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### **Oikophilia: Relationships Among Life, Human Life, And Place in School Communities And Their Expressions in Curriculum**

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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

*OIKOPHILIA*: RELATIONSHIPS AMONG LIFE, HUMAN LIFE,  
AND PLACE IN SCHOOL COMMUNITIES AND  
THEIR EXPRESSIONS IN CURRICULUM

A Dissertation Submitted in Partial Fulfillment  
of the Requirements of the Degree of  
Doctor of Education

Mandi Leigh

College of Education and Behavioral Sciences  
School of Teacher Education  
Educational Studies

August 2023

This Dissertation by: Mandi Leigh

Entitled: *Oikophila: Relationships Among Life, Human Life, and Place in School Communities and Their Expressions in Curriculum.*

has been approved as meeting the requirement for the Degree of Doctor of Education in College of Education and Behavioral Sciences in School of Teacher Education, Program of Educational Studies.

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## ABSTRACT

Leigh, Mandi. *Oikophila: Relationships among life, human life, and place in school communities and their expressions in curriculum*. Published Doctor of Education dissertation, University of Northern Colorado, 2023.

This naturalistic, non-experimental inquiry explored relationships among life, human life, and place in school communities along with their expressions in school curriculum. I used educational criticism and connoisseurship to richly describe, interpret meaning, evaluate significance, and discern thematics surrounding relationships and how those relationships were expressed in the curriculum. Postmodern ecology provided the framework for acknowledging ecological precarity and performing the critical, as in essential, work of deconstructing what harms life that could be reconstituted as nourishment. The first study question was: What relationships exist among life, human life, and place in school communities? To answer the question, ecological data collection included historical landscape changes, ecological observations outside the school building. The second research question was: How are those relationships expressed in the curriculum? To answer the question, four teachers in three suburban schools who included ecological relationships into curriculum, more-than-human life in curriculum, went outdoors with students, and/or taught interdisciplinary lessons. Initial interviews were conducted. Participant observations were bookended by pre/post interviews with teachers. Curriculum materials included planning documents, lessons, materials, and experiences. For both study questions, I maintained a field notebook and reflexive journal throughout the study. I found that ecological structure, lawns, and educational structure

permeability played an important role in movement around the schoolyards and the curriculum. Teachers skillfully crafted curriculum where predetermined content met their own intentions. The resulting educational situation was fluid and cyclical. At the confluence of flows and cycles, I found that the schoolyard was an ambiguous place in the communities at large and that many lifeforms at the suburban schools. There were many relationships that existed in and around the schoolyard that were commonplace or every day. I propose a new type of curricula, the camouflage curriculum, that holds more opportunities to connect academic content to specific places. The significance of the findings was a reframed view of suburban schools. The findings supported the addition of place to Eisner's ecology of school. The camouflage curriculum opens a portal to renewed relationships among life.

## ACKNOWLEDGEMENTS

Thank you to all the teachers: human and more-than-human. The flowers who captivated me. Thank you to the plants that sustained me, coffee, especially. To all the people that took care of the plants from seed to harvest and those who drove it to the grocer. Thank you to the animals that sustained me and the people who watched over them. To the bobcat who let me see them among the shrubs near my home. Thank you to the birds who never cease to amaze me, the way you move, sing, and watch out for each other when predators lurk--humans have a lot to learn from you all. Thank you to all the living phenomenon humans can explain and to the mystery of life. To the moments I felt like a whole person and the moments I felt lost, transparent, and tapped into the whole, whole.

Thank you to my partner, Nick, who patiently listened to my blathering about schools and discussion boards for the past 4 years. He was my first editor, the voice of reason, who told me when my ideas were senseless, he kept me grounded, and told me to relax. Thank you to my mentors at University of Northern Colorado: Dr. Christy McConnell, Dr. Derek Gottlieb, Dr. Jenni Harding-Middleton. Thank you for letting me be the student in the Educational Studies program whose committee you all sat on. Thank you to my parents. My mom, Lynn, who helped me navigate academia and the higher education job search. Congratulations on retirement, I'm so proud! My dad, Nathan, who taught me that routines are a good way of running your life. To my grandpa, Paul, who sent me card that said simply, "Keep Going," so I do--love you all!

These dissertations helped me immensely. Sperling (2020) used Critical Discourse Analysis with EcoJustice Education (EJE) to describe a food justice education program. Gutierrez (2013) combined EdCrit and CDA to describe and interpret teachers' implementation of equity policies in a Head Start program. Moroye (2007) used ecocriticism to describe eco-minded teachers and their contributions to ecological education in a public school through their intended curriculum and coined the term complimentary education. She identified ecological education as distinct from environmental education and created ecocriticism as a variation of EdCrit. Ingman (2013) used experiential educational criticism to share the qualities of adventure education experiences. Wright (2018) who added place to the ecology of schooling. I thank these scholars for their work, and I unfurled my inquiry from their dissertations.



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## CHAPTER I

### INTRODUCTION

We are alive during a time of transformation and renewal. Earth's ecological systems are (always) in a state of flux through a myriad of interactions within and among life and place (Ghazoul, 2020; Maltby, 2008). Human life on Earth has always been affected by and affects all life and the places they inhabit (Cajete, 2002; Maltby, 2008; Tuan, 1977; Tuck & McKenzie, 2015). In our present time, anthropocentric activities shifted interactions and climate in known and yet to be known ways. While the present anthropogenic ecological change is unmatched in Earth's known history; change has also been commonplace, routine even, in ecological communities (Ghazoul, 2020). Ecological change happens at the same time ecological renewal. A forest fire combusts plant limbs, returning cellular material to the atmosphere or to the soil surface--change. The sun reaches the forest floor and plants sprout forth to fill the freshly vacant space--renewal. Times of volatility and stochasticity are unsettling for humans and all life. Times of change are ripe for wild imagination, play, and reconstituting relationships. Schools have been contiguous with the ecological world positioning them as ideal sites for renewal. For these reasons, ecological and education research methodology was combined in this dissertation research study. Ecological life was observed with regular site observations, I used spatial indexing methodology (Tuck & McKenzie, 2015). Educational life was observed with the qualitative educational method, educational criticism and connoisseurship (Uhrmacher et al., 2017). The methods combined provided a unique, ecological perspective on education that

renewed relationships among life. The dissertation also added constructively to the notion that the ecology of schooling includes place relationships (Eisner, 1992; Wright, 2018).

We are alive during a time of social and ecological crisis stemming from relationships of extraction, exploitation, and domination (Martusewicz et al., 2015; Orr, 1992, 2009; Thomas, 2022). The sixth mass extinction from over hunting, habitat destruction, climate change, and pollution has begun (Kolbert, 2014). Climate change fueled natural disasters have become more frequent, further destabilizing human economic and social systems (Intergovernmental Panel on Climate Change [IPCC], 2014, 2022). “We can count on the permeance of crisis popping up, eroding away, and worsening. We are in times of guaranteed precarity” (Nxumalo et al., 2022, p. 97). Throughout this study I used the term “ecological precarity” to refer to intersectional social and ecological crisis. These crises grow from a culture of domination and anthropocentric epistemology; the belief that humans were separate and superior to all other life on Earth (Bowers, 1995; Martusewicz et al., 2015). Culture has been a collection of relationships among people, place, and life. Thomas (2022) stated, “as a society, we often forget that humans are a part of our global ecosystem and that we don’t exist separately from nature; we coexist with it each and every day” (p. 3). The culture of domination included human relationships where hegemony existed among social groups where power was allocated based on race, gender, class, ability, and sexual orientation (Martusewicz et al., 2015; Thomas, 2022). “The same systems of oppression that oppress people also oppress and degrade the planet” (Thomas, 2022, p. 32). The culture of domination in the social sphere has facilitated ecological degradation (Martusewicz et al., 2015). At the largest scale relationships among human life and all life are currently unsettled. We all experience those large-scale relationships at a regional or local scale, the people and places we each interact with on a routine basis. Educational systems are nested within and

connected with these larger issues. It follows then that teachers and their classroom communities are seeded within educational systems.

Gregory Cajete (2002) pointed out that the two quintessential problems facing educators are relational. First, how to get along or create healthy relationships in multicultural society. Second, how to attend to the relationships with the natural world. Sometimes it was helpful to describe these relationships as distinct and sometimes they were related, or even inseparable. Neimanis and McLauchlan (2022) stated that the climate crisis was “inseparable from the crisis of colonialism, white supremacy, patriarchal power, and violent body normatives” (p. 218). They reminded me that we all experience ecological crisis and, simultaneously, classrooms are sites of climate change. “We are all bodies that are climate changing and climate changes. Climate change is metabolized in and as our own bodies--bodies that are differently affecting and affected by climate change” (Neimanis & McLauchlan, 2022, p. 220). Ecosystems have flown into classrooms where relationships may be constituted, then spilled back into the ecosystem.

Ecological precarity sometimes has appeared insurmountable, and I did not dwell in this space during this study. I am inspired by Arundhati Roy’s conception of “a portal” through which a new world could be imagined and realized:

We can choose to walk through it, dragging the carcasses of our prejudice and hatred, our avarice, our data banks and dead ideas, our dead rivers and smoky skies behind us. Or we can walk through lightly, with little luggage, ready to imagine another world. (Roy, 2020, final paragraph)

Roy (2020) referred to the portal during the early stages of the COVID pandemic in India. Like much of her work, the meaning crosses time and place. The opportunity to reimagine sustaining relationships among life on Earth are ever-present. I illuminated these expressions and

opportunities in four educational situations during this study. The U.S. education systems has been composed of many school sites of cultural reproduction (Arum et al., 2011).

Correspondingly, schools can generate interdependent culture comprised of mutually sustaining relationships among and between the human and more-than-human community (Martusewicz et al., 2015). I used the term portals to refer to windows, doors, or permeable curtains that allow nodes of healing to be perceptible.

For human life, language has been one dimension of communication that has shaped relationships. Symbolism and language have been means to encode ways of knowing and the subsequent patterned relationships (Fairclough, 2013; Grande, 2015; Martusewicz et al., 2015).

What we “know” is always a matter of what we can say about the world--that is, the particular metaphors that we use to describe it. Then we use this culturally constructed knowledge to determine how we will act. All meaning about who we are in relation to others, including more-than-human others, is created via the language we exchange in the process of trying to say something about our relationship to the world around us.

(Martusewicz et al., 2015, p. 62)

Fairclough (2013) posited that education institutions, “equip [learners] with a resource for intervention in and reshaping of discursive practices and the power relations that ground them, both in other domains and within education itself” (p. 529). In other words, the messages and stories learned in the school setting have had real consequences beyond their subject matter boundaries that have extended into diverse systems including work, politics, and ecological relationships to list only a few. Schools have existed at a confluence of people and place in high consequence environments where domains of power were learned.

I am interested in the relationships that have existed among life and human life within a school setting, further, how those relationships were present in the curriculum. This non-experimental, naturalistic study documented the “real-world situations as they unfolded naturally in a nonmanipulative and noncontrolling way, being open to whatever emerges” (Johnson & Christensen, 2020, p. 47). This study used educational criticism and connoisseurship (EdCrit; (Campbell, 2021) to illuminate relationships among the human, more-than-human living communities, and their expressions in curriculum at a suburban school.

### **Why Suburban Schools?**

For this study, a suburban community “applies to communities that surround and extend from a given metropolis” characterized by sprawl and existed in the exurban shadow between urban and rural environments (Brooke, 2015, p. 6). I was interested in suburban schools, in part, because I was a product of suburban schools, specifically, predominantly white suburban schools. I resided in a suburb during this research. While suburbs have often been pictured as wealthy and white, suburban communities have been demographically diverse. Nationally, suburbs were home to more than half Asian American, Black, Indigenous, and Latinx people who lived in metropolitan areas. Further, more than half of the people currently receiving low-income wages live in the suburbs. Ongoing demographic shifts have been studied by sociologists, geographers, and urban planners. However, little research explored the implications in education contexts (Diamond & Posey-Maddox, 2020).

Suburban environments have been contiguous among ecosystems, rich histories, and abundant learning opportunities with students. Broadly, they are constructed and designed for movement. New suburbs enticed families to move easily between suburban communities as they transitioned among various high paying jobs. The transient and newness obsessed nature of

wealthy suburbs could make place relationships more important for young people in the suburbs than in urban and rural settings (Brooke, 2015).

I also wondered what relationships with the natural world were being expressed in suburban schools. During my own compulsory education, I felt at peace and that life was meaningful when I was outdoors with more-than-human life. The living world interested me and seemed more real than anything in school. Yet, school did not connect with the surrounding ecology. Quite the opposite was true, my schooling was disconnected from surroundings teaching me implicitly ecology was unimportant, unwelcomed even. During this study, I highlighted relationships that existed among life in suburban communities. Suburban schools were meaning laden and important sites of fostering relationships among human life and all life that was worthy of investigation.

### **Living Word Choice**

Describing life on Earth and humans within the biosphere has been rich in value. Beings, humans, life, and non-human each have held different connotations. Dominant culture benefitted from separating and elevating humans above all other life. Human and non-human life have communicated separation and affirmed hierarchy (Grande, 2015; Martusewicz et al., 2015; Oppermann, 2022). Nxumalo et al. (2022) used human and more-than-human to describe life. This word choice unsettled the hierarchy and attributed a sense of scale to humans relative to all other lifeforms. More-than-human life outnumbered humans and they were subject to the fluctuations and perturbations of ecosystems like all other life. Pugh et al. (2019) called for relational epistemologies and an Indigenous “theory of knowing that recognizes all entities, human and more-than-human, as related and interconnected in mutually reciprocal, interactive,

dynamic, and always-becoming relationships” (p. 427). Cajete (2002) used the words “life” or “beings” with “human life.” He also identified human-nature relationships as a place for healing.

I found that the terms life and human life most appropriately arranged humans within a larger relationship with life. Conducting research required language specificity. In efforts to communicate my attempt at an ecocentric epistemological stance, I used “life,” “human life,” and sometimes “more-than-human.” Life referred to all living things (single-celled, feathered, finned, rooted, two, four, six, and eight legged organisms). Human life referred to humans within the larger living ecological system (Cajete, 2002). Sometimes, I referred to more-than-human life to describe living beings that were not human (Nxumalo et al., 2022). I encountered diverse more-than-human life during this study: birds, plants, insects, domesticated animals, and bacteria. I also observed things that embodied characteristics of both life and non-living. For example, viruses, extraterrestrials, mythological creatures, and gods or deities.

### **Rationale for the Study**

Ecological precarity has called for human life to “honestly face the forces we’ve set in motion and look to a farther horizon” and to “create a vision of a decent human future within the bounds of ecological possibility” (Orr, 2009, p. 9). The study attempted to honestly describe, interpret, and evaluate the relationship among living things in the unique school setting. Second, ecocriticism illuminated these relationships as expressed by teachers’ integration of the more-than-human ecology into curriculum. Additionally, I focused on the existence of interdependent relationships or portals through which we could move to health and healing relationships (Roy, 2020). The third purpose was to include the more-than-human ecosystem into this qualitative research study in an attempt to actualize an ecocentric epistemology in the research context as co-creators of educational communities.

### **Significance of the Study**

Diamond and Posey-Maddox (2020) pointed out that suburban and rural communities were underrepresented in education research. This study added to suburban focused education research. This study contributed to research methodology because it played with an ecocriticism by positioning all life and human residents as equal participants in the education setting. When I used the word “play,” I meant to explore the field beyond hierarchy or duality among life. I did not taking relations with life as a toy. Quite the opposite, healing is a process of letting go, combustion, which made room for new patterns, play in this study was asking: What could fill that space that is rooted in healthy sustenance (renewal)? This study used an ecocriticism method to invite the more-than-human residents into curriculum as co-creators. The methods converged by acknowledging more-than-human communication as equitably meaningful as human communication which revealed interdependently linked community residents. By using ecocriticism, I aspired for “research at the borders of the humanities and the new postmodern biological sciences” (Garrard, 2011, p. 204). This transdisciplinary study contributed to the understanding of relationships among schools, place, and living beings who resided there as they evolved in their unique place ways.

### **Research Questions**

- Q1     What relationships exist among life, human life, and place in school communities?
- Q2     How are those relationships expressed in the school curriculum?

### **Definitions**

*Community*: Referred to both the living residents in a place. Human communities were made up of interdependent social and physical environments. Martusewicz et al. (2015) stated that community “Begin[s] from this understanding that human communities are nested in and



absolutely dependent upon the wellbeing of a larger living system” (p. 28). I used resident instead of citizen because, in the U.S., citizenship connotated a status that granted rights and responsibilities (U.S. Citizen and Immigration Services [USCIS], 2022). Citizenship did not apply to all people who resided in the U.S. and attended schools. Further, the U.S. does not currently grant rights to more-than-human life. While the Rights of Nature movement posed prescient questions, this conversation fell outside the scope of the study.

*Curriculum:* Referred broadly to the curation of experiences that shape education (Connelly & Clandinin, 1988). There were explicit, implicit, null, hidden, intended, received, and complementary curriculums (Moroye, 2007; Uhrmacher, 1997; Uhrmacher et al., 2017). For this study, the instructional arc summarized the intended, operational, and received curriculum (Eisner, 2017; Uhrmacher et al., 2017). I focused on relationships among life along with how those showed up in teachers’ intentions and expressions or operationalizations with students. Further explanation is included in Chapter II.

*Education:* The constructed accumulation of experiences created from materials, methods, and social relationships. Experience is educative when it grows towards a particular aim and is contiguous with social life beyond the school walls (Dewey, 2015; Moroye & Ingman, 2013). Ecocentric educative experiences were interdependent, reciprocal, and grounded in local community. United States education referred to the structure, function, and curriculum of the compulsory U.S. education system, kindergarten to 12th grade.

*Place:* Gains meaning from a variety of narrative perspectives: spiritual, political, aesthetic, economic, recreation, ecological, and familial (Semken et al., 2017). For this study, I focused on the relationships on the confluence of life and human life in a school

community. I included more-than-human life and landscape changes for a fuller representation of place (Tuck & McKenzie, 2015).

*Relationship(s)*: The term relationships appeared often in educational research in a variety of contexts. We seemed to agree that relationships were important and that fostering them among community was valuable. However, the definition of “relationships” in education has remained illusive. For this dissertation, I leaned to ecology, relationship was an exchange of matter or energy between or among life that may take the form of eating, friendship, communication, composting, care, time investment or neglect are all possibilities to list only a few. Cajete’s (2002) and Kimmerer (2020) invited reciprocity and responsibility which was a powerful practice and portal to notice. Consistent with eco-centricism, ecological relationships were abundant among life, including school residents.

## **Overview of Methodology**

### **Theoretical Frameworks**

Postmodern ecology was the theoretical framework for this study. Postmodernism is a rejection of modernism and its foundations. Modernism “evinces great faith in the ability of reason to discover absolute forms of knowledge” (Crotty, 2015, p. 185). Reasoning and Cartesian science offered an idealized form of knowing and being in relationship with the living world because humans were imagined as separate and able to objectively view the world. Modernism has been characterized by an “astounding control and manipulation of nature that its science makes possible” (Crotty, 2015, p. 184). Control of nature has proven illusory and costs to communities far outweighed the financial benefits for the few (Shiva, 2005/2015). The belief that humans were separate enabled exploitation and exempted humans from consequences of

those actions. Postmodern ecology pushes against the notion that humans were apart from and not a part of ecosystems (Maltby, 2008; Oppermann, 2022).

Postmodern ecology started with an ecocentric worldview and sought to reconnect humans with the more-than-human world. Ecological postmodernism posits that humans and the environment were biologically and culturally transformed reciprocally (Oppermann, 2022). Similarly, EcoJustice Education (EJE) is a research framework that critiqued the cultural roots of the present social and ecological crisis especially the anthropocentric worldview affirmed in modernism (Martusewicz et al., 2015). I foregrounded postmodern ecology because it explicitly sought to disentangle harmful discourses to heal and repair relationships with positive critique. While EJE has had a tendency towards historical criticism--pointing out what harms. Resolution was found by revitalizing the commons (Bowers, 2006; Martusewicz et al., 2015). The commons that Bowers (2006) strived to create were conditional. Conditionality was not my aspiration during this study. I find postmodern ecology deliberately positive and pluralistic. Postmodernism cultivated a place for a reconstitution of meaning. During this inquiry, I illuminated relationships among human and more-than-human world and their expression in curriculum.

### **Educational Criticism and Ecocriticism**

Postmodernist, Bogdan (1990) proposed a process of *ostranenie* or “the making strange of reality in order to create it anew” (as cited in Crotty, 2015, p. 190). Educational Criticism and Connoisseurship (EdCrit) also aimed to make the familiar strange (Eisner, 2017; Uhrmacher et al., 2017). The EdCrit research method occurred in two parts, connoisseurship and criticism. Connoisseurship “is a private act in which to some degree we all engage. It entails the skills of using one’s senses to apprehend a present experience and of making fine-grained distinctions” (Uhrmacher et al., 2017, p. 1). We were all connoisseurs of something that allows us to see

distinctions that others cannot. No vision is better than the other, all are valuable and instructive. Everything teaches. Researchers bring to their research embodied and accumulated experiences that act as a unique suite of expertise through which they described and interpreted observations (Eisner, 2017). Eisner used the word “seeing” to refer to all sensory experiences that arose during research. Epistemic seeing was awareness along with the context in which the experience sat within the larger setting (Eisner, 2017). My expertise was seeing ecological and educational realms at the same time. Criticism was interpreting and evaluating the meanings for those involved along with disclosing that meaning (Eisner, 2017).

Ecocriticism has been an evolving method within EdCrit. Moroye (2007) described ecocriticism as a lens through which observations and interpretations may be filtered. Ecological meaning embedded relationships among life including care, decision-making, sustainability, and global equity. An ecological lens “allowed me the opportunity to describe the intricacies of the classroom environmental and practices as they relate to the abovementioned ecological and educational themes” (Moroye, 2007, p. 48). Using an ecocriticism lens, the expressions of the more-than-human world and the relational form those expressions take is made visible. Once visible, the expressions are accessible for description, interpretation, evaluation, and thematics (Uhrmacher et al., 2017). Ultimately, I was curious about educational situations evolving during this time of ecological precarity. Further, what did or what could it look like to take precarity seriously in ecosystems where schools existed? Ecocriticism was the method I selected to reveal and highlight portals into sustainable world.

### **Participants**

This study took place in suburban schools and outlying districts surrounding the Denver Metro area. Four secondary (6th to 12th grade) teachers engaged in some level place-based

education were recruited. Meaning, the teachers had any amount of training in and/or implementation of place-based education practices or took their students outdoors as part of their curriculum. I included teachers who went outside with their students and/or used interdisciplinary content with local contexts. I recruited teachers with a snowball method (Glesne, 2016). Further details about participants and recruitment are discussed in Chapters III and IV. More-than-human life participated in this study. Life included more-than-human communities. Within a postmodern ecological framework, more-than-human life participated as co-creators of ecological relationships (Tuck & McKenzie, 2015; White, 1998).

### **Data Collection and Analysis**

This study derived meaning from the following data collected: an initial semi-structured interview with teachers, participant observations, pre/post interviews with each observation (Appendix A) and emergent observations of more-than-human life with and without students documented with spatial indexing. Teachers signed consent forms (Appendix B) prior to interviews. Over the course of the study, I collected teacher-developed curriculum and lesson materials. In addition to the data collection described above, I maintained a personal reflective journal and annotated data throughout the study to trace my evolving thoughts and synthesis (Eisner, 2017; Glesne, 2016). Data collection and analysis was completed in compliance with University of Northern Colorado IRB approval (Appendix C).

