make better choices in the present. In this unit, we will begin to reckon with this legacy by understanding the scope of this timeline through visual art.

UNIT CONTENT

CAHOKIA, A CASE STUDY FOR THE PAST

To impress upon students the power of a millennium, we will start a millennium in the past through the case study of Cahokia. Students will explore what survives from that time to the present: artifacts, knowledge, and language.

Cahokia, near modern-day St Louis, Missouri, was the largest Pre-Colombian urban center outside of Mexico at its time. Settlement of the area began around 700 CE but was at its height (with a population of around 20,000) between 950–1350 CE. [7] Further tens of thousands of people lived on farms radiating out fifty miles from city center. [8]

Using carbon dating, we can tell that around the year 1050 CE, there was a rapid leveling (perhaps over weeks or months) of Old Cahokia and massive construction of New Cahokia.[9] A planned city, New Cahokia was designed with neighborhoods built around a central plaza and associated with one or more earthen pyramids. [10] The centerpiece of New Cahokia was a “fifty-acre Grand Plaza, surrounded by packed clay pyramids” which would have been “at the time the biggest public space ever conceived and executed north of Mexico”. This was carefully built with drainage systems and reservoirs, and would, after New Cahokia’s initial construction, be home to “the New World’s third largest pyramid”. [11]

Pyramids that have survived to present day compose the Cahokia Monks Mound State Historic Site, a UNESCO world heritage site. [12] The effect of the human-altered landscape is dramatic. Some may say that it is Robert Smithson’s 1970 Spiral Jetty that serves to ‘epitomize Land Art’ [13] , but clearly this tradition has a rich history in North America and should feature Cahokia pyramids as the star.

The surviving portions of Cahokia have not had just the centuries to contend with. Highways cut through two parts of the site, and what we now know to be the central plaza was once covered by a subdivision. [14] Modern farming practices and erosion had damaged all but less than a dozen of the largest pyramids before the central part of the site was purchased by the state. Roughly half of the mounds in total retain their earlier sizes. [15] Learning about what knowledge and art was lost is just as important as learning about what we still have, because it can instill in students the importance of preservation. They can explore the full range of the

consequences resulting from what would have been considered ‘progress’ by the European American settlers.

While Cahokia is just a single example of the rich, complex, and long history of people in North America, I find it is such a dramatic and evocative one that serves the purpose perfectly of establishing how long a millennium truly is. Cahokia will serve as our case study for visualizing this deep time in three different ways. First, my students are often surprised to find out Cahokia existed at all, as it challenges assumptions about Indigenous life. Second, looking at events taking place in the world at the same time as Cahokia will help to establish history as a simultaneous experience rather than the timelines broken up by continent or country as we are often taught, and that we are still connected to even far history in the present. Finally, we will use the rise and fall of Cahokia to understand the life cycle of an empire, including the effects of climate change on an empire.

Historical Analogues

Here we will contextualize the time span of Cahokia’s history using historical analogues to demonstrate for students what these years, dates, and time spans mean in a broader sense. For example, Cahokia was at its peak of power and prosperity for roughly 400 years [16] , far longer than the roughly 250 years of the existence of the United States so far. [17] Students can reflect on this: do they think about the end of the United States? Do they think people living in Cahokia thought it would exist as a state forever?

The razing of Old Cahokia and the building of New Cahokia can be carbon dated to around 1050 CE. [18] Two major events in world history that still affect my students' lives occurred around this time: the Battle of Hastings and the invention of moveable type in China.

The Battle of Hastings in 1066 CE resulted in the Norman conquest of England and the end of Anglo-Saxon rule. It was recorded visually soon afterwards in the Bayeux Tapestry. [19] As a result of the conquest and the subsequent replacement of Anglo-Saxon clergy and aristocrats with Norman clergy and aristocrats, Norman French eclipsed Old English in prestige. So, language began to develop along class lines. As the Universität Hamburg explains, “It is the reason we have words like beef *and* cow, pork *and* pig. The common folk called the animals by their Old English names; the Norman French aristocracy used French to describe them.” This confluence also resulted in the major discrepancies between the way modern English words are spelled, and the way they are pronounced. [20] These vocabulary and grammar challenges vex even my native English speakers. Students can reflect on the fact that the complications of the very language they are speaking today began at the same time Cahokia was being built. They can reflect on how so much of what would have comprised daily life for Cahokia does not survive, but a language that was born at the same time does survive, albeit with significant evolution. Additionally, students can reflect on the fact that there would have been no English speakers in the hemisphere at the time of Cahokia’s construction, and yet because of the results of colonialism, signage at the Cahokia state park will be in English. This historical analogue shows our connections to even the distant past.