Data analysis used ecocriticism that richly described the situation, interpreted meaning through an ecological lens, evaluated the qualities of the situation, and discerned themes (Eisner, 2017; Moroye, 2007; Uhrmacher et al., 2017). Qualitative data was annotated in cycles (Saldaña, 2016; Uhrmacher et al., 2017). I coded each participant individually and described personal themes in Chapter III. Next, I coded across participants to interpret meaning, evaluate

significance, and reveal themes that were summarized in Chapters IV and V. Relationships were illuminated among living residents in the school community (Eisner, 2017). This was a non-experimental, naturalistic study. Methods are described in detail in Chapter III.

### **Organization of the Research Study**

The study was a traditional dissertation model as outlined by the University of Northern Colorado Graduate School. Chapter I is a broad overview that summarized the case for the study. Chapter II contains a literature review of relevant research on this topic and the theoretical research including curriculum meaning, ecocriticism and past EJE studies. Chapter III outlines the research design for this ecocriticism inquiry, participants, data collection, and data analysis methods. Chapter IV contains descriptions of the educational situations with observations from spatial indexing and participant observations inside the classrooms of four teachers in three school communities. Chapter V continues with the collective interpretation, evaluation of significance, and distillation of themes for all participants.

### **Summary**

Ecological precarity warrants an appraisal of communities and the relationships that existed in school settings. Schools and education practices have had implications beyond the physical buildings. Education has been a portal to understand community relationships contiguous with past and future societal arrangements. This research study blended ecological and education methods, then inquired into relationships among life within suburban school communities and their expressions in the curriculum. Teacher participants who already used place-based education practices and/or go outdoors with their students were recruited. I conducted participant observations in and around the school building. I researched historical

landscape changes in the area surrounding the schools. The data were analyzed and shared with ecocriticism in four parts (description, interpretation, evaluation, and thematics).

## CHAPTER II

### LITERATURE REVIEW

#### **Organization of the Literature Review**

This naturalistic study will blend ecological and educational research methods so both disciplines will be discussed in this chapter. I began with a summary of ecological precarity followed by a discussion of what it can mean to take precarity seriously in an educational context. The literature review summarized relevance, past research, and what this study added to education research overall. Four kinds of educational approaches exist to address human relationships with all life on Earth: environmental education, ecojustice education, ecological education, and place-based education. These approaches will each be defined in this chapter. I provided reflections concerning EcoJustice Education (EJE) and a rationale for backgrounding EJE. Lastly, I included rationale on why I recruited teachers with some level of place-based education practice and/or training and/or teachers who go outside the classroom routinely.

#### **Ecological Precarity**

We are alive during an ecological crisis. The sixth mass extinction resulting from over hunting, habitat destruction, climate change, and pollution has begun (Kolbert, 2014). There have been five mass extinctions, three of which were caused by sea level change. Climate change fueled natural disasters (wildfires, extreme weather, emergent diseases) has become more frequent, further destabilizing human economic and social systems (Intergovernmental Panel on Climate Change [IPCC], 2014, 2022). The Intergovernmental Panel on Climate Change (IPCC) offered a global synopsis of climate change and summarized for policymakers who also



made education policies. Climate change itself has been a convergence of social, economic, and ecological systems. The IPCC documents offered a large-scale synthesis of ecological precarity. The IPCC recommended working throughout social, economic, and ecological systems within which the U.S. education system was nested. Climate change as described by the IPCC was a symptom and a mechanism of colonialism that revealed relationships in need of repair (Cajete, 2002; Nxumalo et al., 2022).

### ***Relationship Defined***

The term relationship holds diverse meanings. My ecological schooling and teaching classified relationships as certain types of living interactions: competition, mutualism, symbiosis, commensalism, predation, and parasitism. These were movements or exchanges of energy and matter among life. Relationships also exist among biosphere, geosphere, atmosphere, and hydrosphere. In the process, there were moments of stillness and movement. Weather and climate along with geological and hydrological cycles have moved or held matter and energy in place or releasing it. A moment may be a few seconds or stretch for millions of years. Human life, in some depictions, was separate from ecological relationships which was the notion I pushed against this idea by foregrounding postmodern ecology and relationships among life. Additionally, many relationship nuances escape perception by human life simply because they were unmeasurable by Cartesian forms of science.

Educational scholars referenced relationship and expressed the need to value relationships and did not explicitly define the term. Kemp et al. (2016) synthesized relationships with the more-than-human world into four forms (mastery over nature, steward of nature, partner with nature, and participant in nature; Table 1). They have joined a chorus of other scholars seeking to understand how ecological knowledge and relationship with nature influenced

individual actions. While this was a relatively simple definition, little research described these expressed in the school environment.

**Table 1**

*Human-Nature Relationship Defined*

Human-nature relationship	Definition
Master over nature	According to the idea of Mastership, humans stand about nature. Humans are allowed to do with nature whatever they want. Economic growth and technology are expected to provide answers to (environmental) problems that may arise.
Steward of nature	The Steward stands above nature and is responsible for environmental conservation. Nature is not owned by the Steward but entrusted to him or her. The steward owes responsibility to God or future generations.
Partner with nature	The Partner stands side by side with nature. Humans and nature are considered to be of equal value. Humans should work together with nature in the conviction that this interaction will benefit both.
Participation in nature	The Participant is part of nature, not just biologically, but also on the spiritual level. Although humans are a (small) part of nature, they are active participants. For the participant, the bond between self and nature is very important; it co-constitutes the self.

*Note.* Types of relationship between human life and nature summarized in a table, quoted directly here (Kemp et al., 2016, p. 2064). Authors also include interview quotes and how the quote determined the label of mastery, steward, partner, or participants (Kemp et al., 2016, p. 2064).

Cajete (2002) referred to a Nahuatl poem to explain the “concentric rings of essential relationships and responsibilities” (p. 110). Becoming a complete or fully alive human was to be in relationships with one’s own identity or face, one’s own source of desire that moves you or

heart, one's vocation to show heart and face. Also, one's relationship to family, clan, tribe, place you lived, the natural world and the cosmos. These relational concentric rings interacted and worked through communities (Cajete, 2002). I interpreted this as a process of becoming at peace or with self, family, community, and all life--each seeded within the other or connected in a web.

Greenwood (2009) recalled David Orr, "whether we are conscious of it or not, environmental and cultural education is happening to all of us, all the time" (p. 276). I agreed, ecological relationships surround and sustain human life. Curriculum throughout an education experience, PreK to 12th grade, introduced children to those ecological relationships consciously or not. "The science of ecology is about studying the relationship and interactions between different parts of the system, and the interactions between systems" (Greenwood, 2009, p. 276). Ecological and environmental education centered relationships and interdependence (Greenwood, 2009). Ecological educators in public school settings blended ecological education into their curriculum (Moroye, 2007). Ecological research deconstructed and reconstructed "identities through the construct of relationship" (Greenwood, 2009, p. 277). I agreed with Moroye, Cajete, and Greenwood, that there were many relationships at work simultaneously in the school setting. I was not focused on consumer or conservation choices for this study. Perhaps a systematic review of relationships could be conducted in a separate scholarly inquiry.

For this study, relationship was an exchange of matter or energy between or among life that may take the form of eating, decomposition, care, investment or neglect; all possibilities to list only a few. I assumed that ecological relationships were abundant among life and in schools were connected among those relationships. As a living being on Earth, there was nothing that could be made on this planet that was not derived from a combination of labor and another living resident. Relationships are inescapable. What I aimed to illuminate in this study were the

relationships among life in the school community that were alive for the human life involved along with the expressions or appearances of those relationships in curriculum.

### ***Education Seeded Within Ecological Precarity***

Education is a primary knowledge and a society constructing entity. Education functions to reproduce the world as it is or to transform the world (Jandric et al., 2021). Jaldemark states, “From this it follows that human action in terms of learning, teaching, or participating in education should focus on being inseparable from the surrounding environment” (as cited in Jandric et al., 2021, p. 1423). What does this mean during a time of ecological precarity?

The IPCC named education as climate change mitigation and adaptation strategy. Education access has been essential for human development with safe housing, health care, and social supports (IPCC, 2014). The climate crisis has been intersectional; mixing with racial justice, embodied environmentalism, and gender equity movements (Neimanis & McLauchlan, 2022; Thomas, 2022). The IPCC also proposed that education was a way to transform social systems. Education has provided knowledge of ecological relationships and the skills for constructing sustainable economies. Indigenous and local knowledge has been invaluable in transformation the technological and consumer-oriented society. Mutual sustenance and learning were paramount (IPCC, 2014). If we aimed for transformation, “we need a committed post-digital critical pedagogy that encourages both creativity and imaginative thinking. One aim of such pedagogy is to destroy the social assumption of human superiority and the binary thinking of human/non-human” (Jandric et al., 2021, p. 1428). This sentiment was reflected by Martusewicz et al. (2015), McKenzie et al. (2009), Bowers (1995), Orr (1992), Shiva (2005/2015), Nxumalo et al. (2022). I wondered if this process can be less of a transformation

and more of an exposition of the constitutive relationships that already surrounded and sustained human life.

The ecological and social crisis are complex, overlapping, intersecting, and often inseparable or indistinguishable from each other. There are calls for slow and fast changes at a variety of scales to respond to the twin crisis. The key idea stated directly: “Bateson, ‘these activities in which we now engage do no mean what would mean if they were serious’” (White, 1998, p. 6). Change happened and always happening in ecological dimensions (Bang et al., 2022). Change was facilitated by destruction and creation which were both constant in ecological systems. Thus, the opportunity for wild imagination, play, and renewal of human and more-than-human relationships were ubiquitous (Cajete, 2002; Jandric et al., 2021; Roy, 2020; White, 1998).

### ***What Would It Look Like to Take Ecological Precarity Seriously?***

The IPCC (2014) recommended that education serve as a fulcrum for social change in material living conditions and participation economies. While these recommendations set goals for policy makers, responding to ecological precarity did not require waiting for direction from our local or global policy makers. The localized nature of communities was motivation to start where we found ourselves. In classrooms of all kinds, with students of all ages and creeds, and in a variety of contexts. The journal, *Curriculum Inquiry*, published a special issue on curricular and pedagogical responses to the ecological precarity. Collectively, the authors sought to know about where these scholars and thinkers saw faculties of education being open or reluctant to pushing for structural change and the kinds of different imaginaries required of educators, educational researchers, and curriculum scholars to more meaningfully engage learners to take action to address climate crisis (Nxumalo et al., 2022).

Ecological precarity was a hyper local and global issue at the same time. The authors shared their personal and community work to respond to ecological precarity. Themes from the issue were: centering nature-culture relations (Bang et al., 2022), witnessing relational stories (Scherrer, 2022), disrupting colonialism, attending to Black ecologies (Butler, 2022; Clarke, 2022), and engaging interdisciplinary pedagogies. Ecological precarity did not arise as a singular crisis, it was a symptom of patterned ways of knowing and being in the world (Nxumalo et al., 2022; Yanchapaxi et al., 2022).

Climate crisis both is colonialism and is an outcome of colonialism, or that climate crisis is ecocide and herbicide, suddenly addressing climate change is not the addition of a new special secret something. Instead, it is doing what we have to do to make life more livable anyway. (Nxumalo et al., 2022, p. 105)

Ecological precarity existed in diverse, evolving, living places, where social and ecological systems interact. Educational responses to ecological precarity are correspondingly ecological with goals for resilience and thriving for all life.

An interview in *Curriculum Inquiry's* special issue featured two Indigenous scholars: Megan Bang, Ojibwe, Italian ancestry and Ananda Marin, African American, Choctaw, European ancestry. They identified human relationships among each other and the natural world along with how the relationships were understood as a foundational problem giving rise to ecological crisis. Bang et al. (2022) stated, "Human supremacy is intertwined with, and constructs, white supremacy. This means that human supremacy entitles human beings to turn all other life into natural resources for our own consumption and extraction" (p. 151). This discourse was firmly established in U.S. society overall and in all levels of education. They argued that simply learning about climate change was insufficient and dislodging the production of *Homo*

*economicus* in schools was warranted. As a curricular response, Marin described the teacher education partnership with the Tongva in Los Angeles centering around a water-based perspective. While Bang and Martin recognized the scale of the climate crisis, they pointed out that large scale change has happened before and called for people to consider “what it looks like to make change in everyday life” (Bang et al., 2022, p. 154). Practices of repair, forgiveness, remembering, regeneration, and healing were all important. For curriculum, Marin called for walking, reading, and storying land (Bang et al., 2022).

Members of the Civic Laboratory for Environmental Action Research (CLEAR) lab were interviewed (Yanchapaxi et al., 2022). Interviewees identified individualism discourse as a sticking point in climate change response. Katherine, settler and Kaw Nation, said that individualism could not solve climate crisis. Deondre, settler, Black, and of the Bullhead Clan of Leech Lake Band of Ojibwe, who was also interviewed, agreed with the connection between individualism and the savior complex. Max, Michif and settler ancestry, stated that climate change was a symptom of a set of relations. They proposed that individual actions to carry the burden of collective response was a profound and deliberate mismatch of scale. Also, they positioned ethics as collective. Civic Laboratory for Environmental Action Research (CLEAR) privileged the collective by centering humility in their routines. They took turns teaching and learning with each other. Max connected Zapatista change theories to curriculum work during ecological precarity, “It’s not only that another world is possible, but another possible is possible” (Yanchapaxi et al., 2022, p. 196). This echoed Nxumalo et al. (2022), “We must learn to remember, dream and story anew nature-culture relations” (p. 7).

There were three things relevant to the study in the *Curriculum Inquiry* special issue. First, the call for centering nature-culture relations. This issue asked teachers to take seriously

the “knowledge-making capabilities of the more-than-human world” (Nxumalo et al., 2022, p. 98). Hence, the first research question for this study: What relationships exist among life, human life, and place in school communities? Postmodern ecologists and Indigenous scholars asserted that humans talked to nature and nature talked back (Nxumalo et al., 2022; White, 1998). Second, the scholars in this special issue identified discourses that were problematic or impeded collective existence during ecological precarity, individualism, colonialism, antiblackness, human supremacy, and white supremacy. I acknowledged that these were each embedded in educational communities and people were on their journey to dismantle these oppressive systems. To remain open to what emerged during the study, I was perceptive to what was alive and perceptible in the participating communities. Third, the folks interviewed for this special issue of *Curriculum Inquiry* were residents of communities far from where my inquiry took place. What I learned and incorporated into the outset of my inquiry was the idea that humans were in relationship with life on Earth. The nature of those relationships and how they were incorporated into curriculum were of interest. Each person and community uniquely cultivated meaning with life and place. For example, in my own ancestry, my maternal grandfather told stories about farming as a means of sustenance. He grew magnificent tomatoes until he moved to Florida at age 86. To this day, when I smell tomatoes, I think of him. Tomatoes are one of my portals to relationship not only with my grandfather, but also the delicious mixture of soil, sun, water, seed, a summer season, and my nourishment.

### **Evolving Education**

Definitions are stories we tell ourselves about words. For me, curriculum is where education policies and school practices came to life in the past, present, and future lives of teachers and students. Teachers are curriculum writers and curators. Content may be



predetermined or legislated and completely out of teacher control. How it expresses itself in diverse ways is interesting. Students and teachers roles are interchangeable. Each classroom community is built from the collective past experiences, current environment, and future objectives for all present, whether known or unknown. Curriculum combined “the ‘what is’ and the ‘doing’” (Connelly & Clandinin, 1988, p. 4) along with what was left unspoken and undone. The absent who, what, when, where, and why, speak. Curriculum is curated experienced with place and people (Demarest, 2015). Curriculum is shaped by, and experienced in, human bodies and human minds that each nourished or starved our unique and shared identities (Neimanis & McLauchlan, 2022). Embodied actions left impressions that could become routines to reinforce health or harm. Curriculum curators are guardians and gatekeepers who tended human fruitions and build worlds.

In this next section, I briefly summarize environmental education, ecojustice education (EJE), ecological education, and place-based education. I describe them all as they mark the diverse expressions of human relationships with the more-than-human world in education. These definitions are always shifting and changing in response to a myriad of influences. Any distinction between the kinds of education are flexible and up for negotiation. For the purpose of this inquiry, I sought place-based educators for my study because they used localized context and curriculum.

### **Environmental Education**

Moroye (2007) synthesized the evolving history of environmental education. Environmental Education (EE) was education *in*, *about*, and *for* the environment. The examples that follow were from Colorado, where I lived during this research. Avid4Adventures was an example of education *in* the environment. Participants were engaged in recreation activities like

mountain biking, stand-up-paddle boarding, hiking trips, and various expeditions. These activities could also be called adventure education (Ingman, 2013). Education *about* the environment elevated learning about the more-than-human ecosystems and wildlife often in immersive ecological fieldwork experiences (Moroye, 2007). Walking Mountains and Keystone Science School exemplified education about the environment, both founded by Teton Science School alumni--the same program I attended for graduate school. Environmental Education *for* the environment was a combination of critical understanding of damages, values, attitudes when applying science, and it “foster[s] an environmentally positive image and approach to science which can start to rectify damage already created” (Littledyke, 1996, p. 198). Colorado Trout Unlimited engaged youth in fishing experiences to foster interest in waterways conservation. Eco-cycle promoted zero-waste and composting education programs for sustainable futures.

Overall, EE in, about, and for the environment varied wildly. Moroye (2007) added education *with* the environment by incorporating care for global others along with affinity for the natural world and all of life. Education with the environment acted on unique aims, “to cultivate empathy and consider the implications of individual beliefs and actions on personal, social, and global development” (Moroye, 2007, p. 207). Education with the environment embodies interdependent relationships from intentions to experiences.

Gonzalez-Gaudiano and Buenfil-Burgos (2009) described EE as prolific and ambiguous, sometimes at odds with each other and at other times indifferent. “Environmentalism addresses a wide arc of issues, thereby becoming an empty signifier that enables it to structure the field; that is to say, it can temporarily fixate a discursive field (like a nodal point)” (Gonzalez-Gaudiano & Buenfil-Burgos, 2009, p. 99). While the diversity was reflective of the diverse intersections of ecological precarity, cohesion and solidarity across groups was rare. Environmental Education

struggled to establish itself in the center of an educational practice where it could unspool interdisciplinary and transformative potential. To remedy this, Colorado Board of Education passed an Environmental Education Plan to promote environmental literacy in a variety of contexts in and out of school (Colorado Alliance for Environmental Education, 2022). Navin (2021) acknowledged that EE was perceived as “too far from the classroom” and the greater the distance from the classroom, the less educational that experience would be. She echoed Jardine (2000) who said, “EE has become, in many schools, one more damn thing that needs the weary and already scattered and overburdened attention of teachers and children” (as cited in Moroye & Ingman, 2013, p. 589). When EE resides outside of the community, it exists in the null curriculum, which is a statement about the collective ideology expressed in U.S. education. Nxumalo et al. (2022) called for education *with* the environment to see humanity contiguous with land and the relationship as a teacher.

I was grateful for Gregory Cajete’s invitation to gaze through the window and hear a Pueblo story for transformation. Cajete (2002) stated, “in the Tewa language we often refer to the process of gaining an education in the same as we refer to ‘breathing in life’ or to ‘be with life’” (p. 103). Tewa language connected life itself with education that was developmental and transformational. Further, the Pueblo story “relates that human beings have always been evolving within a landscape and in a sense, we are in a continual journey of becoming human” (Cajete, 2002, p. 104). The process of becoming was one that built relationships with the self, family, tribe, and place. Cajete (2002) advocated that children must have a chance at each of them during their education. While gazing through the window, I remembered that being *with* life has always been the way humans existed. We were already with life. I remembered that relationships were the vehicle and experience of education--this was what I aimed to illuminate during this

dissertation. Remembering was paramount to improving education and healing human life relations with all life (Cajete, 2021).

### **EcoJustice Education**

EcoJustice Education (EJE) is a pedagogy and a theoretical research framework responding to social and ecological crisis that grew from discourses of modernity (Bowers, 1995; Martusewicz et al., 2015). Ecojustice Education is “a pedagogy of responsibility” that highlights the interdependency in communities (Martusewicz et al., 2015, p. 22). While using EJE students interrogated the cultural roots of ecological problems: anthropocentric worldview and hierarchical thinking. These problems extended to human relationships because the culture of domination also manifested as racism, sexism, ableism, and homophobia (Thomas, 2022). In addition to the social critique, a pedagogy of responsibility returned morality to the public sphere with EJE by leaning into ethical implications of hegemony and extractive, anthropocentric relationships within ecosystems.

Bang et al. (2022) pointed out that climate change discourse got stuck in theoretical conversation and that responsibility was a point of entry into new human community relationships. “Once people start talking about responsibility, it opens the way for new policy paradigms. Climate change at its root was a transformation of the relationship between human beings and the rest of life on the planet” (Bang et al., 2022, p. 151). Lastly, in doing all this, EJE revitalized the commons which represented the cultural and natural systems maintained without cost in a community (Bowers, 2006). Humans were already in relationship with each other. In some communities, EJE identified these relationships as constructing either a culture of domination or a sustainable culture. Martusewicz et al. (2015) listed six elements of EJE:

1. Foundational cultural assumptions alive in modern thinking undermine life sustaining local and global ecosystems.
2. The culture of domination unjustly withholds worthiness from people of color, poor, women, and non-human life by upholding the idea that these groups are inferior.
3. Modernist thinking on a global scale, consumption and commodification has facilitated exploitation of the southern hemisphere by the north.
4. There exists an interdependent relationship among humans, non-humans, air, water, land with whom we share a finite planet. Recognizing cultural and environmental commons in our relationships can lead to mutual benefit.
5. Earth democracy is the idea that those affected by decisions ought to be the ones making them or the refutation of paternalism. The commons are an ideal arrangement.
6. Pedagogy and curriculum emphasizing cultural analysis and community learning will facilitate identification and remediation of local social and ecological exploitation.

During this study, I aimed to illuminate number four: interdependent relationships. Education was a location of cultural production (Arum et al., 2011). Culture could either create the conditions for domination of people and places or for interdependence. EcoJustice Education addressed our common ecological crisis and drew on community relationships that already existed to create a culture that acts sustainably.

### *Critique of EcoJustice Education*

Indigenous scholar Sandy Grande (2015) critiqued Bowers' claims that EJE was a means to disrupt the continued exploitation of people and places by critically deconstructing the cultural patterns that empower those actions. Grande (2015) agreed with Bowers' contention that revolutionary critical pedagogies maintained an anthropocentric worldview. Sustainable use and democratic management of resources have still been viewing ecosystems as a human resource with "no inherent worth or subjectivity" (p. 115). She added, however, that Bowers' focused on deconstructing symbolic formations, however, he still overlooked how Western Thinkers privileged written language. Bowers omitted the meanings of non-textual symbols present in ceremony, dance, and songs. Grande (2015) stated, "the question regarding the homogenizing effects of critical literacy reemerges, Indigenous cultures have been navigating the impact of such forces since the time of contact" (p. 116) and such Indigenous people were experts in cultural critique. Grande (2015) pointed out that the continued depiction of Indigenous knowledge as traditional, implicitly assuming a static nature avoided the vital issue of tribal sovereignty. She asserted that Native people were changed by modernity and that Indigenous knowledge evolved (Grande, 2015).

Grande (2015) agreed that critical pedagogies were poised to "sort through the underlying power manipulations of colonialist forces" (p. 117). She listed five structures of colonialist consciousness. One, the belief that change was progress, measured by material gain. This coupled limitless growth and technological growth as inevitable. Two, separation of faith and reason. This separateness granted preeminent authority solely to empirical ways of knowing that was "objective" and certified "experts" solve problems. These were absent of culture and technology was neutral. Three, the universe was secular, impersonal, mechanistic, material, and

relativistic. The universe did not relate to humans nor any spiritual divinity. Divine attributes were viewed as primitive. Fourth, individualism grew from the Cartesian idea of self as a knowing social unit. Self-actualizing pursuits, self-governance, and self-determined health were noble pursuits. Fifth, the “belief in human beings as separate from and superior to the rest of nature” (Grande, 2015, p. 99). Dominion over nature was affirmed by secular practices and undergirds other modern dualisms: man/cosmos, subjective/objective, and body/soul. In schools, these manifested as independence, achievement focus, rational humanism, disconnected local and personal knowledge, and isolation from nature (Grande, 2015).

She called for a widening of Bowers’ criteria for EJE, an animation of the more-than-human world, and reciprocal human relationships (Grande, 2015). Martusewicz et al. (2015) addressed Grande’s critiques in a chapter “Learning from Indigenous Communities.” Their response clarified respectful intent and openness to traditional ecological knowledge that avoids appropriation. I acknowledge Grande’s critique. In the past, I fell into the cultural thinking patterns she critiqued, and these were affirmed by the education institutions I attended. Grande’s work invited me to continue my own internal interrogation, to reconstitute my personal relationship with place, and foster collective relationships in school communities.

### ***EcoJustice Education and I***

On optimistic days, I thought EJE implemented well could be transformative for students, on a small scale, and, on a large scale, society overall. However, EJE is just as likely as all other pedagogies to reproduce systems of oppression. It was essential to honor the embodied experiences and intergenerational expertise of Indigenous, Black, Latinx, and all people of color. Decolonized and explicit antiracist practice with EJE was essential. I hesitated to embark on a study with EJE for the following reasons: EJE’s emphasis on dualities led me to judge all matter

of classroom ecosystems as either right (leading to sustainable culture) or wrong (culture of domination). The moral high ground was as equally intoxicating as domination, and I often wondered if they were different. While I agreed sustainable culture was a worthy aim, there was simply no possible way for me as a researcher to know the multitude of ways to get there. As a secondary teacher, my students constantly surprised me with their creative solutions that pushed beyond established environmental problem solving. I wanted to show up in inquiry with an equally open mind. Setting aside duality made space for multimodal being and communication.

As I read and applied EJE to my own curriculum development and thought processes, my thoughts lingered in all the ways the humans were doomed. Apocalyptic questions arose in my head: Will my nieces survive the next 50 years? Will the social conditions become so toxic that I retreat to the woods to live out my life? Will peace ever exist? How will I survive in the Western U. S. when water becomes even more scarce? I recalled the violent future worlds created by Paulo Bacigalupi or the sterile, technological worlds of Ray Bradberry. These were heavy, heartbreaking, smothering thoughts. From here, it was difficult to disentangle from the familiar pull to depression. I could not dwell in EJE for the duration of a study; my heart could not bare it. Alternatively, Rumi graced the first page of *Fields of Green* (McKenzie et al., 2009, p. vii) and captured my goal:

Out beyond ideas

Of wrongdoing and rightdoing

There is a field.

I'll meet you there.

(Rumi as cited in, McKenzie et al., 2009, p. vii)



When I read this the first time, goosebumps covered my body. My stomach dropped and I felt time and space bend. I acknowledged linguistic lessons of EJE to identify the words that constructed systems of domination first in culture, then codified in policies, and finally affirmed in practices. The words that built toxic worlds. I saw them, I felt them, I learned from them, and then I released them to play. Portals opened to the renewal of ecological relationships.

### **Ecological Education**

Environmental education was established and has existed in a variety of manifestations (Gonzalez-Gaudiano & Buenfil-Burgos, 2009; McKenzie et al., 2009). EcoJustice Education added an explicitly critical framework to the environmental education to identify hierarchical thinking as it undergirded oppression. Next, EJE aimed to dismantle diverse systems of domination and revitalize the commons (Bowers, 2006; Martusewicz et al., 2015). Each of these were recombination from the other and all were valuable to reconnect people to the places they resided in a variety of ways. Next, I described ecological education which widened the lens with which we saw relationships in education settings. Lastly, place-based education sought to ground interdisciplinary education in places where schools existed to make learning immediately perceptible and inseparable from life beyond the school building (Demarest, 2015; Sobel, 2005).

Caduto (1998) defined ecological education as a “dynamic, organic, interactive process, requiring a vital environment, diverse surroundings, and enriching life experiences” (p. 11). Caduto also highlighted the importance of relevant context for students to learn about the natural and built environment. For Caduto (1998), the portal to travel beyond ecological precarity was through relationships, “the healing, cannot be found by using more force. It can only come about through a metamorphosis in our relationship with the plants, animals, other people, and all

creation” (Caduto, 1998, p. 15). Importantly, Caduto aligned with Cajete’s call for healing relationships among human life and all life on Earth.

Moroye (2007) proposed a slightly different version of ecological education, “by ‘ecological’ I mean situations, ideas, and issues that address the inescapable embeddedness between and among humans and the natural environment including issues of care, decision-making, sustainability, and global equity” (Moroye, 2007, p. 209). In her dissertation, she highlighted connectivity between teachers’ ecomindedness and intended curriculum. Moroye and Ingman (2013) created an entry point into ecomindedness with vignettes and interview excerpts. Three qualities emerged: ecological care, interconnectedness, and ecological integrity. By recognizing these in a public-school classroom setting, Moroye (2007) moved ecological education from the periphery of education to the center and opened up possibilities for ecological education to also be studied in the operational and received curriculums. “Ecological education seeks to explore the interconnectedness of human interactions with the natural environment, as well as with other human beings in a variety of countries and cultures” (Moroye, 2007, p. 2). Additionally, ecological education was experienced aesthetically and in the present moment. The educational future required attention to the present time to curate experiences that stoke future growth and engagement (McConnell-Moroye & Uhrmacher, 2018). Ecological education contained the vital work of ecological relationships without recreating hierarchy or right/wrong judgment. There was room for interactions in diverse and unique communities across education settings.

Pugh et al. (2019) agreed that human and nature relationships were reflective of human activities in the present time. They stated, “expanding the possible forms of nature--culture relations in learning environments is necessary to better engage young people in learning about

complex socio-ecological systems responsive to twenty-first century demands in just and sustainable ways” (p. 426). Indigenous folks referenced throughout this proposal saw this as essential to remediate education from its colonial roots. Carefully considering identity, culture, and epistemic activity, further how those were conceptualized and designed in learning environments were part of remediation. Pugh et al. (2019) elevated the knowledge generating ability of an Indigenous method of walking, reading, and storying the land. Indigenous education was not the same as ecological education, however, I learned with a multitude of related ways of being. Ecological education was a way in which the continuity among life, individuals within communities, and culture could all coexist. Moroye’s (2007) relocation of ecological education from the periphery to the center of a typical K12 classroom offered a place from which ecological education could expand. Ecological education had transformative and healing potential. For this study, ecocriticism allowed me to see ecological relationships clearly and to foster mutually sustaining relations among life in an education setting.

### **Place-Based Education**

Human environments have evolved over time to reflect societal relationships to place and people. Place is considered the physical setting that held human activities. Space is how and what happened within the physical places. Though they have been two distinct terms, they are sometimes interchangeable and indistinguishable from each other (Tuan, 1977). Place exists in the absence of humans but can also be known and understood with human experiences. Place was filled with meaning through human experience (Semken et al., 2017; Tuan, 1977). Place was socially and culturally constructed with and onto a physical landscape (Semken et al., 2017). Places evolved over time and were living entities (Tuan, 1977).

Place-based education reconceptualizes environmental education in a broad form,

[Place-based education] teaches about both the natural and built environments. The history, folk culture, social problems, economics, and aesthetics of the community and its environment are all on the agenda. In fact, one of the core objectives is to look at how landscape, community infrastructure, watersheds, and cultural traditions interact and shape each other. (Sobel, 2005, p. 9)

School campuses are seeded in place and in its space hosted a unique mixing of culture, ecology, and interactions among residents. Place held evolving and multidimensional relationships. Demarest (2015) expanded from Sobel (2005) by orienting education around local investigations with personal connection at the foundation. Demarest (2015) invites teachers to ask these four progressive questions that could shape local investigations. To build personal connections for learning: “How can I better relate school to my students’ life experiences?” To deepen understandings of place and content: “How can I help students better understand how the big ideas works in the real world?” To foster holistic, interdisciplinary understanding of place: “How can I help students better understand place?” Lastly, to incorporate civic participation: “How can I help students better understand themselves and their possible futures?” (Demarest, 2015, p. 43). Local inquiry projects were proposed by the teacher and the findings a path to learning was determined by students’ curiosity. Place was integrated at every step of learning. Place was text from which students learned and became co-creating community members. Human, more-than-human life, stories, geography, history, current events, music, art, and the landscape were all teachers along with the students themselves (Demarest, 2015).

Place-based education practices are oriented towards sustainable and socially just futures (Bowers, 1995; Demarest, 2015; Martusewicz et al., 2015; Sobel, 2005) or diverse expressions of place identity (Williams & Vaske, 2003). Some scholars implemented critical pedagogies of

place (Flynn et al., 2009; Gruenewald, 2003). EcoJustice Education combined a place-based pedagogy with the pedagogy of responsibility and interrogated the culture of domination, beginning with human relationship with the more-than-human life on Earth.

### **Rationale for using Place-Based Education Practices in This Study**

I described Environmental Education, EcoJustice Education, Ecological Education, and Place-Based Education briefly. Among them all, I sought teachers who implemented PBE to any level, had any amount PBE training, and/or went outside the school building regularly to participate in this inquiry. There was considerable overlap between ecological education and PBE. Both were rooted in a unique local context and explicitly aimed for relationships among people, more-than-human life, and the surrounding community. There was room for culture, inquiry, and all forms of knowing in both. Place-based Education (PBE), like ecological education, contained the opportunity to cultivate relationships without recreating hierarchical relationships. While ecological education has been happening in schools, it has remained an emerging pedagogy in U.S. public education. Place-based Education (PBE) was established and I hypothesized there were teachers doing PBE in suburban schools. Some PBE educators may have explicit, school-wide efforts to implement interdisciplinary methods. Some teachers, like my own practice, implemented PBE without external policy.

All this considered, I recruited teachers who engaged with PBE to any extent in their classroom, meaning they connected across content areas with local contexts, and/or have participated in any level of PBE training and/or regularly went outside of the school building with their students. Place-based Education PBE was established and flexible for including relationships among living communities and practitioners may already incorporate ecological precarity and/or reparation into curriculum.

## Summary

Postmodern ecology posited that “the environment is made up of other communicators, so that it ‘talks back,’ the relationship between organism and the environment may be described as a ‘conversation’” (White, 1998, p. 10). In other words, the surrounding ecological setting and the more-than-human life can teach me. My connoisseurship allowed me to perceive the ecological and educational simultaneously. My idea of taking ecological precarity seriously was to release established ecological analysis and use emergent observations with ecocriticism. Further, I and all living things are on a continuum of evolution. The coming together and dissolution of traits are shaped by ecological relationships. Then it follows, as a living being, free on the surface of the earth that I also create interdependent relationships as the knowledge was stored in my, and our, collective, ancestral lineage. Education, like ecosystems themselves, have constantly been evolving and changing forms. The relationships and evolution already exists. The question is: what form did they take in school settings? Within the sphere of PBE, I inquired about relationships among life, human life, place in a suburban school, and how those relationships were expressed in curriculum.

## CHAPTER III

### METHODOLOGY

The Rocky Mountain cordillera extends from the U.S. and Mexico border in the south through Canada in north. The mountains were a consistent presence during this inquiry. While I drove across the Denver Metro area between study sites, they were visible in my vehicle mirrors or out the windows. When I walked around the schools during ecological, spatial indexing, they were omnipresent. Snow capped at the top and skirted in green. Meanwhile, my feet were grounded in the Great Plains. The Earth rumbled with vehicle travel or mechanized land transformation equipment, and life. Prairie dogs held strong in their pocket communities between the highways or in the few remaining areas without human habitat. Less than four percent of prairie dog habitat remains intact in the U.S. Living interactions between the mountains and plains are endlessly interesting. For many terrestrial species, this area is geographic boundary that inhibits movement. For others, navigating the area was part of annual migrations by air, for birds, or by land, for elk. Ecological and educational boundaries were present or permeable throughout this study. Which invites the question, what does place and life at the continental border teach us about schools, about teachers, about life?

#### **Introduction**

During this dissertation inquiry, a postmodern ecology research framework endeavored to foster healing ecological relationships among life (Oppermann, 2022). Within this framework,

educational criticism and connoisseurship (EdCrit) was used to orient me towards a laudatory critique to improve education (Eisner, 2017) by illuminating relationships among life, place, and curriculum. While “critical” sometimes has a negative connotation, it also means essential, valuable, or important (Eisner, 2017; Frankenberg & Ayscue, 2013; Littledyke, 1996). I used ecocriticism to filter my naturalistic observations through an ecological lens to foreground ecological relationships and expressions of more-than-human life (Moroye, 2007) in the curriculum. I recruited four teachers from suburban schools to participate in this inquiry. The four teachers taught in three public schools. Ecological observations occurred before or after each classroom observation to invite more-than-human residents into conversation with the human community (Pugh et al., 2019). This inquiry endeavored to answer the following two questions:

- Q1     What relationships exist among life, human life, and place in school communities?
- Q2     How are those relationships expressed in the school curriculum?

### **Organization of Chapter III**

Chapter III summarizes the research methodology. First, I start by explaining the theoretical framework, postmodern ecology. Second, I discuss educational criticism and connoisseurship (EdCrit) and ecocriticism as a lens for observations. I used this combination of methods to put educational research in conversation with the larger ecological community. My expertise allowed me to see both the ecological and educational situations at the same time, thus, this dissertation blended education and ecological methods. Third, I describe the region where this study took place, at the boundary between the Rocky Mountains and the North American Great Plains. Denver is a large metropolitan area surrounded by expanding suburban and exurban communities. I share brief histories of the two suburbs, Prairie Heights and Bear Hills, where all



four participating teachers worked, two teachers in each suburban community. Chapter IV describes the schools in further detail. Fourth, the data collection procedures with an introduction to the participants. Fifth, I discuss the data analysis methods for each of the study questions. I close Chapter III with trustworthiness in EdCrit and my researcher positionality.

## **Research Methodology**

### **Theoretical framework: Postmodern Ecology**

A postmodern framework participated in the decomposition of habituated cultural patterns so that researchers can see them anew and reconstitute the world. Bogdan (1990) called for a defamiliarization process they call *ostranenie*, “the making strange of reality in order to create it anew” (as cited in Crotty, 2015, p. 190). In part, postmodernism was an adversarial position to modernism which proposed a narrow view of knowing and being in the world, explained as wholeness or universality (Crotty, 2015). Rationality created a world that must be separated to be known and technology is a primary means of problem solving (Martusewicz et al., 2015; White, 1998). Postmodernism takes the position that there were multiple truths and multiple ways of being (Crotty, 2015; Glesne, 2016). The postmodern framework aligns with Eisner’s (2017) commitment to pluralism in education research and the process of making familiar educational situations strange. Postmodernism in this study defamiliarized and decomposed (Neimanis & McLauchlan, 2022) such that relationships among life can be reconstituted with a renewed understanding. For this study, I was primarily concerned with relationships among living communities where schools existed.

Postmodern ecology rejected master narratives associated with modernity and aimed to reposition humans as cohabitators and co-evolving beings in time and place. The world, from this view, is reciprocal. Human thought and actions constructed life and life shaped human

thought and action (White, 1998). Further, postmodern ecology sought to decompose dualisms and dominionism that ultimately gave rise to the social and ecological crisis, so that humans and their relationships are created anew (Maltby, 2008; Oppermann, 2022; White, 1998). Postmodern ecology explicitly aimed to describe situations as they are and highlight points of restoration, healing, and interdependent thriving.

Early postmodern ecology thinkers were interested cybernetic networks as analogy for ecosystems and humans evolving to cyborgs that were posthuman and post mechanistic (White, 1998). They played with binaries and challenged their existence. The dissolution of the boundary between human and machine was a parallel exploration to poking holes in the boundaries between human and more than human along with natural phenomenon (Keller, 2005). My dissertation inquiry addressed relationships among living ecosystems in suburban schools. Postmodern ecologists represent networks by any number of material or imaginary connections: rhizomes, maps, cybernetics, meshwork, or webs (Deleuze & Guattari, 2021; Haraway, 1988; Tarter, 1996; White, 1998). At the boundary between the Rocky Mountains and North American Great Plains, water is a significant mountain shaping force as water erodes the mountains into the plains. In the Denver Metro, water is scarce, and water moves across the landscape through a network of rivers, human constructed catchments, and ponds. For this inquiry, I used water networks to represent connectivity among life and place.

Ecological viewpoints expressed in story, or education settings, “in some sense help restore our connection to the earth” (Oppermann, 2022, p. 230). This was analogous to Cajete’s (2002) call to attend to the relationships with the more than human world in school settings. Restored connection manifested in postmodern ecology was realized in this study through linguistic playfulness (Oppermann, 2022). Play is multidimensional, “at once structured and

unstructured, orderly and dynamic, logical and illogical, intellectual and emotional--so that becomes a good simulation for the idea of ecology” (White, 1998, p. 223). Ecology can be everything all at once, situated in complex entanglements (Barad, 2014; Brown et al., 2020). Movement between dualism and wholeness was evolution, oscillation, and playfulness referred to that movement in space, time, and living systems of all scales or species. Barad (2014) states,

Diffraction is not a set pattern, but rather an iterative (re)configuring of patterns of differentiating-entangling. As such there is no moving beyond, not leaving the “old” behind. There is not absolute boundary between here-now and there-then. There is nothing that is new; there is nothing that is not new. (p. 168)

While there exists a dazzling diversity of life, so too are diverse researchers who bring themselves to inquiries (Keller, 2003). For this research, postmodern ecology fostered a process of defamiliarization, strange-making, and play. I foregrounded our entanglements and the relationships that existed among life. The telling of the educational situation was shaped by what was present and alive for the participants.

### **Educational Criticism and Connoisseurship**

Educational Criticism and Connoisseurship (EdCrit) was a qualitative research methodology conceptualized by Eliot Eisner whose work established qualitative research as a rigorous and useful way to make sense of educational settings. Eisner used the word inquiry in lieu of research. He posited that inquiry, “reveal[s] not only the quality of the classrooms and schools, but also the process of teaching; teaching is a form of qualitative inquiry” (Eisner, 2017, p. 6). In my view, inquiry connotated a process of asking questions and seeking answers with pluralistic means. Multiple ways of knowing and being were critical for collective understanding of the world we shared (Eisner, 2017; Martusewicz et al., 2015; Nxumalo et al., 2022).

Education criticism and connoisseurship (EdCrit) occurs in two parts: connoisseurship and criticism. Connoisseurship “is a private act in which to some degree we all engage. It entails the skills of using one’s senses to apprehend a present experience and of making fine-grained distinctions” (Uhrmacher et al., 2017, p. 1). We are all connoisseurs of something that allows us to see and appreciate unique distinctions. Researchers bring their embodied and accumulated experiences to their inquiry that act as a unique, expert lens through which they described and interpreted observations (Eisner, 2017). My expertise was seeing the ecological and educational realm simultaneously. Criticism, the second part of EdCrit, “is the disclosure of what we learned through our connoisseurship” (Uhrmacher et al., 2017, p. 2). Eisner was concerned with research methods that improved schooling. Criticism “does not impose an obligation to make derogatory comments. Criticism can be laudatory. Its aim is to illuminate a situation or object so that it can be seen or appreciated. We appreciate virtues as well as vices” (Eisner, 2017, p. 7). During this inquiry, I illuminated relational moments among residents and how those relationships were expressed in intentional and operational curriculums.

Educational criticism and connoisseurship (EdCrit) is effective in this inquiry process because education contains abundant relationships: time, space, personal, community, geological, and economic for example. Some relationships will be foregrounded in the research analysis. I will look for what relationships are alive for the participating teachers to guide foregrounding or backgrounding. Relationships are often entangled in overlapped and distinctions among them can be blurry (Barad, 2014). This fluidity invited initially parallel but ultimately blended streams of thought. One thread, my perception of ecological relationships in a place as told through teachers and curricular experiences. Then the second thread, those same

ecological observations shaped how I shared those relationships and created narratives about the educational situations.

### *Ecocriticism*

Moroye (2007) developed eco-educational criticism within EdCrit to filter her observations and interpretations through an ecological lens. The method is now called ecocriticism. Ecology means, “situations, ideals, and issues that address the inescapable embeddedness between and among human and the natural environment” (Moroye, 2007, p. 50). For Moroye (2007), ecological included care, decision making, sustainability, and global equity. In her study, the ecocritical lens revealed educational and ecological themes operationalized in the public-school setting by ecologically minded teachers (Moroye, 2007; Uhrmacher et al., 2017). Further, she moved ecological education from the periphery to the center of public-school classrooms.

Consistent with the artistic roots of EdCrit, ecocriticism in literature is concerned with the relationship between literature and the environment. Cultural analysis attended to an ecologically oriented moral and political stances (Garrard, 2011). Ecocritics are poised to notice representations of the more-than-human world in education settings, extended ecological vocabulary into educational settings, and looked for the ecological significance of curriculum or lack thereof (Uhrmacher et al., 2017). Kerridge (1998) states, “ecocriticism seeks to evaluate texts and ideas in terms of their coherence and usefulness as responses to environmental crisis” (as cited in Garrard, 2011, p. 4). Postmodern ecology aims for a positive critique and reparation of ecological harm. One of the ways this was possible was exploring the nature of relationships and networks as they evolve, “at the borders of the humanities and the new postmodern biological sciences can disentangle it from our systems of basic presuppositions” (Garrard, 2011,

p. 204). For example, I remember during spring 2020, time was measured in emptied toothpaste tubes and prescription refills instead of an alarm clock and my daily commute. Subsequently, my routine priorities dissolved and were reconstructed anew. A crisis need not happen to notice entangled relationships. During this study, ecocriticism illuminated relationships among living residents of a suburban school communities and their expressions in the curriculum.

### *Ecocriticism with Postmodern Ecology*

During this inquiry, foregrounded overlapping social and ecological relationships that exist and to document how those relationships were expressed in curriculum. At the outset of the study, I worried that children learned, and teachers affirmed human separation from the natural world in public schools. At the same time, I knew this was not an absolute. I also suspected that teachers in a variety of content areas were invested in renewing relationships instead of separating humans from all life. Our common ecological precarity offer the opportunity to reconstitute relationships between and among people, place, and life (Cajete, 2002; Martusewicz et al., 2015; Shiva, 2005/2015). For this inquiry, I aligned with the positive critique in postmodern ecology which compliments the laudatory goals of ecocriticism. I asked these two study questions for the dissertation:

- Q1     What relationships exist among life, human life, and place in school communities?
- Q2     How are those relationships expressed in the school curriculum?

So far, in Chapter III, I summarized postmodern ecological framework, EdCrit, and ecocriticism in the preceding sections. The following describes the Denver Metro, the suburban communities where the research took place, and lastly, the research methodology. I start with a bigger picture to connect the present with the past as well as to show that our present relationship to place is one iteration of many. First, I describe geological process that gave rise to the current

geological arrangement at the boundary between the Rocky Mountains and the North American Great Plains. Then, I summarize the data collection, participant recruitment, and data analysis methodology.