The invention of moveable type occurred first in China by Pi-Sheng between 1041-1048 CE. He developed a movable type “made of an amalgam of clay and glue hardened by baking. He composed texts by placing the types side by side on an iron plate coated with a mixture of resin, wax, and paper ash. Gently heating this plate and then letting the plate cool solidified the type. Once the impression had been made, the type could be detached by reheating the plate.” [21] It would be more than 400 years before moveable type was used in Europe. [22]

The very existence of the modern school system undoubtedly rests on this invention, as it enabled cheap book printing and the following rise in literacy and ease in transmission of knowledge. Students can reflect on the fact this invention dates from the same time as the rapid building of Cahokia. They would not have had this invention yet as it was happening in China, so they can reflect on a world completely without the printed word, without books. Modern schooling has taken up most of their young lives: what would their daily life be without it? How do they think Cahokia would have developed differently with the printed word, or what additional information would we know about Cahokia if we had surviving printed books about their lives, written by them? To reiterate an earlier point about what survives the centuries, students can reflect on the fact that printed literature may not have survived even if it had existed, while the earthen mounds we do have are far less likely than paper to degrade.

Life Cycle of Empire

Cahokia would have had immense power, and this power would have been stratified. This is obvious in the immense amount of labor it would have taken to build the city that had clearly defined areas for different economic and social classes. Excavated artifacts reflect trade "with peoples from as far away as the Gulf of Mexico, the Appalachians, the Great Lakes, and the Rocky Mountains." [23]

Ancient Cahokians had a complex understanding of geometry and astronomy. There is evidence of several observatories dubbed of series of 'American Woodhenge' made of giant upright cypress posts constructed in circular formations that would have tracked the rising and setting sun. [24]

Every year, the earthen pyramids around Cahokia would be refurbished. [25] This massive architectural undertaking was a goal of monument building, not the result of architectural flaws. [26] Refuse piles found near the build sites contain evidence of the cooking and the consumption of vast amounts of food, evidence of routine festivals and feasts whose participants would have numbered in the many thousands. [27] These grand feasts would have been furnished by the efforts of farmers who used "adaptive strategy" to maximize their production to feed the large population of Cahokia. [28]

These advancements and celebrations did not benefit everyone. Nearby the festival sites in the Grand Plaza is where we find evidence of the routine human sacrifice of young women. While we cannot know if the feasts and the sacrifices happened simultaneously, Timothy R Pauketat posits that it is "Possible Cahokians accommodated the bizarre mortuary spectacles and tolerated the excesses of their leaders in part because of the social and economic rewards that might have accompanied the great festivals." [29]

Archaeological research has revealed that while Cahokians had a richly varied diet, residents of the farming communities that supplied Cahokia ate mostly corn soup, supplemented with meat from dogs and smaller animals like lizards and turtles. [30] Judging from their pottery styles, many of these farmers would have been immigrants or their descendants from what is now Missouri or Arkansas and would have been compelled to give their surplus to Cahokia. [31]

While it is miserable to imagine the life of the farmers, left with bare subsistence, and even more so to imagine the terror of the human sacrifice victims, Cahokia leaders used these as a means of control. Timothy R Pauketat further theorizes that "The leaders of a New Cahokian society may have believed that if they could associate themselves with the source of life and death on earth – with creation itself – their rule would be unquestioned and unchallenged." [32]

History shows us all empires rise and fall, and Cahokia was no exception. There are many theories as to the cause, but the fall of Cahokia was undoubtedly an unpleasant time to be alive. The political vacuum empowered organized military action, the brutality of which was unprecedented. We see this in the surviving site of a massacre dating to the fourteenth century at Crow Creek, South Dakota where an entire Proto-Arikara village was almost entirely exterminated. [33] Killing techniques used were likely perfected by Cahokia - mace like war clubs and shields in hand-to-hand combat, [34] leading to victims of the massacre being clubbed to death, scalped, dismembered and mutilated "as one might butcher a bison."