### **The Place: The Colorado Front Range**

The Denver Metro exists at the edge of the Great Plains and the Rocky Mountains. While the study physically took place with feet grounded on the plains, the mountains were always in sight. Sometimes the mountains were scarcely visible through the clouds or pollution, sometimes I was up close. On a geological timescale, the mountains have been raised, eroded, and lifted again four times by tectonic forces below Earth's surface. Frozen water flowed in glaciers that shaped the mountains. The work of the Arkansas, South Platte, and Colorado Rivers gave the mountains their appearance in present day (Abbott & Cook, 2012). The Front Range is littered with fossilized remains of dinosaurs. The current mountains formed while the Colorado land mass was at the equator and experiencing an ice-age. They were exposed during a period of erosion that began 5 million years ago. During the Pleistocene, the Front Range climate oscillated which produced extensive icesheets, that receded, then formed, then receded again (Abbott & Cook, 2012).

Utes, Cheyenne, and Arapaho called the area known as Colorado home for more than 12 thousand years. Ute bands (Moghwachi, Tabeguache, and Uncompahgre) lived in and around the Front Range since Creation and will live there into perpetuity. The placenames, plants, and animals throughout the Front Range are culturally significant and meaningful connections to place (O'Meara, 2022). European settlement "created lasting and profound effects for the Indigenous people of the area, it is secondary, and less important part of their history. More

important, were the lifeways and histories that preceded Euro-American settlement for the 12,000 years prior” (O’Meara, 2022, p. 47).

Europeans arrived about 500 years ago. They encountered Utes, Camanches, Pawnees, Apaches, Cheyennes, and Arapahoes. The tribes interacted and traded with Spanish, French, and Mexican governments for centuries (O’Meara, 2022). The 1800s dramatically changed human life and more-than-human life in the region. The Louisiana Purchase of 1803 ended French influence followed by the Mexican independence from Spain in 1821 that changed relationships among people and places. The Colorado area was ruled by the Mexican government until the Treaty of Guadalupe Hidalgo in 1848 which put the area under U. S. jurisdiction. The gold rush led to a major influx of European settlers. The City of Golden, where I live, was founded in 1859 and was the informal capital 1862-1867. Punitive military campaigns and policies towards Native groups made European settlement possible. The initial treaties were the foundational documents that facilitated Indigenous land loss. Nine treaties remain pertinent to Colorado: Treaty of Abiquiu, Treaty of Fort Laramie, Treaty of Fort Atkinson, Treaty of Fort Wise, Conejos Treaty, Treaty of Little Arkansas, Treaty of Medicine Lodge, Treaty of the Utes, and Fort Laramie Treaty (O’Meara, 2022). Future partnerships could explore the relationship among place, schools, and Indigenous groups.

### **Two Suburbs in the Denver Metro**

Next, I briefly describe the two suburbs where this inquiry took place. I did not live in either suburb where the study took place. During the inquiry, I did live in Golden, Colorado, which is a suburban, bedroom community for the Denver Metro. In the past, I lived suburbs in several states: Connecticut, California, Michigan, Tennessee, and North Carolina. The two suburbs where this study took place have different histories that shaped present-day relationships



among community residents. I named and described the Denver Metro at a large scale because the interaction between the mountains and plains are a prominent component to place throughout the region. The mountains themselves were visible throughout every observation to some degree. In efforts to protect privacy of participants (Glesne, 2016), I used participant selected fictitious names, or pseudonyms, for people and created placenames for where they worked and/or lived.

### ***Prairie Heights***

Prairie Heights was founded in the late 1800s but stayed similar in size for about 60 years (City website withheld for privacy). The post-World War II suburban development occurred like many other places. The suburb expanded dramatically from the 1950s through the 1970s (Brooke, 2015). During the 1980s, the city annexed remaining land between suburbs and Military Bases. The annexation of the surrounding land where the Plains School presently sits was in 1961 (City website withheld for privacy). Prairie Heights was described as a traditional suburban development. The area was added onto the pre-existing city at the edge. The automobile facilitated early development (Brooke, 2015) with drive-in motels, shopping, and entertainment along major roads (City website withheld for privacy). Since then, the city has added large shopping centers, diverse housing developments, and a wide variety of restaurants reflective of diverse communities that live in Prairie Heights. In the time that I have lived in the Denver Metro, I witnessed prairie dogs thriving at the edges of suburbs be replaced with survey stakes, and then human habitats constructed on top of the vast networked communities. Mr. Pink and Elizabeth worked at the Plains School in Prairie Heights.

### ***Bear Hills***

Settlers defied the Fort Laramie Treaty when they sought gold and lived in Bear Hills. The Bear Hills Company was formed in the mid 1800s to supply settlers during the golden rush.

Gold was discovered in the area, west of the town. Irrigation ditches and a church were constructed by the mid 1800s. Bear Hills was incorporated in the late 1800s when the population exceeded 3,000 people, then Colorado became a state in 1876. Education institutions were built the following year and remained an integral part of the community. Health and recreation shaped early construction along with the discovery of tungsten, gold, and oil. There was a strong Klux Klan (KKK) presence in the area and the community was hostile towards Black, Indigenous, and Latino people. Post-World War II brought an influx of immigrants to the community who over time shifted to more progressive leanings. A 2% development rate was enacted to maintain the natural beauty of the area, which remains in place today (Local Museum website withheld for privacy). The policy profoundly shapes housing availability and cost throughout the Bear Hills and outlying communities, including Oso Creek. Steve worked at Foothill High School in Bear Hills. Sloane worked at Pine High School in Oso Creek, a community in the same Windy district that is contiguous with Bear Hills.

### **Data Collection Methods**

In the next section I explain the data collection procedures broadly and then provide more detail about how the data answers each study question. Following the Data Collection sections, I describe Data Analysis methods including annotations and memoing, participants, trustworthiness, researcher positionality, and limitations of this inquiry.

To answer the two study questions, I began within a postmodernism framework and filtered my observations through an ecocriticism lens (Moroye, 2007; Uhrmacher et al., 2017). “To illuminate a situation or object so that it can be seen or appreciated” (Eisner, 2017, p. 7). There was overlap in data sources for Research Questions 1 and 2. The first question was broad

to include ecological relations among life and place. The second question narrowed to focus on how living relationships were expressed and operationalized in curriculum (Table 2).

**Table 2**

*Research Questions, Data Sources, and Analysis*

Research Questions	Data Sources	Data Analysis Methods
Q1 What relationships exist among life, human life, and place in school communities?	Spatial indexing in and around the school, initial interviews with teachers, participant observations during school, historical and geographical landscape changes, spatial indexing, and researcher journal.	I used a two-column method of journaling and recording field notes. I used cyclical annotations and memos throughout the research process. I recorded and transcribed interviews. I used ecocriticism to richly describe, interpret meaning, evaluate qualities, and discern themes about living relationships.
Q2 How are those relationships expressed in the school curriculum?	Participant observations (four per teacher participant), pre/post interviews with teachers about intentions and reflection on how the lessons operationalized those intentions (Appendix A, and curriculum artifacts	I used a two-column method of journaling and recording field notes. I used cyclical annotations and memos throughout the research process. I recorded and transcribed interviews. I used ecocriticism to richly describe, interpret meaning, evaluate qualities, and discern themes about living relationships.

*Note.* Research questions are listed with data sources and analysis methods. The analysis methods are similar for each question; however, they are different as the first question looks at the community overall and the second focuses on the relationship's expression in the intended and operational curriculum. I used the initial interview, classroom observations, and pre/post observation interviews more prominently to answer the second research question.

Eisner uses the word “seeing” to refer to all sensory experiences that arise during inquiry. Epistemic seeing is awareness along with the context in which the is seeded within a larger setting (Eisner, 2017). The suburban communities where the three schools existed each had a unique historical and founding context. I reviewed each city and local history museum websites for each community and summarized the findings in Chapter IV as part of the description.

### **Research Question 1**

Q1 What relationships exist among life, human life, and place in school communities?

I observed the area surrounding the school and conducted historical research about land use changes to describe the suburban school (Eisner, 2017; Tuck & McKenzie, 2015). I conducted walking ecological surveys on the school grounds with spatial indexing which “broadly refers to any time we notice something in our spatial field, and it alludes to something else on temporally, spatially, or relationally dynamic scales” (Pugh et al., 2019 p. 428). Movement around and outside of the building was observed along with plant and animal life. For each school community I kept a list of the relationships I observed and their expression in the participating teachers’ curriculum. I annotated these records for emergent patterns.

At the outset of the inquiry, I conducted full-day observations in an effort to unsettle anthropocentric temporal routines in the school setting. I wanted to observe the school from outside the building from sunrise to sunset. However, principals did not approve this part of the research project. Instead of a full-day observation, I walked around the school either before or after each participant observation in classrooms for at least a half an hour. All three school properties had public trails that traveled around the entire or most of the schools’ perimeter. The proximity to the school properties allowed me to observe movements of living things in and around the schools. I did complete a 2-hour observation at the Plains School on a day when

Parent-Teacher Conferences happened. On other days, I walked around the block on the ditch trail that extends for seventy miles through the Denver Metro and then briefly through a neighborhood next to the school. In the case of the Foothill High School, the trails went between the Middle and High Schools. The trail system traversed throughout the neighborhood, school, and the community recreation center. Pine High School was next to a busy street on one side and neighbored an extensive trail system. There were also multiple athletic fields and a track stadium. All three schools had public parks and trails immediately next to the school campus.

## **Research Question 2**

Q2 How are those relationships expressed in the school curriculum?

I used EdCrit to capture expressions of life and human life relationships with a four-step process (description, interpretation, evaluation, and thematic; Uhrmacher et al., 2017). As an ecocritic, I paid particular attention to the expression of relationships among the living world in the intended and operational curriculum (Moroye, 2007; Uhrmacher et al., 2017).

Four teachers were central to the study. The initial interview was semi-structured (Appendix A). In the dissertation proposal, I stated that the first interview would be a walking interview or in location that the teacher felt a strong relationship with at the school (Tuck & McKenzie, 2015). However, teachers were content to remain in their classrooms, so we did. Sloane was interviewed remotely while she was on a professional development trip in Yellowstone National Park; we used the google meets. All initial interviews were recorded and transcribed with Otter.ai. I did not record participant observations to comply with the districts' conditions that no students be recorded.

To illuminate the intentional and operational curriculum, relatively brief interviews occurred before and after participant observations in the classroom or over email. Analogous to

Moroye (2007) who clarified teacher intentions by asking about teachers' curricular intentions and following the observation, I asked teachers about how the intent was realized. The limited time between classes made pre/post interviews difficult. I sent the same questions to teachers over email and they replied most of the time. I planned for a series of four observations that would happen sequentially to work with one participating teacher before observing the next teacher. I aimed to fully immerse myself in the community. Time constraints and prolific testing, particularly after Spring Break, made this aspiration difficult. Mr. Pink and Steve were observed successively in January, February, and March. I was sick in mid-February for 3 weeks which further condensed observation times. Sloane and Elizabeth were both observed in March and April.

Participant observations took place in the classrooms of participating teachers and included their daily activities like being in the hallway for passing period or before school. All participating teachers taught multiple classes in their content area. I observed all their classes at some point over the four observations to document a breadth of curriculum and, simply, because most of them wanted me to. I documented observations in a bound, paper notebook with written description and/or drawings on alternating pages to leave space for annotations, emulating the two column observations as described by Uhrmacher et al. (2017):

Eisner suggests using two-column observation technique in which the left column is filled with observations and details and the right column contains the researcher's interpretations of them. The notes allow the researcher's ideas to coalesce around themes and significant qualities of the situation. (p. 26)

Ecocriticism, the two-column method makes a place in the notebook for cyclical annotations that reveal relationships among life in the suburban school. Photographs were taken for inclusion in the description of place and curriculum expressions.

### **Participant Recruitment and Selection**

I began recruiting participants for this study by leaning into my connections with fellow alumni from a place-based education graduate program, Teton Science School. Many graduates worked in organizations with explicit place-based education goals or, like me, included place-based practice in their curriculum to embed state standards in a local and regional context. I contacted alumni through an established social media group and listserv. I also posted the recruitment letter to the Colorado Alliance for Environmental Education listserv.

After I made connections, I used a snowball method to recruit teachers that had similar place-based practices (Glesne, 2016). I sought participants who went outside with students, had attended place-based education trainings, or was engaged in similar practices that included non-human life. These practices included but were not limited to inviting ecological relationships into curriculum, going outdoors with students, and teaching interdisciplinary lessons (Demarest, 2015). I was open to all teacher identities. I sought secondary educators, grade 6 to 12 who taught in suburban schools in the Denver Metro and outlying areas.

### ***Participant Recruitment and Selection Realized***

Recruitment took more time than I expected. Neither of the Teton Science School Alumni or Colorado Alliance for Environmental Education communications resulted in the recruitment of participants. I received a message from someone I attended graduate school with and one local elementary teacher. My colleague taught 90 miles away in a rural, mountain district. Neither

person met my study criteria. Through my part-time work, I asked a Windy District administrator about who and what schools may be interested in participating and met the study criteria. They directed me to the district research office. I applied to conduct research in the Windy District and was approved. At the time of study, the district was in the process of evaluating what curriculum opportunities existed for students PreK to 12th grade to learn about sustainability. My research questions were complementary to the aims of the evaluation.

The Windy District paired me with a district sponsor who posted the call for participants in secondary principal newsletters. She shared the opportunity district wide on an internal science teacher Schoology group and advertised the research in regularly scheduled professional development. I received an email from a robotics teacher whom I used to work with. They did some biomimicry modeling, we exchanged emails, then they stopped responding to emails. When no participants resulted from the newsletters and Schoology group, I emailed nearly every middle and high school principal in the district. I prioritized principals with doctorates; I thought they might be sympathetic to the recruitment process. I followed up each email with a phone call 1 week later if I had not received a response. Principals said they forwarded the email to their staff or mentioned it in staff meetings. They informed me that no one was interested in participating. One high school principal at Foothill High School in the Windy District was an enthusiastic supporter of dissertation projects. She invited me to present at a department chair meeting and a whole school staff meeting. I connected with Steve through this process who was nominated by his peers. He accepted a flier, then emailed me later that day. I exchanged emails with another science teacher at the school who also eventually stopped corresponding. Lastly, I emailed my partner's climbing partner who worked at a different Windy District high school. They connected me with Sloane at the Pine School who participated.



While I emailed and called principals in the Windy District, I also emailed and texted people and places where I used to work. Although two people were interested in participating in one district where I used to work, I settled a discrimination lawsuit with the district in 2022 and I was reluctant to conduct research there. I also contacted a student teacher I supervised in 2022 who was a middle school Social Studies teacher. They wanted to participate, met the study criteria, and identified as Indigenous. I completed an application to conduct research in the district and it was not approved. I contacted two Plains School teachers who I knew went outside with their students and incorporated living things in their curriculum. One teacher declined and Mr. Pink accepted participation. When I asked who else could be interested, he recommended I contact Elizabeth who also participated in this study. Participants agreed to participate in the study and signed the Consent to Participate form (Appendix B).

### *Indigenous Perspectives*

When I read Tuck and McKenzie (2015), I heard a call for Indigenous perspectives to be included in place research. For two reasons, first, to move the origination of place relationships beyond European settlement and worldview. Which lead to the second, including Indigenous folks in research can undo some erasure of Indigenous people from the current landscape. I contacted the Center for Native American and Indigenous Studies in Boulder requesting an interview to respectfully share Indigenous relationships particular to the Front Range. I offered 3 hours of volunteering and cash in exchange for an interview with an Indigenous community member. The organization did not respond to inquiry. I also contacted the History Museum in Golden who had recently completed an ethnography and ethnobotany study with Ute, Cheyenne, and Arapaho community members. They forwarded my inquiry to the primary researcher, who did not reply.

### *Introduction to the Teacher Participants*

Four teachers participated in the research inquiry. To protect their privacy, participants selected fictitious names, or pseudonyms, and I omitted identifying descriptions. I also used pseudonyms for placenames: schools, districts, communities, trails, creeks, and omitted identifying place descriptions (Glesne, 2016). Three high school science teachers (Steve, Elizabeth, and Sloane) and one middle school social studies teacher (Mr. Pink; Table 3). Steve and Sloane worked in the Windy District at two neighborhood public schools (Foothill High School and Pine High School, respectively). Mr. Pink and Elizabeth worked at the Plains School, which was a non-profit, public charter school in the Grasslands District.

**Table 3**

#### *Participants' Demographic Information*

Name	Age	Gender Identity	Ethnicity	Race	Highest Education	Class	Anything else?
Mr. Pink	50	Male	Celtic American	White	Master's Teaching	Lower Upper class	Family pride
Steve	56	Male	Caucasian	White	Master's Science Education Doctorate Ecology	Upper Middle class	Athlete
Elizabeth	36	Female	Declined to answer	Declined to answer	Master's Science Education	Working class	Colorado resident for 16 years
Sloane	50	Female	Non-Hispanic	White	Master's Science Education	Middle class	No

None of the participating teachers had attended place-based education training. They met other criteria because they included ecological relationships into curriculum, more-than-human

life in curriculum, went outdoors with students, and/or taught interdisciplinary lessons. All participants taught in suburban schools in the Denver Metro and outlying areas. More detailed descriptions of participants with the schools and communities where they taught are included in Chapter IV.

### **Data Analysis**

Educational criticism and connoisseurship (EdCrit) analysis occurred in four dimensions (description, interpretation, evaluation, and thematics). Rich description provided evidence for interpretations and the description contextualized results for credibility. Uhrmacher et al. (2017) explains “description is a detailed, particularized and purposeful account of participants’ social actions” and “Its aim is not simply to depict, but to evoke images and to give the reader a visceral sense of places, people, and situations” (p. 39). For this inquiry, I described the ecological relationships that existed in the school community broadly. I described each teacher’s classroom situation including the intended curriculum and operational curriculum.

Corresponding to description, interpretation was “the application of concepts, often through the use of analyses and metaphor, in ways that foreground relationships, patterns, or reasons for events and situations at hand (one’s data). Interpretation was a search for meaning and a way of seeing” (Uhrmacher et al., 2017, p. 41). Additionally, ecocriticism built written descriptions with ecological imagery and language so ecological patterns came into focus (Moroye, 2007).

Relationships were varied, overlapped, and interacted at many levels simultaneously. I highlighted the expressions of relationships that were apparent and alive for the community members involved in the educational situation.

The next two dimensions were evaluation and thematics. Evaluation assessed the value of the educational situation for those involved and for education broadly (Uhrmacher et al., 2017).

The prefigured foci for the evaluation process were my interest in relationships among life that co-habitat and co-create suburban school situations. Next, I remained open to emergent foci to let situations teach and guide my observations of those relationships in the intended and operational curriculum. Thematics were the “articulate patterns, big ideas, and anticipatory frameworks for other educational situations. The themes distill the major ideas that run through general educational matters and provide, not a guidance or prediction, but understanding broader educational contexts” (Uhrmacher et al., 2017, p. 54). In essence, thematics summarized the inquiry and offered learnings from this situation to other educational settings (Eisner, 2017; Moroye, 2007). Total time spent during interviews, participant observations, and curriculum materials analyzed were summarized (Table 5).

For ecological, spatial indexing, I described behavior or interactions with place and other life. I made a list of bird species I observed on each visit. There were some species of birds that were observed at all the schools (for example, Canada Geese and Corvids). I did not identify plants because deciduous trees and annual forbs did not have leaves or flowers at the time of this study which made plant identification difficult. The most common plant was Kentucky Bluegrass, grown for lawns. I included observations about plants as birds or other animals interacted with them. After each participant observation, I wrote a full description of the experience both in and outside the school building. Then, I went back to my notes and the experience to annotate.

### **Annotations and Memoing**

Qualitative methods utilize coding as a method to distill data into meaningful themes. A code is “most often a word or a short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data”

(Saldaña, 2016, p. 4). Coding methods are diverse and fit a variety of qualitative methods. Annotations were used to remain consistent with EdCrit methodology. Uhrmacher et al. (2017) invited arts and humanities methods into qualitative research, which call for coding methods that explored multiple ways to discern meaning. Poetry, for example, was annotated with an eye for tone, voice, speaker, imagery, and so on; these braid together to shape meaning with those engaged with the poem (Uhrmacher et al., 2017). Similarly, ecologists recognize that individuals within an ecosystem are inextricably bound to other organisms and the community overall. Briefly, parts of systems are inseparable from the whole. Annotation offered a way to see the parts and the whole simultaneously.

I used cyclical coding to continuously review and confirm emerging themes (Eisner, 2017; Saldaña, 2016). To answer the study questions, I coded participating teachers' interviews individually and then explored global, pattern-finding, and cross-checking annotations as the interpretation and evaluation process occurred (Uhrmacher et al., 2017). Each teacher's interview and observations were coded individually. When prominent themes emerged for one teacher, I cycled back to other participants to see if the pattern was present for other participants (Saldaña, 2016). Themes arose from data collected from curriculum artifacts, interviews, participant observations, and spatial indexing ecological observations. Themes then were synthesized and shared. In Chapter IV, I used Eisner's (1992) ecology of schooling with Wright's (2018) addition of place to organize the description of the educational situations I observed.

### **Trustworthiness**

Educational criticism does not aim to give rise to one truth, only to capture embodied experiences in education and share them with others. There exists a multiplicity of ways to know, be, and share with other people that largely relies on judgement or discernment (Eisner,

2017). For these reasons, educational criticism required deliberate means of achieving validity: structural corroboration, consensual validation, and referential adequacy. In the following paragraphs I define each process and its form during this dissertation.

Structural corroboration looked “for recurrent behaviors or actions, those theme-like features of a situation that inspire confidence that the events interpreted and appraised are not aberrant or exceptional, but rather characteristics of the situation” (Eisner, 2017, p. 110).

Analogous to triangulation, I evaluated multiple artifacts to see emerging patterns. Participating teachers engaged with an initial interview and then relatively brief interviews before and after observations. Participant observations were collected along with curriculum materials. I coded all the curriculum materials and used an ecocritical lens to foreground expressions of more-than-human life and the relationship among life. I coded each teacher’s interviews and curriculum materials individually and then compared across teachers.

Consensual validation was the second educational criticism tool for validation.

“Consensual validation is, at base, agreement among competent others that the description, interpretation, evaluation, and thematics of an educational situation are right” (Eisner, 2017, p. 112). This can be achieved first through structural corroboration and, in some cases, followed with a second educational critic who studied at the same school (Eisner, 2017). Given the dissertation was an individual endeavor, this was achieved through ongoing dialogue with participants to obtain consent that the story was reported authentically. After I completed four observations with each teacher, I sent them my summaries and asked for confirmation that what I reported was accurate. Educational critics also offered their criticism to readers and researchers for conversational fodder and ongoing research for accumulating evidence to support or reject the critic’s storytelling (Eisner, 2017). I discussed my observations and emerging themes with

colleagues and Dr. Christy McConnell, my dissertation advisor. Consensual validation occurred throughout the study during teacher interviews with participant observations. The post-interview question asked participants about something I observed and what it meant to them. Then I connected the meaning to a component of their interview. For example, “I noticed that when you were teaching, you repeat what students say back to them and then ask a question to extend their thinking. What do you think that means to the students and for their learning?” I also sent the full written descriptions and emergent themes to the participants for their feedback. Participant provided feedback via email or in conversation.

Referential adequacy extended from educational criticism’s aim to illuminate subject matter. “Criticism is referentially accurate to the extent to which a reader is able to locate in its subject matter the qualities the critic addresses and the meaning he or she ascribes to them” (Eisner, 2017, p. 114). The researcher aims to communicate findings to the audience such that readers may create a vivid image of the educational situation. Further, readers were shown a perspective they may have missed without the assistance of the critic (Eisner, 2017). At the outset of this dissertation, I imagined ecological and education experts may be interested in the findings. While the dissertation evolved for dissemination beyond committee members, I strived for authenticity in representing findings most applicable to audiences.

### **The Researcher**

Holmes (2020) suggested that researchers disclose their positioning about three areas: the subject of investigation, research participants and, lastly, the context and process of research. The subject of investigation, relationships between and among life in school settings, is one I care deeply about. I came to education as a third career after I was a field researcher interested in ecological studies of rare, endangered, and endemic species throughout Colorado. I have always

felt connected with the more-than-human world, and this drove my inquiry. As a secondary science educator, I was transparent with students about my vision that education could foster sustainable human communities. With few exceptions, students matched my enthusiasm about learning within and about an ecological context.

Second, I viewed participants in this research as partners that were invaluable to the success of our education system. I had a deep respect for teachers' craft as individuals and collectively. I aimed to demonstrate this respect by fostering a mutually beneficial relationship during the project. My relationship with the science process fluctuated during my adult life. Upon graduation with a Bachelor's in Ecology and Environmental Biology, I was skeptical if my field would lead to the conservation of biodiversity or sustainable relationships among life on Earth. I experienced the darkest depression of my life at that time. I viewed quantitative science as reductive because it took highly complex, interdependent relationships to a few numbers on a page. All over the planet scientists measured species declines and documented extinctions. To me, the negative trending charts were inadequate to describe the loss of a species or what was at stake as they passed. My partner studied the three remaining Po-ouli living on the Hawaiian Islands--likely all males. As an undergraduate student, I studied the Uncompahgre Fritillary Butterfly. The federally listed endangered species lived in 11 known locations in the world, all on Colorado's high peaks. One colony moved up the mountain side where it may inevitably run out of livable habitat. In ecology, grief was constant and there was not a remedy on the horizon. Instead of becoming mired in grief, I aspired to lean into the restorative power of grief. This is not to say that quantitative ecological research is not valuable, but to say that it cannot be the only way to know or be in relationships with life. In my current view, qualitative science brought



nuance and renewal into our ecological understanding along with capturing the human relational dynamics. Dare I say qualitative methods made room for healing?

### **Limitations**

There were limitations to this study. The temporal constraints of the dissertation format narrowed my sampling to four participants in three school locations. I worked two part-time jobs while I completed the dissertation. I was a Garden Educator/Curriculum Writer and Student Teacher Supervisor. Time was in short supply. It took me longer to connect with and recruit participants (see Table 4). I conducted observations in the winter and early spring. Teachers said they went outside with students in the Fall. I was able to observe one of the four teachers interacting with students and life outside the classroom. I focused only on suburban schools and included three different suburban schools. However, three of the four teachers identified as white and middle class or higher. While this may be representative of teaching overall which remained an overwhelming white profession at the time of this study, the sample did not include of diverse racial, gender identities, and economic backgrounds that exist throughout the teaching profession. I hoped this is the first iteration of exploring living relationships in school settings in diverse contexts. Adding similar research in urban, rural, and more suburban environments would provide a robust picture of living relationships in school communities. Finally, a single inquirer would inevitably produce a narrow view. For future projects, I would seek interdisciplinary connoisseurs with whom collaboration would reveal insights into relationships in schools.



Table 4 (continued)

Task	2022										2023			
	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Writing Preliminary Reports														
Planning final document										x				
Draft Dissertation														
Revisions														
Dissertation Defense														

*Note.* Dissertation timeline with intent to defend dissertation in June 2023. The “x” indicated the proposed start of that activity.

Shading indicated the actual timeline. Darker shade of grey in literature showed ongoing reading and times of deliberate review

responding to emerging patterns. The darkest shade of grey marked proposal and dissertation defenses.

## Summary

This dissertation inquiry used a postmodern ecology framework to combine qualitative educational research methods and ecological spatial indexing method in an ecocriticism. The inquiry was a non-experimental, naturalistic study that aimed to illuminate the dynamic, evolving relationship among humans and more-than-human life. The dissertation took place during a time of ecological precarity, and I was optimistic that this transdisciplinary inquiry put ecological and social sciences in dialogue to reveal opportunities for renewal of relationships between human life and all life.

## CHAPTER IV

### MORE-THAN-HUMAN LIFE IDENTIFIED CLASSROOM PATTERNS

#### **Organization of Chapter IV**

Chapter IV describes the educational situations where this inquiry took place.

Educational connoisseurship and criticism (EdCrit) occur in four steps: description, interpretation, evaluation, and thematics. In this chapter, rich description provides evidence and interpretations to respond to the research questions. These will grow into the evaluation and thematics in Chapter V. Description contextualized results for credibility, “Its aim is not simply to depict, but to evoke images and to give the reader a visceral sense of places, people, and situations” (Uhrmacher et al., 2017, p. 39). My hopes are that the descriptions provide the reader with an understanding of the educational situation to answer the study questions:

- Q1    What relationships exist among life, human life, and place in school communities?
- Q2    How are those relationships expressed in the school curriculum?

In efforts to actualize an ecocentric epistemology within a postmodern ecological framework, an ecological vignette opens each participating teachers’ description. I explicitly aimed to include more-than-human life as a part of the school’s ecology to play with hierarchical relationships among human and more-than-human life. Further, while I conducted spatial indexing surveys at each school, I observed a situation that drew my attention to a structure or a relationship that I was able to perceive in the school setting as well. The schools were described in connection with the participating teacher for the most local place description. This pairing

illuminated connections to place, intentions, and operational curriculum. When I interviewed participants about relationships, I noticed their intentions were intertwined with relationships. Thus, each participant description begins with their definitions and observations of relationships in their contexts. Next, Eisner's ecology of schooling dimensions organized educational situation descriptions. I begin with the place dimension as defined by Wright (2018), the structural and then curricular dimensions (Eisner, 1992).

### **Introduction**

Eisner's ecology of schooling sets out a schema with which education researchers can see schools as comprehensive systems. Eisner's aim is to improve schools and argues that reforming school in isolated parts is inadequate. If changes occur, they will be "temporary and superficial" (Eisner, 1992, p. 621). Education reformers and researchers must examine schools ecologically to enact significant reforms. Eisner (1992) states, "reform will require attention to each of these dimensions" (p. 621). With the ecology of schooling, we can see the parts and the whole of the school system simultaneously along with how the dimensions relate to each other. In this study I combined ecological and educational research methods in a postmodern ecological framework. I accept that human life is in relationship with all life of Earth. Life relates in evolving, unpredictable, expected, and unique ways. Eisner's ecology of schooling is best suited to structure the data analysis.

The introduction of Chapter IV defines relationships, the place dimension (Wright, 2018), the structural dimension, and the curricular dimension (Eisner, 1992). I start each teacher description with their definition of relationships because it observed that how they conceptualized relationships, influenced classroom activities. Then, I proceed to the place dimension because I observed that place was foundational to participants' teaching practices and

relationships with the community. The data collected in this study support Wright's (2018) addition of place to Eisner's ecology of schooling. The teacher descriptions that follow move through the same schema as the introduction (relationships, place, structure, and curricular dimension) with observations from the classrooms and interviews.

### **On Relationships**

The term relationship holds diverse meanings. My ecological schooling and teaching classified relationships as certain types of interaction: competition, mutualism, symbiosis, commensalism, predation, and parasitism. These were movements or exchanges of energy and matter among life. Relationships also exist among biosphere, geosphere, atmosphere, and hydrosphere. While ecological definitions are established, educational scholars referenced relationship and expressed the need to value relationships and did not explicitly define the term. Little research describes or clearly define teacher definitions of relationships in the school environment nor how they manifest in teacher practice. Further, how teachers express relationships among life in their curriculum. Thus, I add teacher relationships in their own words to show how their definitions manifested in their practices.

Greenwood (2009) states, "whether we are conscious of it or not, environmental and cultural education is happening to all of us, all the time" (p. 276). I agree, ecological relationships surround and sustain human life. Curriculum throughout an education experience, PreK to 12th grade, introduced children to those ecological relationships consciously or not. "The science of ecology is about studying the relationship and interactions between different parts of the system, and the interactions between systems" (Greenwood, 2009, p. 276).

Consequently, when I used the ecology of schooling, I also clarified how teachers solidify (or not) relationships across dimensions. For example, ecologically minded educators in

public school settings blended ecological education into their curriculum (Moroye, 2007). There were many relationships at work simultaneously in the school situations that I will describe. I defined relationship as an exchange of matter or energy between or among life that may take the form of eating, decomposition, care, investment, or neglect; all possibilities to list only a few. I assumed that ecological and educational relationships were ubiquitous among life and in schools were connected among those relationships. Relationships are inescapable.

### **The Place Dimension**

Wright (2018) added the place dimension to Eisner's ecology of schooling, because, by definition, an ecological system of any scale happens in a place. "Eco" etymologically descended from *oikos*, meaning house. She states, "ecology is significant because it is rooted *somewhere*--the places which these sites are located in and of themselves are unique and un-replicable, however transcendent the curriculum taking place in that location might be" (Wright, 2018, p. 47). In her dissertation, the participants each had different reasons to move to that place and how they included place in their teaching (Wright, 2018). For my inquiry, one of the three participation criteria for this study was that the teacher included local ecological, economic, social contexts or living things in the curriculum. All participating teachers met this criterion and included place in their unique contents. In addition to teacher descriptions, I included ecological observations from spatial indexing on and around the schoolyard. Place in this case, was an expansive view of the place, all life, and the relationships that existed among them.

I lead with the place dimension because place was the context within which the ecology of the school was nested. A place's physical form shapes who live in the area and what relationships exist that may be integrated into the schooling broadly, and curriculum specifically. We would not plan a marine biology experiment with students living in Colorado or great plains



experiment in the East coast pine barrens for example. Demarest (2015) wrote, “the breadth of ways in which we can understand a place is enhanced by this idea that places hold stories.” I observe that the teachers were co-creating stories with their students, colleagues, and place. All participating teachers included more-than-human life in images, materials, as study subjects, or as entire units of study. Some life was local, as in from the school grounds, and some were from other continents. At each study site, the schools’ immediate surroundings were used by the three science teachers during the fall season or more. The two teachers at the Plains school integrated culture, religion, and familial community which they described as important. This indicated that the teachers were aware of the uniqueness of their community relationships and responded by including their place explicitly in the curriculum. For the reasons described above, I endeavor to support the notion that place is an essential dimension to be included in Eisner’s ecology of schooling (Wright, 2018).

### **The Structural Dimension**

Eisner (1992) defines the structural dimension of school as, “aspects of schooling pertain to the ways in which we have organized subjects, time, and roles” (p. 622). Secondary schools were typically organized in department, this was true in all study sites. In title and scheduling, the sciences or social studies or art, for example, were bounded to parts the school day. Roles of teacher and student were established and maintained through routines. Teacher as knower and student as learner. Eisner (1992) invited educators to not be limited by these roles and to see them as impermanent. Herein lies a connection between the ecological and the educational. Teachers may create a path for learning to follow, like water catchments followed predicted water flow patterns. Water flow and learning may not always follow the expected path. A torrential downpour will lay waste to an engineered system, or a hail event will poke holes in

plants on their way to melting into soils. Fluid and evolving relationships among life makes a space for roles to also shift and change. Energy, like information, flows in predictable and unpredictable ways. Ingman (2013) pointed out the way that education can be a linear life trajectory, as connected to past and future. Education experiences can also be “unpredictable and circuitous” (p. 397). Inflexible roles are rare in life, why then do humans insist on static roles or structures for educational settings?

The Denver Metro is at the boundary between the Rocky Mountains and the North American Great Plains. This is the fourth iteration of Rocky Mountains (Abbott & Cook, 2012). Over vast amounts of time, the region has been inland seas, dinosaur habitat, and continues to be home for Indigenous people, the Ute, Cheyenne, and Arapaho (O’Meara, 2022). There are many familiar species that live in the Denver Metro that are under researched at the western extent of the range, Fox Squirrels, American Robin, and House Finches (Geluso, 2004; Kaufman, 1996). Further, species that thrive in suburban and commercial landscaping environments are also under studied. Some, like Canada Geese, are considered pests because their populations have boomed in the last 50 years and whose numbers are likely still increasing. American Robin population growth was also unknown. The Robin, however, is not considered a pest (Elphick et al., 2001; Kaufman, 1996;). Perhaps a function of its poop being small and thus going unnoticed unlike goose poop which is voluminous, abundant, and slippery. While life at the continental border changed in interesting ways, the area, and suburban environments surrounding the Denver Metro, were under researched ecologically and in educational settings.

Dynamic change at the continental scale and city scale happened simultaneously. There was also movement across the continental boundary. From January to April, elk move from their winter ranges in the plains to the foothills where they dine on golf course lawns and public lands

on their way to spend their summer in the mountains. Birds migrated in April and May traveling within Colorado elevational gradients or some birds traveled across hemispheres. Highway 70, that transects Denver, connects human life from Pennsylvania to California. Human life regularly travels from the Denver Metro to the mountain towns for recreation. So, the continental boundary is permeable and not rigid.

At the ecological scale, suburban life in the Denver Metro was shaped by water flows and catchments. Stormwater wetlands are common in suburban ecosystems. The wetlands were habitat for a variety of birds depending on its structure. Stormwater catchments were typically planned as the first-order run-off treatment from road, parking lots, lawns originating effluent during rainstorms (Sparling et al., 2007). Also, they serve to move or store water to prevent flooding. Ideally, water catchments were designed with consideration of shape, depth, proximity to grassland, native or ornamental plants. Pocket and strip marshes (strip is a narrow area with wetland vegetation) were better for nesting bird success (Sparling et al., 2007).

All three study sites had water flows, catchments, and/or flood mitigation structures that contacted the school boundaries. At the Plains School a public ditch trail would absorb water from southwest Denver suburbs during floods. The ditch was dry during every visit. However, I did observe equisetum, a hydrophilic plant, indicating that the area held water over the summer. There was also a water catchment pond in the backyard of the Plains School. At the time of the study, it was frozen with a red shopping cart in the center. Foothill High School neighbored a public park with lakes, cattails, and lawn landscaping. Pine High School was next to a large, public, open space and creek complex that channeled a creek through suburban subdivisions and small farms for several miles. Following the presence of water in and around the schools, the science teachers, Steve, Sloane, and Elizabeth, utilized the wetland areas as study sites each in

unique ways. Further, all the teachers, as a criterion for participation, were interdisciplinary in their delivery of content. The boundary between the school and the community was permeable for all participants which gave rise to relationships among place, human life, and all life that lived in and around the school properties.

### **The Curricular Dimension**

School curriculum, as shaped by the ecological and educational structures, is of the utmost importance. Curriculum affects the likelihood that that something will be learned.

Decisions about curriculum can be made about several of its features. Among the most important are those about the content that is to be provided, about the kind of activities that are to be used to help students experience that content, and the way in which the curriculum itself is to be organized. (Eisner, 1992, p. 622)

Teacher intentions to include a specific content further increases the chance that something will be learned. The absence of content or subject matter, the null curriculum, decreases the chances something will be learned (Eisner, 1992).

Ecological and environmental content is often relegated to the null curriculum and seen as one more burdensome thing to add to an already full curriculum, especially at the secondary level (Jardine, 2000; Navin, 2021). This reduces opportunities for older children to learn about the ecology that surrounds and sustains them. It also communicates that ecology, the very systems that support all life on Earth including humans, were relatively unimportant. The very opposite educational reaction that our ecological precariousness warrants. That said, this elevates the importance of the intentional and complementary curriculum that includes ecological concepts and a is force in shaping educational experiences (Moroye, 2007). I included teachers' intentions in their curricular dimension because it informed the operational curriculum. During

the first few observations as an ecritic, I noticed that the ecological surroundings, the place, was also present in the curricular dimension. On the outside of the building, water catchments played an important role in moving water in and around the Denver Metro. Water is stored for times of drought and during torrential rains, water catchments move water away from people and properties. Life similarly follows the water sources and catchments in the Denver Metro. Thus, within the curricular dimension, I organized by flows, constructed and free-flowing, and cycles. Steve articulated how schools behaved like ecosystems and used the words flow and cycle. He confirmed the ecological pattern existed both outside and inside the school building. I carried this ecological terminology through each participant description to the interpretation, evaluation, and themes.

In the introductory section of Chapter IV, three dimensions of the ecology of school were defined, place, structure, and curricular (Eisner, 1992; Wright, 2018). The dimensions serve as the schema for the following descriptions of the educational situations for the participating teachers. The study sites each had unique ecological relationships that expressed themselves in curriculum. The themes of flow and cycles emerged from ecological and classroom observations with the first two participants, these became pre-figured foci for the final two participants. For each teacher I shared their definition of relationships because it informed their depictions of life. Next, I described how flow and cycles existed in their practices and their unique combination created their classroom situation. Curricular themes expressed by individual teachers are discussed in this chapter and the significance of the themes will be outlined in further detail in Chapter V.

## Participant Descriptions

For each participant, the school where they work will be described including the physical setting, population demographics, programs offered at the school, and general curriculum intentions published on the school websites. I spent a total of 21.25 hours in teachers' classroom and 14 hours spatial indexing outside the school buildings. Curriculum materials collected and analyzed are listed in (Table 5). Teacher descriptions are listed in order of observation throughout this chapter to show the accumulation of knowledge over the study. I observed two teachers at the Plains School, Mr. Pink and Elizabeth, but I did not observe them in succession. Thus, the order of descriptions in Chapter IV is Mr. Pink, Steve, Elizabeth, and Sloane.

**Table 5**

*Summary of Data Collection*

Participant	School, District	Interview time	Participant Observations	Curriculum materials collected and analyzed	Spatial Indexing
Mr. Pink	Plains School, Mountain District	50 minutes (pre/post over email)	4 (5 hours)	Textbook chapter, class handouts, videos, and the daily agenda slide	4 (5 hours)
Steve	Foothill High School, Windy District	70 minutes (some pre/post over email)	4 (5.75 hours)	Genetics Slideshow, student research project titles, project self-assessment questions, Serengeti Rules book	4 (3 hours)
Elizabeth	Plains School, Mountain District	45 minutes (pre/post over email)	4 (5.5 hours)	Virus images, evolution slide show, posters, evolution video	5 (2.5 hours)
Sloane	Pine School, Windy District	60 minutes (pre/post over email)	4 (5 hours)	Worksheets, slideshow, pictures of the classroom, human evolution video	4 (3.5 hours)

*Note.* Some of the pre/post observation interviews were conducted via email to respond to time constraints during the teacher's workday.

I think it is important to acknowledge that seasonal timing played a role in what I observed. All the teachers said that they planned and completed outdoor experiences during the Fall season. I gained access to sites and recruited my first participant in January. The spring semester in secondary schools, especially high school was full of state and academic tests. Students took International Baccalaureate (IB), Pre-IB, Advanced Placement (AP), Scholastic Aptitude Test (SAT), and American College Testing (ACT) exams. Balancing my own work schedule and teacher schedules limited what I could observe in the classrooms. I initially planned to work with one teacher at a time. As my dissertation timeline condensed, I overlapped working with the teachers (Table 6).

Ecological vignettes from spatial indexing open each teacher description. Each vignette was selected from among the observations because they taught me something about the school situation. Next, I describe the school and include observations from spatial indexing throughout the descriptions. Then, I describe the participating teacher and how they define relationships. I include definitions of relationships with their personal descriptions because I observed that teachers' views of relationships mediated their interactions with their students and how they represented life in the curriculum. Within ecological systems and, in turn, the ecology of schooling, relationships are mediating forces in communities. Lastly, I describe educational situations with three dimensions of the ecology of schooling: place, structure, and curriculum dimensions.

**Table 6***Participant Interview and Observation Schedule*

Teacher participant	School	Interview Date	Observation			
			One	Two	Three	Four
Mr. Pink	Plains School	January 20	January 23	January 31	February 1	February 9
Steve	Foothill High School	February 13 and March 2	March 2	March 13	March 15	March 22
Elizabeth	Plains School	March 7	March 27	April 5	April 6	April 17
Sloane	Pine High School	March 9	March 16 (outdoors)	April 20	April 25	April 26

*Note.* All interviews and observations took place during Winter and early spring between January 20 and April 28, 2023. There was some overlap between participants due to time constraints, spring breaks, participants or I got sick, and testing schedules at each school. I was able to conduct one outdoor lesson observation. Sloane invited a bird expert to take the students birding around the school campus and the neighboring creek.

### **The Plains School**

During this opening vignette, I share how a raven taught me something about boundaries. A raven walked on the ground in the ditch trail. The raven's tail swished back and forth, leaving a wispy track in the snow between its footprints. When they noticed me, they squawked, and flew up to the black fence. The bird's flight drew my eye to the cameras on tall poles that pointed along the fence and towards the school. Animals did not adhere to the human constructed boundary. Rabbit, cat, mouse, dogs, and fox squirrel tracks revealed frequent movement under the fence. The paths and tracks were easily identified in the snow. They indicated movement across the permeable barrier. The black fence likely prevented most humans from moving on and off the school property. Two gates were locked during the school day and over the weekend.



Cameras surveilled and documented activities. Human beings were the only life adhering to the boundary they built. I learned that more-than-human life moved across and disobeyed the human constructed barriers.

The Plains School has an impressive, arching, entrance with white columns. People enter the auditorium through the arch to a half-circular foyer. The main office is to the right of the archway connected with a curved, two-story brick façade with tall windows. Plains School is a non-profit, public charter. The school opened with sixth and seventh grade only. They added grades over time and increased to about a thousand students (Table 7).

**Table 7**

*The Plains School Student Demographic Data*

Race	Percentage of Student Population
Black	42
Hispanic/Latinx	40
White	15
Asian or Pacific Islander	2
Two or more races	1
Native American	1
Students from low-income families	81

*Note.* Demographic data was accessible on the school's website.

According to the website, the Plains School serves diverse communities and instills enthusiasm for Science, Technology, Engineering, Arts, and Math (STEAM). Students can participate in a handful of sports in middle and high school. I worked at the Plains School for 3 years as a Secondary Science teacher. I taught seventh grade life science and AP Environmental

Science. I sometimes felt strange returning to the school for this inquiry. However, it was good to see past colleagues and talk about their growing children and successes since my departure. There had been many investments into the building and the teachers reported that life was good at the Plains School. They were all optimistic and expressed care for students, leadership, and teacher peers. The community itself was near the suburban expansion fringe. While working and commuting to the school, I watched as prairie dogs, hawks, and coyotes gave way to flags, construction equipment, and then biocides that made room for a human habitat which was also a place for Canada Geese and Corvids to thrive. The following vignette introduced Geese and Corvids that were common at all the schoolyards.

The geese were present during the entire two-hour observation. When I arrived at the backyard, the geese were all still in the shade sitting, some with their heads tucked behind wings. They remain this way until a raven walked through the group and pecked one of the geese then continued walking. Some geese stood and honked loudly, what I perceived as annoyance or perhaps they admonished the bird. One goose flew away. Within ten minutes, the group of twenty geese walked around and ate grass. They continued in this state while I walked around the backyard for two hours. I heard the grass shred as the geese ripped and tore the grass from the ground. They lifted their heads and watched when I got within ten feet of the group or when a dog ran down the ditch trail on the other side of the fence. A red, heart-shaped, mylar balloon rose from a neighboring apartment complex. Its wobble reminded me of swooping geese and corvid tails as they walked. The ravens' tails left curved wisps in fresh snow.