This organized military action was established by Cahokia centuries earlier and spread thanks to their cultural preeminence. When earlier conflicts may have led to small skirmishes or led to settling the score through a game of Chunkey, Cahokia changed the standards of engagement. [35] Cahokia fell victim to their own invention. In the remnants of Cahokia itself dated to its fall, "inhabitants constructed a series of palisaded wooden fortifications through enormous effort—clear evidence of external threats that previously had not existed" [36]

Climate Change and Empires

One of the theories behind the collapse of Cahokia is a changing climate. Oxygen in Calcite in nearby lake deposits lets us track rainfall, and carbon isotopes from skeletons let us track diets. The rise of Cahokia coincided with increased rainfall during the Medieval Climate Anomaly; an unusually warm time that would have encouraged the agricultural output needed to sustain Cahokia's large population. The fall of Cahokia coincided with the Little Ice Age, where drought in the midcontinent and east, floods from the inundated west, and cooler temperatures would have destroyed that agricultural capability. This corresponded to evidence of widespread political instability such as signs of violent conflict and eventual abandonment of the site. [37] The archeological record shows farmers abruptly leaving in the late twelfth century, the same timeline as the fall of Cahokia. [38]

As we face a future with an even more unstable climate, this historical warning that climate change leads to political instability serves as another call to action as we must work to mitigate the effects of what is now human-caused climate change. This is not the only message about empire Cahokia has for us. A thousand years later, the United States also uses technology to get the maximum output from the land. We also deal with class stratification that leaves huge differences in people's quality of life. Cahokia shows us the danger of religion controlling the state, religion in which not everyone is honored as equal. Cahokia also shows us all empires have an expiration date. For all the control exerted over the Cahokian populace to force people to build and rebuild the massive pyramids year after year, many of them were plowed under by the American empire. For all our present-day wonders, our empire will equally be left in ruins for future empires to pick through. But what in particular will the future know us by?

PLASTIC AND NUCLEAR WASTE: OUR GIFT TO THE FUTURE

Time, decay, and development has rendered the present-day site of Cahokia vastly physically different than it was at its height. Archaeological finds must work around centuries of environmental change that has left much of Cahokia to decompose and be buried beneath new layers of sediment.

Trash pits leave behind a wealth of artifacts for future archaeologists. [39] When I imagine what artifacts our present will be known for, when I think of our trash and the materials within the trash that do not readily decompose, I immediately think of plastic and nuclear waste.

Plastic Life Cycle

In the decades since plastic production started in full force in the 1950s, plastic waste has proliferated at every level of the environment, including notable accumulations in the oceans. The dangers of plastic in these environments include “choking and starving wildlife, distributing non-native and potentially harmful organisms, absorbing toxic chemicals and degrading to micro-plastics that may subsequently be ingested.” [40]

Despite this longevity, plastic products do degrade over time. Artists in the 20th century that were early adopters of plastic as an art material found that materials like fiberglass and celluloid acetate will warp over a matter of decades. This material relationship likely inspired Gustav Metzger’s 1959 manifesto on auto-destructive art, stemming from his belief that “making works which destroyed themselves would highlight society’s obsession with destruction and the damaging effects of machinery on human life”. [41]

Plastic Waste as an Art Material

These themes of destruction inherent in the lifecycle of plastic bring attention to materiality in plastic artworks. The artist pair Richard Lang and Judith Selby Lang have been combing 1000 yards of Kehoe Beach Point Reyes National Seashore since 1999, collecting and curating plastic that later becomes their artworks, shocking viewers that realize the supplies for this artwork was once considered trash. [42]

In *Unaccountable Proclivities*, they pair well-worn plastic with expensive dishware, the patina and colors between the highly valuable plates matching with the patina and colors of the discarded plastic, which makes the viewer ponder the different values we assign to these manufactured items. [43]

One of their most sobering works, *The Ghost Below* is made from the over 450 pounds of fishing equipment and plastic found within the stomach of a sperm whale who washed up on Point Reyes National Seashore, having, tragically, starved to death. [44]

Plastic is everywhere in our school day, from single use plastic meals are served with and on, to more durable plastic surfaces in the classroom chosen for the ease of cleaning during a pandemic, to the assortment of plastic trash that will litter the ground walking to the bus stop. According to a United Nations report, should we divide the total amount of plastic ever produced by the earth’s population, it would result in 1200 kg of plastic per person, a staggering amount. [45]

The proliferation of plastic and plastic trash has normalized it, and in normalizing it, it becomes almost invisible in our daily lives. By looking to plastic refuse as potential art material rather than trash, and by looking at the full potential of both longevity and auto-destruction in that material, students are forced to notice plastic trash, and notice the sheer amount of plastic trash. Making a problem visible and giving means to deal with that problem is the first step in embedding in students an anti-plastic trash mindset, one that will have positive impacts on the environment. Not only that, but it shows students that art materials can come from anywhere.

Nuclear Life Cycle

Nuclear power is “electricity generated by power plants that derive their heat from fission in a nuclear reactor.” [46] Fission was discovered before World War 2 along with it the realization this power could be used to build a bomb, and during World War 2 the United States began funneling an immense number of resources into the Manhattan Project to transform that science into functioning weapons. The Trinity Test, detonated in

Alamogordo, New Mexico, proved the success of the weapon in July of 1945. Two atomic bombs were dropped by the United States on Japan, on Hiroshima and Nagasaki, forcing the Japanese surrender and the end of World War 2. The Soviet Union tested their first atomic weapon in 1949, beginning a nuclear arms race between the United States and the Soviet Union that would comprise the Cold War. [47] Meanwhile, the United States built commercial nuclear power plants that began generating electricity for the civilian power grid in 1958. [48]

Of the many sources of energy that power Virginia's electrical grid, the largest percentage comes from nuclear power. Virginia has large uranium deposits, which is the fuel source for nuclear power, but uranium mining is banned in the state. [49]

Waste elements of the nuclear fuel cycle are highly radioactive, making it extremely dangerous to living beings. [50] According to the World Health Organization, "At very high doses, radiation can impair the functioning of tissues and organs and produce acute effects such as nausea and vomiting, skin redness, hair loss, acute radiation syndrome, local radiation injuries (also known as radiation burns), or even death." [51]

Radioactive half-lives, or the time it takes this radiation to decay "can range from less than a nanosecond, to hours, days, or sometimes millions and billions of years or more." [52] Uranium-238 has a half-life of 4.5 billion years. [53] Thus, radioactive waste requires storage that will be safe and secure for an unfathomable amount of time.

Waste Isolation Pilot Plant: Intimidation through Art

The United States has a single permanent repository for disposal of this waste, the Waste Isolation Pilot Plant, in New Mexico. The US Department of Energy states that this site was chosen due to the presence of salt beds, wherein disposal is ideal "because the salt is free of flowing water, easily mined, impermeable and geologically stable. Salt rock also naturally seals fractures and closes openings." [54]

As stated before, the waste buried at this site will be dangerous for an unfathomably long amount of time. Thus, a challenge exists to mark the site in a way that will be intelligible to passersby for millennia, without the use of language or reliance on governmental continuity.