As the sun hit the treetops, corvids stirred and announced their waking, then flew to other trees or the ground. Two jumped from the tree immediately into play, rolling, dipping, and sped around the school building, then along the apartment complex. I heard them calling after they

disappeared behind the houses. One Raven landed directly in front of me. They took a few steps, their tail swooped back and forth. They quickened their pace and jumped with two legs down the edge of the turf. They were so close! I marveled at the depression their feet left on the turf and how they tilted their head, blinked their eyes, appraised me. A few more hops and their attention shifted to a chip bag, frozen on the ground. They tilted their head, pecked it once, and then flew away. The corvids consistently called back and forth. One, “caw, caw, caw,” then 5 or more answer back, “caw, caw, caw.” The conversation was ongoing.

### **Mr. Pink**

Mr. Pink greeted every child that walked through his door no matter the time or reason they entered. If Pink was not in his classroom, his favorite place was in the hallway where middle and high school students converged at some point every day. I stood with Pink before school started. The time was rich in fist bumps, greetings, “how’s it going?,” “hellos,” lots of compliments, and quick conversations as students traveled to the first class of the day. Pink was a big guy. Large lungs run in his family (twice the average size!). I hypothesize his heart is also bigger than average. His positive energy radiated brighter than the white shirt he wore emblazoned with a rainbow from arm to arm. I got infected when I observed his classroom. He loved his community and loved his job. This was clear for his students too. I heard this conversation,

“Mister. Have you ever called in sick when you weren’t sick?” A student asked Mr. Pink.

He responded, “In my life, yeah, of course. Have I missed any days this year?”

Students shook their heads no.

One day, while the students worked on an assignment, he sat down near me to tie his shoe and said with a huge grin, “I like my job! Weird!” and laughed an infectious laugh. Mr.

Pink was 50 years old, used he/him/his pronouns, was Celtic American, Caucasian, and was lower-upper class. He was proud of his “crew”: his wife and three children. In the summer, Pink loved to go fossil hunting with his wife to get to know other like-minded people in Colorado. Twin daughters were both in college and were on a path to becoming teachers. One loved wrestling and earned a scholarship for college. All three of his kids attended the Plains School, one was enrolled as a freshman in high school.

### ***Mr. Pink on Relationships***

Mr. Pink’s intended to create community and he prioritized human relationships, “I think it’s imperative that I foster that love and that respect for others, for self, for our environment, that can be done through relationship building.” He showed that love with greetings, respectful heckles, living in the area, knowing the students, meeting their needs, all consistently. This matched Mr. Pink’s definition of relationship: “The sum of knowing, respecting, connecting, and bring consistent” (Table 8). Among teacher participants, Mr. Pink had the most specific definition and examples of what relationships meant to him.

While Mr. Pink shared the most detailed definition of relationships among participants, he also identified how relationships and intentions overlap. He clearly articulated intent to “foster that love and that respect for others, for self, for our environment, that can be done through relationship building.” In this statement I hear an answer to Cajete’s call for teachers to renew relationships among people and with the natural world (Cajete, 2002) because he connected human relationships to the environment. As I continue to describe the educational situation that Mr. Pink created, this stream of intent connects through his routines.

**Table 8***Mr. Pinks' Definition of Relationship*

Describing words	Definition of "relationship"
Knowing	So knowing things about your student, like who their siblings are or remembering their favorite sports team, etc.
Respecting	Second ingredient for me is that relationship is respect. As teachers we have to respect our students, especially inner-city schools, because being an inner-city boy, growing up, 'you best respect' you know, that's always that thing, but 'respect me, we're in the streets, you better respect me' and that follows, that follows these kids is it followed me into school. and I walked into middle school with a big chip on my shoulder, 'you best respect me, right'. But if it's not appropriately in the way that it should be. it is a <i>grand</i> tool to grow relationship with students.
Consistently, consistent	You must be consistently consistent. For me that is, it's one of the it's one of the things that I have kids comment to me all the time. And I never thought about it before because most of them are like, oh mister, you're funny. or You're you know, you're nice. or You're patient. The things that you hear. But a lot of fun. Like, 'I know who you are every day. You're the same person yesterday as you're going to be next week'. Pink added, I know where that comes from. It comes from being in a home where there was a lot of inconsistencies and a lot of um, parental behaviors. That are kind of hit and miss. So, for me coming in here every day. You can even be consistent with your curriculum too, because there's some there's some evidence that shows that you know, younger people especially like to know what's expected of them. You know what I mean? You can have different types of lessons but there's still the expectation can still be the same.

*Note.* Mr. Pink's definition of relationships was articulated in three words that he explained in further detail. The other participants' definitions will not be summarized in a table. Steve, Elizabeth, and Sloane each defined relationships with a statement and they did not provide further definitions in the same way as Mr. Pink.

*The Place Dimension: Global  
Connections in Prairie  
Heights*

Mr. Pink lived near the Plains school. He said the school was his “second home,” he added, “I don’t plan on going anywhere. Literally my plan, I have 14 years left, I plan to retire from here. They’re gonna have to kick me out otherwise.” He loved the community presence that came with living in the neighborhood. He regularly saw families and students when he was out and about in town. Mr. Pink said this about his decision to buy a home near the school,

I knew that I wanted to teach in the inner city. So, if I’m gonna teach in the inner city than I’m going to live in the inner city, I’m an inner-city kid. I also did it to expand my cultural awareness, we’re so culturally rich. ... Some of its selfish proximity, I have a five-minute commute which is awesome. But you know, things like community presence, awareness. I can’t go to the grocery store without seeing a kid I know or that graduated. Me and my wife went to Pho and I saw students with their parents ... I love it.

He felt and maintained a strong connection with the students and the community by living in the school community. His son regularly walked to and from school. Mr. Pink’s son was in his elective course as an eighth grader and in sixth grade social studies.

There were 38 languages spoken among the students and families at the Plains School. Many students were first- or second-generation immigrants to the U.S. from Africa and the Middle East. The families were proud of their home countries and cultures. At the Plains School, students’ attendance followed Muslim holidays and there was a room for students to pray during the school day. Many female students wore Muslim head coverings and full-length dresses with long sleeves. During one passing period, a student asked Mr. Pink if he had a safety pin for her

Hijab. He said, “yes.” She collected a pin from the cabinets unassisted and returned to her class in another room. Mr. Pink had pins for the students when they needed them.

In addition to the cultural and religious ties that spanned global place relationships, families were central to the school culture and reached across grade levels, “we have kids that are in first grade that have brothers and sisters in eleventh grade. So, it’s like this kind of long process. We’ve got kids graduating this year that have been here since kindergarten.” Families attended conferences together in groups of four to seven people, with two or more adults.

Global places were present in Mr. Pink’s classes. During my first observation, in his Geography elective class, they studied maps. In this vignette, I summarize the introduction to the lesson. Mr. Pink said,

“We are not in a two-dimensional world.” A map was “a representation of a complex and vast landscape.” A worksheet guided students to explore time zones and the correlation between longitude and time zone.

“If you were calling your cousin in the Bronx at 10am, what time is it in New York?”

“12 o’clock!,” someone shouted out.

“I knew it!” another student exclaimed. They worked through questions on their own.

They were excited to get answers correct and asked each other where certain states are.

“Where is California?” A student asked.

At first, I was surprised. Then, I remembered that most the students were first- and second-generation immigrants from all over the world. The worksheet had a world map, but only asked questions about the Northern hemisphere and most questions were about the U.S. I was glad that I had my glasses, the text was so small. I hypothesized that if the worksheet contained questions about their home countries, students would quickly locate cities and time zones.

Local place relationships were simultaneously present. The last section on the worksheet asked students to make a map of their path from home to school--a classic place-based education lesson. There was no district bus service to the Plains School. Pick-up and drop off times were busy and slow moving. Some students arrived at on the city bus in the morning and waited at the bus stop in the afternoon. This next vignette captures students' dialogue among themselves or Mr. Pink while they created the commute maps.

There were murmurs as students discussed where they live, for some, the map is a short line from areas neighboring the school. Other students didn't know where they live. Mr. Pink asks,

"Where can you find help?" Mr. Pink asked.

"Google maps," students responded.

"Mister. Can I use google earth?"

"Do your best, I don't expect perfection or every detail." He answered rapid questions. Students collected Chromebooks or took out their phones. They diligently traced a path on their papers and added street names by checking google maps. Mr. Pink circulated around the table groups.

"How would you get home if no one came to pick you up?" One student asked for him to look up their address, he did, then wrote it on a sticky note.

He walked around again and commented, "Ah, I've seen that neighborhood,"

"Add the street names to your maps,"

"Use your resources,"

"Nice!" he exclaimed when students named the main street in front of the school.

"did anyone find out they live near each other?" Mr. Pink asked.



“Yes!” the students said collectively.

“There are many students that live in my neighborhood. I can’t go anywhere without seeing students.” Mr. Pink smiled. The bell rang and students rushed out.

Mr. Pink was surprised that many students did not know their home address or how they traveled to school. He gives me a fist bump and went back out to the hallway. Later, via email, he stated that the lesson,

Gave [the students] an opportunity to think about their physical place in their community and it led to some interesting sharing of proximity, distance, and directions. It also allowed them to make connections to one another. It made the lesson personal which gave it academic weight. (Mr. Pink)

This comment reflected his definition of relationships by inviting students to get to know each other and the places where they lived. It also gave Mr. Pink the chance to build relationships with his students by inviting students to talk spontaneously amongst themselves about where they lived or how they traveled to school. These were sixth through eighth graders that got to know one another across grade levels.

The place dimension for Mr. Pink was him living in the community for a multitude of reasons. The students and families’ relationships at the school were globally and locally connected. Religion and culture were integrated into school routines. Place was represented in his classroom with local relationships like traveling to and from school.

### ***The Structural Dimension: Permeable Boundaries***

I noticed boundaries first outside the school building during two sessions of spatial indexing. The following are my synthesized observations. Ravens, Mr. Pink’s favorite animal, were abundant in the ditch trail and carried on a noisy conversation. As described in the

ecological vignette, fresh snow and animal movements across the constructed boundary around the school drew my eye to the permeability of boundaries at the Plains School.

Permeable boundaries were present in the students and in the Social Studies curriculum. Many of the students' families themselves traveled across continents and oceans to immigrate to the U.S. They both recognized that the U.S. had more opportunities and subsequently moved through national boundaries or in some cases national boundaries passed over them. Mr. Pink welcomed the global perspectives that students brought with them to his class, "[I use] connections to incorporate place in my curriculum. For example, we have a large Latino population and I happen to teach Indigenous American history. So that is a very easy way to incorporate place." He observed that students were more engaged and including their cultures gave the content significance as well. More about this in the curricular dimension section. Social Studies, as a discipline, mixed other content areas to explain life in a particular place and time. Geography, economics, agriculture, governments, culture, social conflicts, and religion were all part of Social Studies curriculum.

On February 1st, Mr. Pink invited students to research a Black History Month Hero. He chose George Washington Carver as his hero and created an example assignment for students. After showing a short video about Black History Month, he shared a portrait of George Washington Carver, a list of his contributions, and why he was a hero. The significance of George Washington Carver's contributions to agriculture cannot be overstated. He pioneered the use of cover crops in the U.S. He was unwavering in his support of Black people and poor folks in the south. He developed hundreds of commercial uses for peanuts, then traveled by cart to share the information with farmers. Mr. Pink said that Carver was "an important figure that should not be forgotten. People do not often know about him," and added, "I like to feature

scientists” to branch out beyond social studies to get a different perspective. The interdisciplinary connections made room for novel relationships to emerge.

Students attentively made portraits of Frederick Douglas, Malcom X, Mohamed Ali Tupac, Mae Jemison, Elijah Mohammad, Nelson Mandela, James Baldwin, and Vice President, Kamala Harris. The students talked at their table groups and listened to music. One table shared Takis and one student stealthily pulled one Cheetos at time from their pocket. During the class Mr. Pink and I realized that neither of us had read any of James Baldwin fiction books. On my last day of observations, I gifted Pink a copy of “If Beale Street Could Talk” and I read “Giovanni’s Room.” We learned from each other and from James Baldwin. The permeability gave rise to an emergent learning that neither of us had foreseen nor planned for.

### ***The Curricular Dimension: Emergent Teaching***

Mr. Pink was the Social Studies department chair and had been in the role 4 years. He taught eighth Grade Social Studies, with one honors section, and an elective course, Geography, for sixth, seventh, and eighth grade students. I was able to observe each of his classes. The pre-figured foci, flow and cycles, will be described followed by what made Mr. Pink unique, emergent teaching. Mr. Pink intended to create community in his classroom and human relationships were priority, “I think it’s imperative that I foster that love and that respect for others, for self, for our environment, that can be done through relationship building.” He showed that love with consistent greetings, respectful heckles, living in the area, knowing the students, and meeting their needs. He was a role model for the students and fully integrated himself into the community at school and in his life outside school by living in the community.

**Flow.** In the flow we also see the place dimension because students brought their own cultures to school and that was welcomed and reflected in the curriculum. Mr. Pink described how when he integrated the students' cultures into his lessons, they were more engaged,

Our students have such a deep love and respect for their cultures. Muslim kids, you see it.

I see it in the Latino kids, and our West African Kids. So anytime we have the opportunity to study the students' culture or religious faith, you just see participation skyrocketing. You see engagement go up. So, for me, either teaching directly to that

culture or faith or making connection to that culture or faith through that particular lesson

What Mr. Pink described was a flow of information from the community that fostered connections to the curriculum. Students were proud of who they were, and he gave them a place to bring themselves into the school. The permeability between school content and students' cultures brought relevance to prescribed Social Studies standards.

Mr. Pink himself was drawn to the busiest spot in the secondary section of the Plains School. During passing periods, he stood at the place where all students moved over the day,

Right around the corner in the main hallway, the intersection right here. If I'm not in my room, that's where I'm at. All six to twelve [students] pass through there throughout the day, at some point so it gives me an opportunity to interact with all the kids throughout the day.

This place in the school building aligns with Pink's definition of relationships in knowing students by fully embedding himself in the community by living there and he positioned himself at the physical hub of the secondary school.

**Cycles.** The curriculum at the Plains School cycles each year like most schools. As the Social Studies chair, he had some "clout where I can make decisions." He liked autonomy, "I

have a lot of autonomy. I have standards that I have to hit, right? But hitting those standards, I can do it the way that I was to.” While there were non-negotiables, like vocabulary focus and word walls in every classroom, there was flexibility from day-to-day and annually to improve. Mr. Pink was clearly passionate about Social Studies, however, “There’s only a few [standards] and they’re very vague. I don’t like the fact that we don’t teach history chronologically.” He said it was needed but, “dang, it makes things a little easier to understand when you start at the beginning point and you come to an end point.”

Every year, eighth grade honors social studies honors class participated in the Colorado National History Day (NHD) competition. This was not only an annual cycle, it was also a way for students to participate in the research process--which is often cyclical. The year this study took place, the theme was Frontiers in History: People Places, Ideas. Mr. Pink invited a NHD mentee to join the honors class, “she comes into the classroom, and she was helping the kids with their NHD program. So, writing thesis statement, doing research etc.” Three of seven NHD projects featured more-than-human life. One student group studied Jeanne Villepreux-Power, who loved octopus and developed the use of aquariums for marine biology. The students were making a slide show to print then paste on a folding poster board and discussed the background color. Another group studied, Laika, who was a stray dog and the first animal that visited space. Laika did not survive the journey and scientists invested a lot of training. Students discussed animal rights and worked on their Chromebooks. The third group was interested in Antony Van Leeuwenhoek, who contributed significantly to cell theory and the understanding of bacterial diseases. Students planned to present first to their Middle School peers at the Plains School and then at a regional Colorado for competition.

Mr. Pink's daily routine included collaborating with his colleagues and mentoring new Social Studies teachers. He also strived to show up for his students with a consistent attitude and prepared in the morning,

Consistency for me is, it's behavioral, it's built into the lessons. It's my attitude, you know, when I come to work and check email and wake up, etc. So again, knowing, respecting, connecting, and being consistent and for me, that's the culmination of a student teacher relationship.

As a teacher, Mr. Pink described how he prioritized consistency in relationships with students and his colleagues. His morning routine "gave myself the opportunity to get my own head right for the day." In the morning, people stopped by his classroom to see him on the way to their classrooms. Every morning he met with the new seventh grade Social Studies teacher, "We spend five, ten minutes just kind of going over what he's doing for the day" and any issues that come up. They became quick friends and spent time together outside of work at the Plains School. I observed that this attention to routine and consistency allowed him to be fully present and responsive to the emergent opportunities that arose in his classroom with students, mentees, and Plains School staff.

**Emergent Teaching.** Mr. Pink was fully invested in the community where he taught. This embeddedness allowed the opportunity to include beings and emergent happenings into his classroom. Three examples follow. First, Mr. Pink had a unique class pet that brought more than just his students into his classroom. Second, he was able to facilitate the care of kittens born under portable classrooms. Thirdly, he was passionate about extra-terrestrial life. In addition to a unique classroom situation, Mr. Pink expanded my perception of more-than-human life.

Among the participating teachers, Mr. Pink was the only teacher that had a class pet. Nefertiti was a tarantula who lived in a plastic box below the white board. Nefertiti lived at the focal point of the classroom, a suitable location for their namesake. Although the animal was reclusive, I looked for them every visit. Mr. Pink was one of two teachers at the Plains School with a class pet. There was an elementary teacher who had a rabbit. He told me about Nefertiti,

They are a red legged tarantula and the little tubs right there; those are just cockroaches. I chose a spider [for] super easy maintenance. They love living by themselves. They just hide out and they just live. I feed him and he's got a good life. The other reason is because the kids like to observe it. They like to watch them eat. They love to see it crawling around, I mean, it's just amazing that you know, South American animal from the jungle, you know sitting in this classroom.

When I observed Mr. Pink's class, students frequently looked in the plastic box on their way in or out of the classroom. He added, "A lot of them are like, 'oh that's gross mister,' but they're infatuated because it's just interesting." He also let me know that Nefertiti molted between my visits. I wished I saw the skin!

Kittens were born under the portable classrooms behind the school. Mr. Pink described the students coming to class concerned about the kittens outside. At first, he was confused about the "kitties outside" then found out that a stray cat had given birth. He assured the students that the kittens would be cared for, "well, we're going to call the Humane Society, they're going to take care of them. They are going to come and get them, make sure they're healthy and then they'll get people to adopt them out." The Humane Society picked up the cats and took them for medical care, just like Mr. Pink said to the students. While this was not an explicit part of the curriculum, it was an emergent or complementary opportunity for Mr. Pink to role model care

and relationships with all life. This spontaneous learning was reflected outside the classroom when I unexpectedly saw flickers drink from a tiny puddle. Here is the short vignette from my spatial indexing notes.

Two Northern Flickers stood on the sidewalk in front of me. They took turns bending and scooping water from an imperceptible dish in the sidewalk. Life drinks from the obvious places and unexpected place too.

Mr. Pink taught me in unexpected ways as well. The walls of his classroom were graced with human and more-than-human images. There were Egyptian deities and a picture of Tutankhamen's golden mask. There is an "Area-51 do not enter" poster. Next to his desk, in "his area," there is a X-Files poster, "I Want to Believe." It hung next to a cross stitch piece of a large-eyed alien and the words, "And you wonder why I never visit." I asked about the alien posters. Mr. Pink's face lit up, "they could be the most important thing to happen on Earth." He shared his questions: "are they extra-terrestrial beings? interdimensional beings? or do they live here on Earth?" Pink went to his computer and pulled up a picture of a sphere photographed over Mosul in 2016. He pointed out that the U.S. Department of Defense budget this year contains 20 billion dollars for Unidentified Aerial Phenomena (UAP). He expanded my perception of more-than-human life in school communities.

### ***Mr. Pink in Conclusion***

In closing, Mr. Pink created a unique classroom situation with his keen awareness of the place where he worked and by valuing community relationships. The place dimension of the Plains School was present as religious and cultural relationships among families. The structural dimension was permeability across borders to invite the familial and global relationships into the classroom. Additionally, across content areas by featuring scientists and geography in Social



Studies. Mr. Pink's curricular dimension integrated flows and cyclical elements to be uniquely open to emergent properties of the educational situation. He had routines that kept him in a good place and allowed him to present and adaptive to students. Over everything I just described, Mr. Pink was joyful and attentive to his students. He described what he received from his students,

I have faith in humanity when I see my students. Sometimes when I read the news, I'm like, oh my god, this world, these people. But then I come here, and I see these kids from all over the world with all different backgrounds, all kinds of religious faiths. It doesn't bother them. They aren't concerned with those things anymore. They're concerned about who they are and what their character is.

Mr. Pink was clearly fueled by students, and he reciprocated by prioritizing relationships by showing them love, living in the community, and caring for them every day. He worked to build healthy relationships among human life through his teaching (Cajete, 2002). His classroom ecology flowed and cycled. He was unique in the emergent teaching style and the opportunities he created, and he valued human relationships from living in the school community above all.

### **Foothill High School**

The following vignette shows how Spotted Towhees taught me about what boundaries offer to life. Spotted Towhees and students derived sustenance at boundaries. Fences demarcated sports fields around the school's campus. The football field was surrounded by a track. The field had large bleachers with a fence with several gates. People from the community moved in and out of the area freely. Baseball, softball, soccer, and tennis courts all were surrounded by chain linked fences. In some places the fence did not reach the ground, and, like the Plains School, animals moved across the human constructed boundaries easily. Where the base of the fence touched the ground, leaves and food wrappers collected. Spotted Towhees lived in the

neighborhood. During my final observation, Spotted Towhees sang while I walked around the campus, a sure sign of spring's eminence. During other observations, the "double scratch" method of foraging gave away their location among the athletic fields and fences (Elphick et al., 2001). The birds were looking for insects among the decaying leaves that collected when seasonal cycles in deciduous tree life and wind energy met. The Spotted Towhee taught me that life gathered and ate at boundaries.

Foothill High School sat atop a rolling piedmont. The Ute name for the Rocky Mountains, Unyyooweechuyugwi-y, meaning, "They sit in a row" was plain from this vantage point. On clear days, Rocky Mountain National Park peaks were visible. The mountains similarly lined-up, to the south. To the east, the Denver metro was visible less a few houses that blocked the view. This might have been the most beautiful view of all High Schools in the Denver Metro. At the time of the study, about two thousand students experienced the beauty daily (Table 9). In addition to academic opportunities, extra-curriculars included varsity sports, choir, band, orchestra, theater, and fifty other clubs were available.

**Table 9***Foothill High School Student Demographic Data*

Race	Percentage of Student Population
Black	1
Hispanic/Latinx	11
White	71
Asian or Pacific Islander	9
Multi-ethnic	7
Other	1
Students in Free and/or Reduced Lunch Programs	10

*Note.* Demographic data was accessible on the school's website.

The following is a summary of the school's profile available on their website. The high school opened in 1960s and provides rigorous academic experiences in a variety of disciplines. The teachers, on average, had more than 10 years of teaching experience. The curriculum included Pre-IB, IB, AP opportunities and other advanced courses. The profile stated that the curriculum prepares students for college after high school and meets the full spectrum of students' learning needs. On average 5% of students were National Merit Scholars or Finalists. The SAT and ACT scores were higher than the national and state averages. Eighty-five percent of students attending college after graduating go to 4-year colleges.