In *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, a report prepared by Sandia National Laboratories for the United States Department of Energy and released in 1993 [55] , experts considered historical analogues, scientific and cultural realities, and more to create design proposals for this monument. The designs needed to be able to remain intact and intelligible for at least ten thousand years – still a shorter time than the radiation would be dangerous for, but a longer lifespan than all but a limited number of human artifacts. [56]

While nothing has been finalized, concepts show clearly the attempt to intimidate through artistic language. The features of one design [57] "consist of two lines of granite monoliths, 32 around a perimeter and 16 around the defined "footprint" of the waste repository itself." Inside that footprint would be a "massive earthen berm", which in some designs would include metal objects embedded in concrete, other designs include chemical additions to stop vegetation growth. [58] The historical analogues cited by the study for this design are inflected by a range of assumptions. For example, though the plans refer to Stonehenge, they assume that the new monument would be made of granite.[59] Stonehenge is made of bluestone and sarsen stone. [60]

Granite is thought of as durable due to specific United States cultural notions [61] relating to the use of granite as a funerary memorial stone [62] rather than scientific realities. [63] The meanings of Stonehenge were developed over centuries of community use.[64] The monument in New Mexico, however, is isolated from social use and designed by a committee.

As the leaders of this project prepared designs for a future without language, they sought to find ways to communicate emotions through form. In fact, "The ability to identify forms that would convey danger was central to the claim to be able to reinstate an archetypal experience for these generic future humans." [65] This design philosophy is most apparent in the *Spikes Bursting Through Grid* design, concept by Michael Brill and art by Safdar Abidi. [66] In this design, massive, varied stone spikes would jut out of the landscape at varied heights and angles, meaning to invoke an immediate physical danger to the physical body. Given the danger posed by the radioactive waste, every design needed to invoke fear, not curiosity, a fine line to walk. As Rosemary A Joyce explains "This massive effort needed to communicate negative feelings about the enormous project undertaken by this grand culture." [67]

WHY IT MATTERS

I can look around my immediate surroundings and immediately see plastic waste. I can, in minutes, walk or drive to various stops in the plastic waste disposal cycle. The affect plastic trash has on the environment is immediately visual. Nuclear waste is much harder to see, since given the danger it is kept hidden. There are no nuclear waste disposal sites within thousands of miles of me. Nuclear power cools my home and keeps my lights on. So why equate it in importance to plastic waste?

Large-scale plastic production and nuclear production both began within the last century. They both take a long time to decompose. They will define our Anthropocene and will be the problem we leave for our descendants to solve if we are careless. For my students to learn about these problems and to learn how to deal with them through art, is to make them, to borrow the words of Roman Krznaric [68] , a 'good ancestor', someone who is concerned with the quality and safety of the world they will be leaving their descendants.

Nuclear bombs, nuclear power, and nuclear waste all began in the United States. [69] However, the negative impacts of the nuclear life cycle have not been distributed evenly. Exploring this topic educates students about nuclear colonialism and Indigenous rights.

The story of the development and life cycle of nuclear energy in the United States is rooted in nuclear colonialism, which according to Danielle Endres is "a system of domination through which governments and corporations disproportionately target and devastate indigenous peoples and their lands to maintain the nuclear production process." [70] We see this in the 900 nuclear tests over 40 years conducted on Western Shoshone land. [71] We see this over the ongoing fight over the plans to create the first high-level nuclear repository on Yucca Mountain, a move "widely opposed by Western Shoshone and Southern Paiute nations who claim treaty-based and spiritual rights to the land." [72] while the US government claims it sits on federal land. [73] Most nuclear resources in the United States sit on Native American reservations. [74] To ignore the way the nuclear life cycle disrespects fundamental Native American right to health, safety, and wholeness is to accept a "Resource colonialism" which "depends on ignoring the land ownership rights of the colonized." [75] As I write this on Quinnipiac, Paugussett and Wappinger land, and as I live and teach on Powhatan land, [76] I reflect that this attitude of resource colonialism is exactly the opposite of what I want my students to learn.

TEACHING STRATEGIES

The following are teaching strategies to support the goal of establishing an understanding of the sheer length of history that precedes as, the goal of establishing an awareness of waste including plastic waste in our daily lives, and teaching students how to communicate concepts to an unfamiliar audience in a clear way.

WINDOWS TO THE PAST

The following strategy is adapted for the art room from exercises from the book *Deep Time Reckoning: How Future Thinking Can Help Earth Now.* In this strategy, students can visualize what their surroundings would have looked like at different points in time by researching how the people, animals, plants, and landscape would have appeared at their chosen date. Students can illustrate and display their research around the school to function as a 'window to the past'. This activity can, if desired, extend the understanding of time into the millions of years rather than the millennia dealt with in this curriculum's case studies and can also help dispel any common misconceptions or generalizations students may hold about history. Students would need to look up, for example, dinosaurs native to only their area at that time, rather than defaulting to a general representation. For example, in conducting this activity in my Richmond, Virginia classroom, students who were assigned to represent 340 million years ago the shores would have teemed with amphibians, insects, and sharks, but no mammals. 40 million years later, as Virginia and Africa met as part of Pangea, the Appalachian Mountains were formed. 35 million years ago a bolide - an extremely bright meteor - collided, forming the base of what would later be the Chesapeake Bay. The modern shape of the Bay was formed as a result of melting ice at the end of the Ice Age 3,000 years ago. [77] Students will find that human history will occupy a very small portion of these 'windows to the past'. A helpful activity may be to guide your students physically through the analogy made by Brooke Borel, where she states

> If the timeline of Earth were mapped onto the human arm, it would begin around the shoulder where the earth formed about 4.6 billion years ago. Animals originated within the palm, but the myriad forms alive today exploded onto the scene around the first knuckle, in the Cambrian period. Blocks along the fingers represent the periods that followed, such as the Jurassic (dinosaurs!) and the Cenozoic (in which humans evolved, a microscopic sliver at the tip of a fingernail) [78]

PROXIMITY MAPPING

Another goal for this unit is for students to develop an awareness of the amount of waste generated in our modern lives, and the consequences it will hold for future generations. Part of this awareness can be generated by the strategy of mapping with students where your local landfills, nuclear power plants, and other similar local sites are. Maps can be found from local or federal government energy or sanitation departments. It can also lead to fruitful questioning with your students about why these sites were placed there. A map of landfills and associated energy products near me provided by the EPA shows five within a twenty-minute drive. [79] A map of nuclear reactors provided by the US Energy Information Administration shows two operating nuclear power plants in my state. [80] The awareness of this proximity provides immediate local consequences when talking about these subjects with my students: the question of where plastic waste goes when it is thrown away, and the issue of nuclear waste are not theoretical, they are in our backyard.

OUTSIDE AUDIENCE CRITIQUE

This strategy supports student understanding of an issue central to the design process for the Waste Isolation Pilot Plant and in the art room: how do you communicate themes to an unfamiliar audience? The Waste Isolation Pilot Plant must communicate danger to an unknown future without language. Students should understand how their artworks communicate themes to the audience, and not always the themes they intend. Oftentimes students in an art class have been so trained in how to look at art and are so familiar with the artist and the assignment, this makes certain themes seem much more obvious and clearer to them due to prior knowledge. To show how others may interpret their work, you can bring in an element of outsider critique.

For example, when students make art throughout the following lessons, display these artworks around the school along with an area for passersby to write their interpretations. You can then read the comments to students and have them reflect on how the comments of others were in line with their intentions and expectations, or not.

Assign students to share images of the Waste Isolation Pilot Plant designs with friends and family members with no background knowledge, and report back on what their initial reactions and interpretations are. Have students reflect on if there were consistent reactions (Fear? Disgust? Interest?) and how they varied from student interpretation at the beginning of the unit before they had background knowledge. Incorporating the interpretations of those from outside the art space will show students how certain things are less obvious than they believe and will show them how to make choices that influence perception.

CLASSROOM ACTIVITIES

The following classroom activities are designed for students to explore and master concepts outlined in this unit. This unit should take 7 class days of a 90-minute class to complete.

PART ONE

In this section, students will establish a millennium in the past by exploring the art history of Cahokia. By the end of this section, students should be able to identify that Cahokia was a Pre-Colombian major metropolitan area, in what is now Illinois, and reached its peak one thousand years ago. Students should be able to identify how we know what we know and identify how we make inferences based on archaeological evidence. Students should show understanding of historical analogues through written reflection.