The continuity between the school and community at large was pervasive at Foothill High School. The following vignette shows how many people used the school as contiguous with the recreation center next door.

Flickers foraged in the lawn with the 30 or so geese. A pair of geese flew in, wings squeaked in the air. The group honked at the newcomers. Their legs ran in fast cycles for a moment when they landed, then returned to slow waddles. Honking came from all directions today. There were groups of geese scattered across the public park, schoolyard, and recreation center's disc golf course. Two runners talked casually as if they were drinking coffee. They made quick work of each lap around the high school track with 10-foot strides, clearly they were runners. People with dogs either kept the dog from chasing the geese or let the dog sprint around after the geese, tongue flopping. The geese moved in groups among the lawned areas. I imagined that dogs or people flushed the birds from their foraging at various times throughout the day. I wondered if the geese were ever able to rest. A group of Rock pigeons appeared to have made homes amongst the solar panels. The outdoor amenities included five tennis courts, outdoor seating, and I heard pickle ball. I passed a handful of people. In hindsight, I noticed that people regarded each other with similar interest as the geese and humans. Maybe a nod, short hey, or nothing. As an introvert myself, I opted for the silent nod.

Foothill High School was nested within the community. Human life and more-than-human life freely accessed and used the schoolyard for a variety of purposes. If I had a dog to walk with, I would have completely blended in with the residents in the area.

### **Steve**

There were four hooks on a coat rack. Steve hung one dark grey and one navy blazer next to his lab coat. In the morning, he traded an outdoor coat for a blazer. When I interviewed Steve, he was the only participant in my study to interview me back. He asked questions about researcher bias, methodology, and what I was going to do when I completed the dissertation project. Our conversations felt relaxed and that we shared common curiosities and I perceived

that were reciprocally curious about each other's thinking and science projects. Additionally, I think we both felt a responsibility to foster healthy relationships between humans and all life.

Steve had Ph.D. in Ecology and Environmental Science, a masters in Curriculum and Instruction, a Biochemistry bachelor's degree. He is a published scholar who wrote about writing exploratory and generalizing hypotheses in ways to be more amenable to children's natural ability to notice patterns. He co-wrote a book on evolution. He presented the following topics during academic meetings: teaching evolutionary theory in public schools, how science works, and enhancing your biology curriculum. Steve was an athlete, a runner, who drew from many areas of expertise that combined to curate experiences and cultivate learning with his students in a safe classroom community.

### *Steve On Relationships*

Steve, who has ecological and educational expertise, defined relationships in a way that communicated his intentions for his relationships and his curriculum. He felt responsible for ecological and human relationships in his life. Steve described responsibility,

Well, the word responsibility is there. I feel responsible for the economy of nature. And natural processes because I depend on them and affect them. I appreciate the processes. I understand them I think, in a unique way because I have a doctorate and so I've studied them very intensely but then I also teach it it's one of the favorite things I teach.

He described mutualistic relationships as beautiful. Other relationships among living things can be horrific and fantastic. Steve stated, "I try to impress upon my students that most death in nature is fantastic. It's not like in a hospital on morphine with family. It's being eaten alive." There was a spectrum of ecological relationships from violent to "warm and fuzzy."

When asked about his definition of educational relationships Steve listed: nurturing, challenging, warmth, curiosity, and there can be “communication problems.” He said, “These are other people’s children. And I’m in charge of creating a safe place for them to, to explore their ideas and learn some cool things.” Steve worked hard on what he calls “the most important relationships in my life” other than familial relationships. He described himself as, “very social.” “I’ll go for a walk up to the top of the building to the office and I’ll check my mail and I’ll just sort of walk through just to see people and see what’s going on.” He also described routines of collaboration and conversation with other science teachers and the media specialist at the library. When I asked how he saw schools as nested within ecosystems. Steve shared,

When I think most people think of education think of the factory model of education in America was started out as a factory model, produce workers. Dewey argued though, that it was more to produce critical thinkers and people that could solve problems and so on. I think that I don’t look at education as a factory model. I don’t think of my students as products and workers. I think of them as problem solvers. I want them to have the skills, curiosity, and confidence to go out and improve our experience, whatever various ways they can.

For Steve, the content in his class included skills that were applied to improve living situations. I observed that the situations were relational and answered Cajete’s (2002) call for reconstitution of relationships among life. Both individual human health and collective, society scale relationships were experienced by students. In anatomy and physiology class, a guest speaker shared his expertise on preparing athletes for their best performance. Cellular processes, physics, and whole-human body systems were connected. The day before this presenter visited, he used non-human examples to compare cells across species. For Steve, there was relationships

between spatial scales as his class was nested in all life on Earth. This was also apparent in a book that he reads with his students each year, *The Serengeti Rules* that offered a fully integrated view of biology from cell processes to global ecosystems. The text communicated how healthy and unhealthy functions relate to life on Earth (Carroll, 2016).

During the initial interview Steve described how education acted similarly to ecological systems in the way that things flow and move through education settings. Also, how education follows cyclical patterns on various time scales. Steve said,

I can think about education in the sense of ecology there is there is flow of things, there's flow of knowledge. flow of ideas. There's, there's also a, there's just there's just a flow of the of the year. There's a flow along, and then there's this estuary at the end or something and they go off.

His hands lifted and dropped. His hands traced an oscillating pattern of rises and falls. Then he added, "I think there are flows and cycles, [like] ecosystems. Flow is the student. Curriculum tends to cycle starts over again. A group of students coming in, it's like, Alright, here we go again." This comment revealed analogous structures in both ecological and educational systems. The convergence of the two typically isolated disciplines revealed opportunities for reconstituting relationships among the more-than-human world and human life.

### ***The Place Dimension: Beauty and Responsibility***

Place relationships were alive throughout Steve's daily routines. He lived in the community, appreciated the beauty of the area every day, and he used the surroundings as study sites for his classes. Steve lived in the community deliberately. He described the area, "[the neighborhood has] just beautiful scenery. There's the natural hillside [that] is all pretty, natural prairie grasses, there's trees." Below the hillside there were two lakes surrounded by cattails.

There were many birds and a diversity of plants. The beauty of the place was undeniable, and every visit offered a different weather or color that bounced around the natural areas. Steve experienced the beauty of the place daily when he commuted to and from school by foot. Steve said,

My wife and I realized that we were spending nine months of our lives during the weekday coming to this building. It just made a lot of sense for us to do what we could to try and live as close as we could. We didn't want to drive, we wanted to walk. We wanted our daughter to walk to her schools.

Steve appreciated the aesthetic beauty of the place. He was by extension frustrated that the school grounds themselves were neglected, "there's so much potential for this area to be more beautiful." Past clubs and groups planted trees or there were garden beds on the north side of the building that were unmaintained. Aesthetics was not the only reason for investment into the school grounds, "We know from research, when you beautify a space, a neighborhood, it completely changes people's attitudes about that space. Crime drops precipitously when you beautify a neighborhood, people starting to care about that space and appreciate it.." Steve had clear reasons for beautifying the grounds that indicated to me that he cared for the people, by wanting to reduce crime, and want people themselves to care about the place where they lived and attended high school.

Students conducted an annual arthropod diversity study every fall. With Steve's guidance, students set up pit traps. Pit traps were buried cups so that the rim was flush with the ground. Unsuspecting insects walking on the ground fell into the trap with probably a little alcohol at the bottom to quickly kill and preserve the insect. While the study intends to look at



“the effect of edge on species richness and diversity,” Steve described additional learning that emerged from the experience. He said,

By the time they interact with organisms, they’re dead. But many of [the students] have never really looked closely at these really interesting, bizarre, beautiful creatures before. So, they’re learning what they are. Identifying them down to at least family. They are quantifying. They’re seeing differences from one collection to the next. One habitat to the next. They write a scientific paper about what they found.

In the place dimension, cycles present themselves. The comparison of the arthropod populations provided the opportunity to observe changes or consistencies over time. He said he did not initially intend for it to be a long terms study, but the experiment worked so well he included in the curriculum annually. Further, the arthropod sample was unique to the school campus or perhaps other schools could embark on similar studies to compare across school ecosystems.

***Structural Dimension: Invisible Boundaries***

Steve’s classroom had no windows and the walls included posters of all kinds of life. Human science careers, North American bird migration patterns, and many biological phenomena. He was drawn to the library, which was about twenty steps from his room. Steve said,

I am drawn to the school library because of the thirty feet floor to ceiling windows. A full view of the [mountains], just the vastness of it all. The light that comes in, the hum or din of students interacting with each other. The coffee that’s always there, and good. Just A bit of big open space of the big open space it feels like it’s as close to being outside as you can, because it’s such a big open space.

His appreciation for a room that was aesthetically continuous with the surroundings revealed the way he viewed boundaries. The barrier between school and life was present but functioned invisibly. Steve embodied continuity among school life and surroundings. He lived with his family in the same neighborhood as Foothill High School. He walked to school every day. Steve regularly invited guest speakers from the community into his classroom to share their expertise. Past high school students or university students who he taught as an adjunct or science experts from a variety of disciplines who lived and worked in Bear Hills. Steve used the school grounds as they were contiguous with the classroom. Another fall activity was a patterns of nature lab where students develop and implement a study to describe a pattern in nature. Steve described the lab and process,

That's the very first thing we do in the first two weeks of school. In their table groups, they go outside and they find something that looks like a pattern or a difference where they can collect a bunch of data. They design a method for collecting data and analyzing the data and then they present some of their results to the class. They tell me that's the first time that they've ever done an activity that is completely up to them. Completely open ended.

The boundary between the classroom and the outdoors was invisible. Further the routine of teacher directed learning was broken. Like edge effects and the invisible boundary structure, this repeated the notion that, yes, there were established roles or distinctions to be made and there was value in unsettling them.

***Curricular Dimension: Integrated  
Biology***

Steve taught three courses at Foothill High School IB Biology, Anatomy and Physiology, and Science Research Seminar. Steve described schools as having ecological elements of flow

and cycles. In doing so, he moved his hands up and down in an oscillating motion. Energy flows and matter cycling was a foundational ecological concept. Ecological sciences observe and understand living phenomena where flows relate with cycles, the mixing or integration at a permeable boundary. Patterns of flow and cyclical in Steve's teaching will be described, followed by integrated curriculum which Steve wholly embodied.

Steve defined relationships in a way that communicated his intentions for his relationships and his curriculum. He felt responsible for ecological and human relationships in his life, he wanted to keep students safe. Flowing from Steve's responsibility for ecological relationships among humans and all life, he observed that his students developed their ability to think systemically during his course. When I asked about his hopes for his students, Steve said,

My hope is that they can both take a reductionist view but also systemic view of the world, so they can focus in on one thing and try to figure out and understand how it works. Then, they can step back and understand how that thing is part of a big system. Then all those little parts that they can reduce down to their details are all working together. [I hope] that they would be able to do that.

**Flow.** "There is a flow of things, there's a flow of knowledge. Flow of ideas. There's a flow of the year. There's a flow along, and then there's this estuary at the end or something and they go off" His hands lifted away from his body and his gaze drifted to an imagined horizon, "the flow is the student," he added. The following vignette demonstrates the flow of the school year leading up to graduation.

"Good morning class" Steve said.

"Good morning, Mr. Steve" one student replied.

"Thank you, good morning" a few more students reciprocate.

“Three more days, then break, then you come back for a couple weeks, then a weird week for testing, then it’s testing season. Then you all graduate. How many of you are taking more than five exams?” six hands went up.

“More than seven?” one hand went down.

Flows of knowledge were apparent in how frequently the students learned with and from one another. Students routinely shared their learning with each other. For example, during a genetics lesson, students worked in table groups to create phenology models. The table groups being the smaller collaboration unit. Next, the class divided the models among student groups. The students used a microphone to explain their models to the whole class while Steve projected the models. The non-presenting students listened and updated their own models as their peers explained them.

Students also learned from their competitors attending the Denver Metro at the Science and Engineering Fair. The presented posters from the current year were displayed in the library and past years’ students were displayed as exemplars in Steve’s classroom. Teaching happened across time and his students’ posters taught anyone who frequented the library. Throughout the year, the students were responsible for developing experiments about patterns in nature, plants, and for participation in the State’s Science and Engineering Fair. Nineteen posters were presented at the competition during the year of this study. The following titles were paraphrased to remove student or school location identifiers. Students presentations that included more-than-human life were:

1. Comparing impacts of recreational cannabis laws on cannabis use among adults in two states.

2. Chinese medicine predicts and reveal synergetic cancer drugs: Herbs, synthetic drugs, and deep learning.
3. Climate change and wetland effects on nesting red-winged blackbird (*Agelaius phoeniceus*).
4. Novel relationships among precipitation, temperature, and cancer rates; and
5. The effect of THC vs. CBS consumption on insulin sensitivity.

Foothill High School was next to a middle school. There were students that flowed back and forth between the buildings. Middle schoolers took high school math classes and high schoolers volunteered with the younger students. This reorganized the traditional, hierarchical structure of schooling. Where high school teachers typically dispense knowledge to students who receive it passively. In all the cases described, the invisible boundary allowed Steve to reconstitute traditional school roles by positioning students as knowledge creators and teachers building new flows in education ecology.

**Cycles.** Steve said, “curriculum tends to cycle starts over again. A group of students coming in, it’s like, Alright, here we go again.” There were units that he repeated annually and labs within those units. For example, January was the month that Steve studied plants with his students. “[The plant experiments] are an interaction with things that are growing and living and emerging. The students care about their plants and what’s happening to them and why are they doing or not doing that.” He told me that some students asked to take their plants home. One group brought sandwich materials to class for, “a little sandwich party. They harvested the microgreens and had sandwiches.”

The daily cycles of the school day were also apparent in people commuting to and from the school building. Steve said,

There's lots of movement, not in cars. Because it's a suburban school, we are nested in a neighborhood and so students are moving through parks, to get here ... there is this migration of students out of the neighborhood across the park by the rec center.

The school building itself breathes as it fills up and then expels human bodies during the daily cycle that starts anew each day. The following vignette shows how students flowed in and out of the building daily.

Two geese walked east along the sidewalk, eating as they walked. Students got out of their vehicles and walked west towards the front entrance. The geese's heads were bowed and bobbed as they ate grass. One goose raised their head when a student or bus passed, the other continued eating. The geese minded their business. From my view, one of nine students looked at the geese when they walked past them. The one person stepped around the geese because they were between the garbage bin and the sidewalk. For the most part, the geese were equally indifferent towards the students. As the flow of students increased, they jumped out of personal vehicles and the public bus, the geese did not move from their position next to the sidewalk. One goose lowered their head in an aggressive posture, the student passed within two feet of the goose, they did not look up from their phone. The public bus dropped groups of students near the main entrance. Curse words and laughter wafted my way. A handsome sports car caught my eye. Two students climbed out of the custom painted, matte blue Mercedes with black rims and tinted windows. They held hands as they walked under a corvid who called from the tree above the overflowing trash bin. Corvids flushed from their lawn strolls in the lawn as students walked to the front door from all directions.

The same day, after the classroom observation. I joined the flow of students out the doors and onto the lawns. There was a person swinging a huge branch, twice their height, at another

student. Clang! The branch hit the metal bus stop structure. The student leaned the branch which extended well above the bus stop. A robin blush of 20 or so birds singing from a Russian Olive distracted me from the branch wielding student. The number of nice, as in expensive, vehicles surprised me. Range Rover, Jeep, Mercedes, Audi, Tacoma, BMW, oh my. Today I walked a full loop through the park next to the school. The birds were singing as the occasional gropple bounced on the sidewalk. At the end of my loop, I saw half the branch was in a red Mitsubishi's snowboard rack and the other half was on the ground in front of the bus stop. Over the course of the day, I found that people and more-than-human life moved throughout the school and landscape in diverse ways.

Within the building there are smaller cycles of class periods. Science as a process is cyclical, so each lab went through questions, research design, data collection, analysis, and conclusions. Lastly, two meals were provided to students daily, the district prioritized local food procurement, they hitched seasonal cycles with school meals.

In Steve's classroom, students maintained a journal throughout the year to record how much they grew over the year. Students can also take tests and resubmit assignments, circling through the same information multiple times. I observed his Science Research Seminar class after the students competed in the Denver Science and Engineering Fair. He used a series of reflective questions that students answered on a google form that. Steve used student responses as a conversation starter. He opened the one-on-one conversation by saying, "this is an informal chat through the answers that you gave." He reviewed the statement and the student's rationale behind their response. Here are the statements copied verbatim from the google form:

1. I pursued a research question or engineering problem that I was interested in.
2. I researched and analyzed the published literature to understand the 'state of the art' of the knowledge in my project area.

3. I was proactive in finding a mentor to help me pursue my project.
4. I communicated effectively and often with [Steve] about my progress on my project.
5. I created a slide set that effectively communicates my project, my findings, and my conclusions.
6. The project board I presented at the Regional Science Fair was of high quality to the other projects in my category.
7. The project board I presented at the Regional Science and Engineering Fair is an example of my best work.
8. I was effective at communicating my project to the judges at the Regional Science and Engineering Fair.
9. I had a good time discussing my project with the judges at the Regional Science and Engineering Fair.
10. I had a good time discussing my project with other students at the Regional Science and Engineering Fair.

They addressed each goal. Steve listened silently, repeated the main points of the students' responses back to them to confirm he understood and showed that he was listening. He agreed with most of the student responses and pushed the students to see that they had achieved their goals in some they marked "I did not fully achieve this goal." He closed both conversations with compliments, "I am thrilled with what you've done" and "You are showing me that this is a long process, but you will continue to work on this project." The second conversation revealed personal knowledge about the student's life and science fair experience that demonstrated trust in the relationship between student and teacher. I asked him about his method of questioning and repeating students' responses back to them to confirm he understood. He said that the method was apophatic listening which comes from democratic processes, particularly when people come



from different perspectives. He noticed that the method worked well, so kept using it with students. Moving in parallel, Steve was constantly evolving as an educator. He said,

I feel very fortunate. I love where I work. I love where I live. I love that I can walk to where I work. I love that it is beautiful. It never gets old. I love teaching. I love interacting teenagers. I'm living my best life and I hope they can tell [students gave thumbs up] ... I think that every year is my best year teaching. Even when we were, you know, teaching from home. I was doing my best work yet. Because I had to, I had no choice but to be absolutely creative as possible to be inspiring, to be helpful, to be patient. How else would you be as a teacher?

Each year offered a new opportunity to improve. The love he expressed in this response was perceptible during each observation. He smiled often, was enthusiastic about science content, students' lives outside class, and engaged with every student during class.

**Integrated Biology.** Flowing from Steve's intentions, he observed that his students developed their ability to think systemically during his course. When I asked about his hopes for his students, Steve said,

My hope is that they can both take a reductionist view but also systemic view of the world, so they can focus in on one thing and try to figure out and understand how it works. Then, they can step back and understand how that thing is part of a big system. Then all those little parts that they can reduce down to their details are all working together. [I hope] that they would be able to do that.

I read the student posters from the Denver Science and Engineering Fair and listened to a presentation about how cannabis use effected people with diabetes, I noticed that the students responded to his intentions. A study of the received curriculum could explore this further.

The structural dimension, invisible boundaries, allowed planned and spontaneous learning to arise. The same content, genetics for example, provided multiple contexts within which that information was understood by students. During one class, Steve addressed social misconceptions about human traits by using genetic data and academic research. Students developed models to explain relationships among human environments, genes, and phenotypes. In an email he shared that the lesson was, “Bringing together genetic science, human trait expression, and social studies helps students understand that human genetics education is not socially neutral in any society where genetics is used to rationalize prejudice.” I heard many students talk through their perceptions of educational attainment, skin color, intelligence, and anti-social behavior. They came to class with established ideas and left with a reconstituted idea of dynamic and multiple factors that shape human traits, achieving Steve’s aims. He said,

A major objective of my approach to the teaching of genetics is to disrupt the misunderstanding that people who either identify as a particular race or are perceived by others as being members of a particular race, are genetically uniform and that people of different races are categorically different. I also aim to disrupt the assumption that biologically influenced abilities are immutable. ... In my teaching of this unit, I am to reduce, if not eliminate genetic essentialism ideas in my students by using data to challenge faulty assumptions about racial difference and ultimately reduce any racial biases my students may have.

Invisible boundaries between social studies and science made a place for a biology class to engage in essential social critique. Neither content area can explain or address racial bias alone, when the disciplines blend, flow within stagnant ideas about race results. Challenging racial misconceptions was not the only outcome from the genetics unit. Novel relationships

among ideas, scientist, and time also emerged. I observed the following dialogue during a story about Greg Mendel. Steve said,

“Mendel read Darwin as everyone had at the time. There was no indication that Darwin read Mendel.”

“What would have changed if [Darwin] had? If he had read Mendel?,” an astute student in first period asked.

“It would have changed a lot of things. He would have had to re-write Origin of the Species.” After class, Steve said that he hoped the student wrote that book someday, I agreed.

The student made a novel connection between science content when they asked the insightful question. This shows how learning may occur in predictable or unpredictable ways. The Canada Geese acted similarly in that, I expect them to drink water from the lakes, but they don't always drink water where humans expect. The following vignette describes Geese drinking from interesting water sources.

Five Canada Geese walked along the curb and crossed a driveway skirt. Their steps made gentle plucks in the water, and they quietly honked among themselves. Their long necks swooped to drink melting snow flowing to the creeks along the curb. The dabbles smacked and splashed in the water. They arched their necks up again. Wary of my lingering. These geese affirmed the observation from the Plains School. I learned more-than-human life is sustained in expected and in unexpected ways.

I observed that Steve used integration across content areas, scientific disciplines, and time. He included opportunities for students to learn about science careers after high school throughout his classes. Steve invited local experts from diverse fields to share their career paths and how they used science to understand phenomena. The first observation I conducted in

Steve's classroom, he invited a local athletic coach who used human physiology to help athletes perform better. Steve also invited students from local universities. Steve described his intentions,

I'm hoping that my students will get a sort of fresh viewpoint from someone that is not me. I'm hoping that they'll see themselves in that person, career wise. I'm hoping that they're learning from an expert about a thing that I am not an expert on.

I noticed during the observation that students were engaged throughout, they talked at their table groups, and asked thoughtful questions. Some participated in the presentation as study subjects, and they all witnessed their teachers physiological data as they rode a stationary bike.

Steve also integrated his classroom with a global community through social media, where his students follow him. The group of students that regularly ate lunch in his room shared that they found some of the posts funny or interesting. They said, "we care because we are involved" in what he posted. Steve liked to share what was happening in science classes and Foothill High School with other science teachers around the world. Social media was a way to celebrate and collaborate across places.

### ***Steve in Conclusion***

When I finished four observations with Steve, I noticed flows and cycles everywhere. I considered these pre-figured foci from this time in the study on. I also incorporated the idea that established boundaries could be invisible in addition to permeable as I learned at the Plains school. As the Spotted Towhee taught me, there were benefits to exploring what intellectual sustenance collected at a boundary. Similarly, and as cyclical annotation methodology dictated, I returned to Mr. Pink's observations and interviews to see if the pattern existed there as well. I learned many things from Steve that will improve my own teaching practice. We planned to collaborate on a publication submission over the summer to further explore ecological and

educational relationships in science teaching practices. Overall, place shaped local investigations. Steve created a classroom where the boundary between the inner and outer parts of the school building were invisible. The combination of place, structure, and Steve's intentions gave rise to integrated biology in the curricular dimension that observed patterns across scales.