Day 1

As a class, students will share prior knowledge of Pre-Colombian Native American art and culture, identifying what they know about the food, dress, and art of various people groups including the peoples indigenous to their area. Students will then be introduced to the Cahokian culture, and take notes on aspects of Cahokian daily life, culture, and art. After learning Cahokia existed a millennia ago, students will begin to explore what a millennium means. Students will participate in the deep time mapping exercise mentioned above where they trace geological time on their arms to understand geologic time. Students will research to establish what life was broadly like a millennia ago and how it differed from their life: what did the political world map look like?

What inventions would they not have had that we do? What were dominant religions and where were they followed? Students will submit research.

Day 2

Students will review art historical information about Cahokia and show understanding via a quiz.

Students will then be assigned to illustrate different scenes from life in Cahokia. First, students will look at an example illustration and identify where the sources for the visuals would have come from without photography (archaeological artifacts and assumptions based on placement of artifacts). Students will use archeological evidence as justification for their designs to show they understand how we know what we know in terms of history.

Students will reflect on their learning in writing to show their understanding of what life would have been like for different people at different times in Cahokia's history. Why would someone move to Cahokia or away from Cahokia? What would it have felt like living there at the beginning of Cahokia, at the height of its power, and during the collapse? How would it change depending on who you were in that society? Why do you think people tolerated human sacrifice?

PART TWO

In this section, students will learn about the environmental and health issues with the proliferation and slow decomposition of plastic. Students will learn how artists can respond to this problem, and how they can make art out of plastic. Students will collect plastic during their day they would have otherwise thrown away to make art. By the end of this section, students should be able to articulate the issues with the plastic life cycle and identify how art can be used to solve problems in their community.

Day 3

Students will review prior discussions about representations of time to discuss decomposition. Students will share as a class through teacher led discuss any prior knowledge of what decomposition is and how fast items decompose. Students will learn plastic takes a very long time to decompose and has proliferated at every level of the ecosystem, and the environmental and health issues involved in this problem. Students will learn about the plastic life cycle, and where in their community and how plastic is either thrown out or recycled. Students will share their thoughts about what they can do to help, and learn about artists like Richard Lang and Judith Selby Lang. Students will identify plastic used during class that can be saved and used to make art.

Students will be assigned to collect plastic pieces they find or would otherwise throw away. Plastic must be cleaned and brought into class to use. Students who are unable to complete this can instead write a written reflection where they discuss what plastic they noticed themselves using and throwing out throughout a 24-hour period.

Day 4

Students will review the plastic they gathered and discuss anything they noticed about the types of plastic they used and would have thrown away. Students will use personal, group, and class supplies of plastic as well as glue and chipboard to create assemblage artworks made from plastic. Students will reflect on and identify elements of composition, texture, and color scheme in their work.

PART THREE

In this section, students will establish what millennia in the future will look like by exploring the science and art design behind the proposed marker for nuclear waste. Students will create their own design that could last ten thousand years and communicate danger without using language. Students will justify their choices through writing. By the end of this section, students should be able to articulate the basics of the nuclear life cycle, including Virginia's use of nuclear power in the electric power grid. Students should be able to identify the radiation dangers in nuclear waste, and the science behind the WIPP markers. Students should be able to show understanding of using non-language symbolism to communicate an idea through their model of a WIPP marker.

Day 5

Students will be asked to list the oldest artworks they can think of. Students will research the date of the oldest artwork on their list to establish a timeline of what human life was like then. Students will then be asked to add to their list everything they know about nuclear power. As a class, students will share their list to establish an understanding of basic scientific and historical facts about nuclear power. Students will then learn about the scientific and historical background of the Waste Isolation Pilot Plant, and the challenge to have the marker last ten thousand years. Students will compare the list of their oldest artworks to see if any meet or surpass the ten-thousand-year mark.

Students will be introduced to the project to build their own Waste Isolation Pilot Plant marker. They will review the rubric: it must communicate danger without language and must be designed to last ten thousand years. Students will establish how much can change in ten thousand years by learning about what life was like in 8,000 BCE. Students will then imagine the future they are designing for by completing a narrative writing prompt imagining life in 12,000 CE.

Day 6

Students will review symbolic communication through a class-wide review of everyday symbols such as road signs. Students will share their interpretation of these symbols to establish effective symbolic communication: how will people interpret colors, shapes, and expressions? Using symbols such as *Fallout Shelter,* students will learn how symbols can lose their meaning if transmission of information is lost. Students will discuss their interpretation of the symbol, to see if any universal reactions can be found from the colors or shapes.

Students will then explore how the evolution of language can make it fallible in symbolic communication use. Students will use *The Bayeaux Tapestry* to learn how the English language was changed by the Battle of Hastings and will read samples of what English would have sounded like a millennia ago.

Students will use their understanding of symbolic communication to draw their Waste Isolation Pilot Plant prototype design, to be submitted and then built next class.

Day 7

Students will review the rubric for their project, and work as a class to create a list of challenges their design could face over ten thousand years, from political instability to weather to degradation of materials. They will then list the materials they think would best survive the length of time and why.

Students will then make a 3D model of their design from the previous class out of given materials.

Recommended materials for this project, based on ease of classroom use, include cardboard, scissors, tape, paper, plaster strips and water, and clay.

Students will reflect on the project through writing, explaining the thought process for their design and justifying it through their cited research.

Once finished, models can be displayed in the school without explanation and with paper and pen inviting onlookers to write their interpretation of the monument. Students can later review these interpretations and see if they match their intentions.

By the end of this unit, students will have completed research and reflection writing on Cahokia, created their own artwork out of plastic trash, and shown their understanding of the nuclear life cycle by creating and justifying their design for an effective and long-lasting marker for nuclear waste. By doing this, students will understand more clearly the length of a millennia.

RESOURCES

READING LIST FOR TEACHERS

Cahokia: Ancient America's Great City on the Mississippi by Timothy R Pauketat

This book provides a basic history of Cahokia. It vividly reconstructs what it would have looked like with the original pyramids, argues for the theory New Cahokia was built thanks to a 1055 CE supernova and traces the connections of the collapse to modern American history. This book goes into depth on the archeological history behind what we know about Cahokia, and the religious framework behind the human sacrifices.

Deep Time Reckoning by Vincent Ialenti

This book is a thoughtful overview of the Deep Time philosophy and provides extraordinary mindfulness resources in cultivating a Deep Time mindset. This book focuses on nuclear waste disposal marker plans in Finland and compares the trust in expertise in Finnish culture versus American culture.

Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant (1993) Kathleen M. Trauth, Stephen C. Hera, Robert V. Guzowski

This report details the lengthy process, scientific rationale, art historical analogues, and illustrations involved in the process to propose a design for a permanent nuclear waste warning. It is lengthy, but contains illustrations not featured here or in the book below.

The Future of Nuclear Waste by Rosemary A Joyce

In this book Rosemary A Joyce thoroughly highlights the assumptions behind many of the designs in the report above, and explicitly connects the Waste Isolation Pilot Plant project with earthworks. This book is the first thing to read if you have any interest in any of the topics covered.

ARTWORKS DISCUSSED IN THE UNIT

Cahokia Mounds State Historic Site, 13 km northeast of St Louis Missouri [81]

The Ghost Below by Richard Lang and Judith Selby Lang, [82] created in 2012 for the Marine Mammal Center of the Golden Gate National Recreation area. [83]

Unaccountable Proclivities by Richard Lang and Judith Selby Lang [84]

Selections from *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant* (1993) Kathleen M. Trauth, Stephen C. Hera, Robert V. Guzowski [85]

APPENDIX ON IMPLEMENTING DISTRICT STANDARDS

This unit aligns with the following Virginia Standards of Learning for Visual Arts for High School Art 2 [86] in the following ways:

This unit aligns with Standard AII.6 concerning the understanding of historical and cultural influences of art through student exploration of Cahokia and other given earthworks.

This unit aligns with Standard AII.8 concerning ethical choices in art by exploring the negative impact of plastic use and how we in the art room can reroute that plastic and minimize environmental harm with our art.

This unit aligns with Standard AII.11 concerning exploration and response to works of art inspired by non-art knowledge through the exploration and student art making in response to the WIPP, artworks that were designed to meet archeological, scientific, and sociological specifications.

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