### **Plains School**

This opening vignette emerged from an auditory observation and the experience piqued my listening attention in the classroom as well. The main street was full of cars zooming by at thirty-five to fifty miles an hour. Their sounds oscillated with the timing of two major intersections. The vehicles passed feet from the bus stop where students are picked up and dropped off daily. A blush of about twenty American robins sang, chattered, and alarmed from the tops of the cottonwoods. They were in the tree with a Northern Flicker who preened. I walked to the ditch trail that wrapped around the north and west school property line. All the while, traffic noise rose and fell. A vehicular heartbeat. Starlings rasped and buzzed as they flew overhead. Once I rounded the corner away from the oscillating traffic, it was peaceful. Elizabeth was softspoken and calm, her presence in the room slowed the instability of the school around her to near stillness. From one introvert to another, I felt safe in her classroom. From the spatial indexing observation, I learned that more-than-human life matches the flow of sounds and observed the same in Elizabeth's classroom.

Elizabeth is the second teacher participant from the Plains School. The only thing to add to the description, here, is the timing of observing the two teachers (Table 6). I worked with Mr. Pink in January and with Elizabeth in March and April. Although a month had passed between, I had spent time in a different school district, the weather was warmer, and the sun was out longer each day. Testing season, as Steve called it, was also in full swing at the Plains School after their

March spring break. There were far more active and singing birds in March and April than in January. I encountered more people walking and riding bikes on the ditch trail in April. There was a large park across the busy street. During observations, I saw people walking their dogs or walking in groups around the park. In the school's backyard plants greened up and the grass was calf high on my last observation. The AstroTurf was still green, as expected.

### **Elizabeth**

The lights were off in Elizabeth's room. The single window and the projector's glow provided ample light for notetaking. The hallways were bustling and noisy. Her classroom was a calm, quiet, and peaceful place. Elizabeth was soft-spoken and the whole class echoed her volume. Elizabeth moved to Colorado from Indiana. She identified as working-class and declined to specify race or ethnicity. She loves all pets, but cats especially. She was also an athlete and coached cross country at the Plains School. They were a "small team, but they were mighty." Elizabeth was always stylishly dressed. Sometimes paired with a warm sweater or jacket for layering up in the cool room. She started her teaching career at the college level. At the time of this study, she was a secondary science teacher, for the most part, she taught upper-level science classes, and was the Science department chair. During spatial indexing, I observed how the birds were keyed into each other for conversation, songs, and to warn of incoming predators. I observed that a cat incited alarm calls from birds in the area. A Blue Jay mimicked a Red-Tailed Hawk when it landed next to me in a large cottonwood tree. The other birds responded by looking above them for aerial predators. This observation drew my attention to the way that Elizabeth's demeanor shaped her classroom.

### *Elizabeth on Relationships*

Elizabeth defined relationships as an exchange between people or with pets. She said this about an animal she related to, “Family, comfortable, close, warmth, or physical touch ... a literal connection.” The way Elizabeth defined relationships in education was similar,

The word exchange stuck out the most, the literal definition that we’re used to. That’s where I went with all the things that I’m exchanging, like, opinions, feelings, support. And, I think I also related that to connection of some sort. Not just exchange but sometimes, if there is a connection with the exchange of words or with like, facial expressions or body language or again, like, comfortability. A material sense [that] there’s connections and exchanges.

She gave an example of saying hello to someone. We can say hello, but that doesn’t necessarily imply relationship. She added, “The acknowledgement and then some effect connection or exchange, so, not just one directional.” At this point in the interview, I asked if she agreed with Nel Noddings care theory, and she said yes, “the other person acknowledges the exchange.” For Elizabeth, relationships had some kind of reciprocity.

Elizabeth was an introvert, so she balanced her daily interactions with solo time, “lunch is kind of the recovery time. Sometimes I go outside if it’s nice.” She went on to list all the ways she worked with others in the school, the instructional coach, her colleague who she co-taught with during her seventh period, and the people who have the same planning periods. The students were present in her description of relationships. She said,

One of the things I noticed about my classes, and I’m curious if it’s happening in other rooms. I wouldn’t necessarily call them cliques because they aren’t exclusive to the others, but they definitely form their own community. I have roundtables and they can

kind of cluster and talk. But it also changes, it's not static, its dynamic. They shift, like, week to week. It's a little bit different, depending on moods and what's going on.

Perhaps what she noticed in her students was reflective of relationships in general. Relationships shifted and evolved much like ecological relationships. Overall, the parts of the definition I noticed that shaped her practice was the exchange with others, the reciprocity. I observed and heard in her interview that her classes were relational, specifically, evolving relationships among humans, place, and all life--each expressed in her curriculum.

### ***The Place Dimension: Parks***

Place shaped what was included in Elizabeth's curriculum and in her relationships within the school community. Elizabeth organized community running races at the park across the busy street for students and families to get involved with cross country running. She built relationships with the community through cross country. Prairie Heights, like Bear Hills, had public parks near the school. All the parks had extensive lawns. Unique to Prairie Heights, religious centers of diverse designations, also had expansive lawns surrounding the buildings that resembled public parks.

All that was said about the place dimension for Mr. Pink is true for Elizabeth. The school was a global community with close knit family relationships. She said, "There's community culture, since this is their hub, very much so. [Plains] is still a very family-oriented place of K through twelve, siblings and cousins. It's definitely their sense of place, their central hub for their family." One morning before school started, I saw a group of mixed-age children walking towards school on the sidewalk, one wore one-piece animal pajamas. Elizabeth said that while family was a prominent component of school life, it had also shifted from "pre-corona to post-



corona.” Before, there was an “influx of families and friends and cousins and exchanges. Now not so much. It still exists a little bit.”

Of all the participating teachers, Elizabeth was the teacher that chose to live out of the school community. She said,

I think for me the personal choice to live there was just my own hobbies, interests, and personal needs. Also, I like the separation, having a different community at home and a different community at work. So, there’s a clear separation between the two environments. The introvert again, I need some recovery.

Living out of the community did not inhibit her ability to incorporate Prairie Heights and global contexts into her curriculum. Elizabeth described the “curriculum choice for examples or engagement.” She said, “I don’t think I was conscious of it at first teaching here. It’s definitely shifted to be more relatable to Prairie Heights than even more specific to culture.” The place awareness influenced her film choices and science examples. She had recently talked about, “civility, gratitude, tolerance, and discrimination, which obviously looks very different in this community than where I live.” The place context in her work and home community were different and she used the Prairie Heights context in her curriculum.

Elizabeth prioritized relatable examples for her students. She used local parks to build relationships with the community. She utilized the catchment pond on the schoolyard in her AP Biology class. The schoolyard was a study site for her class. Ocean First visited the class and collected aquatic invertebrate data with students the past Fall. In other words, the place dimension was alive in her classes and was a place to form relationships with community.

### *The Structural Dimension: Selective Permeability*

Biology begins at the smallest unit of life. A cell is bounded by a selectively permeable membrane that separates itself from its nonself. “A cell needs pores to permit nutrients to move in and out. It needs docks for signals from the outside to arrive and be processed” (Mukherjee, 2022, p. 75). The cell is at the same time an individual functioning unit and connected with a larger functioning organ.

Elizabeth structured her class as a selectively permeable within a larger context of seeded systems. As an “open introvert,” she was also selective about who and what was brought into her classroom, her daily routines, and where she chose to live. During AP Biology, she said, “there were similarities to muscle tissue, they were striated,” she drew muscles on the board. Like all cells, they contacted their neighboring cell and communicated across the selectively permeable boundary. In the case of muscles, electricity communicated the timing for actions. Elizabeth said to the AP Biology students,

You identified these vertical striations. Cardiac muscle is more branched. There were these bright purple lines between the cells, the intercalated disc. This is so they all contract at the same time. We want contraction at the same time. To function as one. The heart creates its own impulse, the cardiac conduction system. A specialized network of cells to carry that impulse. [Cells] initiate and distribute the impulse.

The muscle contractions were meticulously timed to control blood flow around bodies. The class learned to read an electrocardiogram (EKG) to visualize electrical oscillations that regulated the heart. The cardiac muscle cells were slightly charged and go through cycles of polarization and depolarization. While each muscle cell was an individual, the contractions were synchronized for contractions by electrical flow. Not every cell’s function requires this synchronicity. However,

the heart metaphor is powerful because its function is essential for life. Further, all teacher participants expressed love for their profession, and they were also the heart of their classrooms.

The structural dimension shifted from “pre-corona and post-corona.” During the pandemic, teachers and student were organized by cohort to separate grades. In pre-corona a science teacher could teach seventh to 12th graders. In post-corona, Elizabeth described a “weird stagger” as students moved up in the grades. She said, “I was hoping they would do away with the grade delineations and just be like anybody takes [any science class].” She would like for any grade level to take the higher-level science classes. Perhaps this expresses expertise she brought from college level teaching to the secondary level.

Overall, the selective permeability expressed itself in how ideas, content, and curriculum examples flowed across the boundary and cycled annually. Elizabeth curated curriculum that delivered science content in an explicitly seeded system of organization: cells, tissues, organs, organisms, populations, and ecosystems. Steve’s curriculum was integrated biology, how patterns repeat across scales. Elizabeth’s curriculum included how parts accumulated to make whole systems function. These are closely related and sometimes the same thing, however, I think they function differently. Perhaps further investigation into the received curriculum could clarify the distinctions from the student view.

***The Curricular Dimension:  
Seededness***

Elizabeth valued reciprocity in her relationships and offered choices in her curriculum because, as she said, “I want them to be invested” in their education broadly and her courses. Because she valued reciprocity, she invested in students and expected the same in exchange. The options supported student investment in science content. She solicited investment in a variety of ways. She offered example careers and next steps beyond high school. Elizabeth developed a

Health class for students who will not enroll in AP courses at Plains School. She also included relatable cultural and charismatic examples in class materials. All the lessons I observed in her classroom were connected directly to the lived experiences of students, content was embodied in personal health, future career, or environmental health.

Elizabeth selectively drew from place to craft a uniquely seeded curriculum experience. The place dimension offered parks and aquatic ecosystems. Further, familial relationships, religion, and cultural identity was integral to the Plains School. She described the Plains School as “the hub” for many families. The structural dimension allowed Elizabeth to curate local examples for careers, internships, and ecological impacts that affect all life. Next, the flow and cyclical expressions in her curriculum will be described and I close by detailing seededness.

**Flow.** As described in the place dimension, Elizabeth prioritized relatable examples with her students. Like Steve, this included careers beyond high school. She also brought in outside experts to present in her class. While this had shifted “post-corona”, she still prioritized outside experts to connect content with real life and local aquatic ecology. Lastly, I included a vignette of evolution as a dynamic process between human and all life. Bacterial resistance as the iconic example.

In anatomy class she highlighted paths to students’ career goals, “These are the places that you could end up working. These are the places you can reach out to. This is a great example of the next transitional piece.” In addition to presenting the career option, she included where that fits on a career path from the present moment, in her class, to the next step on the path to the medical profession.

Guest speakers were also part of her teaching, “This year, it was someone from Ocean First, but I always like to bring in someone from the community or at large as an outside

perspective.” The group focused on human impacts to aquatic ecosystems, invertebrates specifically over time. “Having kids in the field going through the mud looking at invertebrates, thinking about a perspective, like, ‘oh my gosh, this is impacting me [and invertebrates].” The flow of information from outside experts brought about a perspective that human actions impact invertebrate life and human life simultaneously, the impacts were related across species boundaries. The presentation was such a success, she hoped to continue collecting data annually because it was a positive experience with the students.

The following vignette was from an AP Biology class about evolution. Elizabeth and students discussed major evolutionary concepts and the Hardy Weinberg equation in preparation for the AP exam.

“How is MRSA a direct observation of evolution?” Elizabeth asked.

“You can tell if someone only took the first round of antibiotics because the bacteria can stick around after” and “you need to take all of the antibiotics,” a student replied.

“Yes, there are already bacteria that are resistant, most will die, but some will survive and reproduce. We are creating bacterial resistance when we don’t completely kill that strain. The selection then is for the stronger bacteria. They have the capability to maintain proteins or the phospholipid bilayer and are now mutating.” Elizabeth affirmed and then added to the student response. At this point we are through most of the class period. Elizabeth pulls up the evolution slideshow and projects the “seventh check” not the “double check” for the Hardy Weinberg equation. She summarizes it one more time and moved on to “Major Mechanisms of Evolution.” Three things contribute to microevolution. One, natural selection, two, genetic drift, and three, gene flow. They reviewed the definition of natural selection, a student gave the definition for evolution, so Elizabeth pushed for clarity,

“What is the mechanism? What is happening to cause that change?” silence, “the environment affects which traits are selected and which are successful. What does success mean?”

“Survive and procreate,” a student answered.

“Yes, to survive and reproduce.”

The next day, they planned to pick up with founder effect and bottleneck effect. The evolutionary process happened over time and in relationship with humans, place, and all life.

Schools prepare students for future careers or college journeys. Elizabeth included specific examples tailored to the students and their goals after high school. She also connected the aquatic ecology system behind the school with human impacts. Further how human behavior effected both aquatic invertebrates and humanity alike. Invertebrates were not the only animals impacted by human life. The following vignette shows how the surroundings influenced human and more-than-human life.

Two geese ate from a small patch of grass near the water catchment at the apartment complex. They watched as I walked nearby, then one of the pair lowered their head, opened their mouth, and walked directly to me. I assumed this was aggression, but they did not hiss. I took a few quick steps, I know not to mess with a Canada Goose, they slowly followed me. They returned their head to the upright position, do people feed the geese here? That would be strange. A few quick steps and I was on the ditch trail overlooking the water catchment. Red Winged Blackbirds, Northern Flicker, American Robins, and European Starlings were all singing in the large Cottonwood between the trail and water catchment. People walked on the trail with dogs, and I saw a couple folks on bikes.

Ultimately, Elizabeth, like Mr. Pink and Steve utilized porousness to foster student investment and engagement in her curriculum. The selectively permeable structure allowed flow across the boundary between school and real life.

**Cycles.** Circulation is a ubiquitous biological phenomenon. The heart pumps vital blood to organs around the body within all life. The heartbeat is a repeating cycle that sets the tempo for life. Chances are that you, the reader, are experiencing nearly 100 heartbeats every minute. What does the constant rhythm teach you?

One observation, AP Biology learned about the heartbeat and an EKG. I observed the introduction to the EKG, the following day, the students would measure their heartbeats. The previous day, the students had dissected sheep hearts. There were still six vacuumed sealed sheep hearts on the back counter of the classroom next to dissection trays and tools. The following describes the lesson when Elizabeth summarized the EKG. She used a video that included a three-dimensional image with arrows, these represented the chest leads that measured electricity. She told the students that the three-dimensional organ, the heart, was like singular neurons because all the chambers moved in a synchronized way. However, the heart was not like a single cell because it was made up of multiple neurons contracting muscles. This vignette includes dialogue between Elizabeth and students.

“If you are reading an EKG, what will you see first?” Elizabeth asked.

“Depolarization.” A student said.

“Yes, what has to depolarize first?,” the students whispered at the tables.

One student spoke up, “Are you asking what part of the heart?” Elizabeth nodded yes.

“Atrium” The same student stated.

“Yes, [Samaya] knows the answer. More people in the room. What chamber do we need to fire next?,” students quietly responded. I could not hear.

“Yes, left and right atria. What happens in the ventricle?”

“Repolarization in atria means depolarization in ventricle,” said a student confidently.

“Yes, the flow of electricity creates change in volume and pressure of the blood flow,” SB stated clearly and projected the notes,

“EKG is recording of impulse components listed here,” students’ eyes go to the board and their fingers typed on their laptops. Elizabeth described the P, Q, R, S, and T waves. Each one “identifies polarization, depolarization, or things at rest.”

“Are you ready for the diagram? The normal one?” SB asked and then projected then wrote over the diagram. The pen clicked on the promethean board – it sounded like a ball point pen on glass. She circled the waves that made up the EKG and explained what was happening at each. A restatement of the same content with a different image than the video. The students filled in more information as she went through the EKG one more time. The homework was to create an EKG and label each part with descriptions of electricity flow. She handed out paper for anyone that needed paper to complete the homework.

This vignette showed the heartbeat as a foundational cycle. The cycle that allows all life to move blood around the body. A relatively small unit of cyclical movement in the classroom and perhaps the most ubiquitous within all life.

The Plains School prioritized rigorous STEAM curriculum. At the high school level, students were required to enroll in AP level courses in multiple disciplines. On a larger scale, annual curriculum cycles included AP Biology units that Elizabeth was required to teach that included relationships among humans, life, and place. Elizabeth said,



Our ecology unit cannot be removed. So, every year we see some piece [of ecology] come back every year. With Biology or AP Biology, it's bacteria or prokaryotes. They are forced to understand on that level. Every year with Anatomy, and so far, since I've introduced Health, it's been the same thing, bacteria, and viruses. But, obviously, a different approach with immunity.

The AP Biology content is highly structured by both the College Board and the curricular goal, to pass the AP Biology exam at the end of the year. The course was valuable for students bound for medical careers and for folks interested in life on Earth. However, not all students thrive in AP courses.

Elizabeth taught a Health class for 2 years as a course, "that was super accessible, relatable, and definitely more applicable than all these high-level classes they are offering." She said the course was "evolving ever since." Elizabeth recognized the value in multiple science course options for students. The course concluded each year with a choice project that students have opportunity to further study a topic that interested them over the year. The choice showed one of Elizabeth's intentions and her definition of relationships, "I want them to be invested." Options support student investment in science content.

Cycles were present in Elizabeth's curriculum in three main ways, literally, as in biological cycles, the heartbeat. Also, as annual curriculum cycles, like both Mr. Pink and Steve. Lastly, she prioritized the flexibility of health as a reciprocal investment process with student choice and adaptive to evolving administrative goals for the secondary school. These all combine to make her practice uniquely seeded.

**Seededness.** Elizabeth constructed her curriculum as a seeded system. In health class, personal health built to environmental health over the year. AP Biology teaches that life itself is

a seeded system. Importantly, these allow the connections between and among individual people and the systems we inhabit to be apparent with students. Both within individual bodies, but also how those bodies interact with a whole ecology and social system.

Health class she drew connections among wellness at different scales, “It’s all about dimensions of wellness so they move through mental wellness, social wellness, spiritual wellness, come around to environmental wellness.” The content expands in scale as the year progress and at each level the parts of the system combine to form the whole and next level of organization. This was also present in AP Biology, which depicts life as seeded systems from proteins, to cells, to body systems, and to whole, global ecological systems. Further each was connected to lived experiences of students. During 2019-2023, human relationships with viruses and disease became very real and prominent in global consciousness. During the pandemic, the labs were directly related to studying immunology and viruses. Elizabeth said this,

Sometimes I don’t think they grasp still, the severity of the connection. They talked about it in pieces, like this is still just curriculum I’m learning. I’m like, ‘no! this is now’ and try and make the connection. I think the year that we were remote was probably the year that they made [the connection] ... they said, ‘this is what’s happening right now.’ ‘Yes! Yes, it is.

In this curricular example the global pandemic was prescient in the class content, the larger milieu of their community, and at the global scale. Further, during the month I observed Elizabeth she got COVID and reported on my final visit, that she had many students out with COVID. I put on a mask. The relationship with the virus was still present.

Human relationships with plants were expressed in the curriculum. In the classes I observed, they were broadly included during an evolution unit in AP Biology. In health class the

connection was more direct in their discussion of alcohol, a fermented and intoxicating plant mixture. The following vignette was included to show not only the human relationship to plants, but also the fascinating connections student made between alcohol, their own bodies, and the price of plants in food or alcohol. It was also an opportunity for Elizabeth to foreshadow upcoming content.

Elizabeth started the lesson and let the students know that they will be adding onto the notes from the previous lesson. The students got out a worksheet from the previous class.

A student exclaimed, “Why is there not liver on this sheet?”

“I don’t know, I didn’t make it,” said Elizabeth.

“It’s the most important organ” they said. “Yes, it is important” she said.

Elizabeth began the lesson, “Alcohol is a depressant. Where does alcohol come from?”

“Fermentation,” the student’s voice trailed off.

Elizabeth repeated their answer, “fermented fruit, corn, or from yeast” and added, “yes, it is amazing that you don’t write down a single note, but you can remember all of it” some people in the class giggled. What a valuable talent!

They go through the short-term effects of alcohol consumption on the different organ systems: liver, kidneys, stomach, pancreas, and brain. The seven students answered each worksheet question together. They transitioned to long-term effects of alcoholism. Elizabeth talked about symptoms of withdrawal, where the body demanded alcohol by feeling sick.

“How can the body demand something that harms it?” a student asked.

“Great question, the brain chemistry changes” Elizabeth answered, added, your brain changes in size too.

“Your brain shrinks!,” half question and half surprise,

“what percentage shrinks? Does it make you less smart?” they asked. Elizabeth explained that neuron connections were reduced and that influences brain function. The student typed on the laptop. Their brow was deeply furrowed. Elizabeth projected more notes and students dutifully wrote them down. She circulated and checked in with students while people finished writing. The student intently stared at the laptop and occasionally typed. Next, she talked about how drunk driving is dangerous because peoples’ depth perception and reaction time changes.

“The brain can shrink 1.6 percent!,” they interjected loudly.

She acknowledged the addition to their conversation and then provided fourteen drinks a week for what is considered sufficient consumption that can lead to brain changes.

“That’s a lot!,” the student said.

“I’m glad you think that is a lot,” She replied.

“That’s a lot of money, you could be buying food” the student adds.

Circulatory system was the next organ Elizabeth discussed. Alcoholism caused a heart to swell and become inflamed over time.

“So, alcoholics have big hearts?”

“Yes, but not in a useful way. Not like you,” She smiled at the student.

“Aw, really?,” student asked.

“Yes, everyday” she said.

“Even just one bourbon on the rocks?” another student asked.

“How do you know bourbon on the rocks?” Elizabeth asked. All the students nodded their heads, apparently, they were all familiar with the drink.

“It was on an ad during the Nuggets game,” they said matter of fact.

“Oh yes, we will talk about marketing and advertisements in this unit too,” a little foreshadowing. Next organ was the liver, she described fatty liver.

“What is worse fatty liver or fatty foods? What about the cauliflower sandwich at Chick-fil-a?” asked the student concerned about brain shrinkage. The students said they remembered seeing a fatty liver during fifth grade. The class went on a tangential discussion about fried cauliflower, it led to laughter, and everyone contributed their opinions about Chick-fil-A. One student recounted that their fifth-grade teacher was fired the year they learned about fatty liver. The whole class talked at the same time. They all agreed that fourteen dollars was too much for a cauliflower sandwich. A student shared that they watched a news story about Whole Foods packaging that was covered in bacteria and the food with pesticides. Elizabeth cycled back to the fatty liver question. She said that both fatty liver and fatty foods were both unhealthy, even if the fatty food is cauliflower.

In the vignette we see that students are connecting science to their lives in interesting ways, in this case, through food and fermented plants, more-than-human life. Seededness made Elizabeth’s combination of place, structure, and curricular dimensions unique. I observed in class that her AP Biology content and Health connected directly to the lives of students. The inclusion of career paths, heartbeats, local ecology, and embodied academic content were all parts of systems seeded in a larger context. The seededness made relationships among life apparent.

### ***Elizabeth in Conclusion***

Elizabeth’s classroom was among the calmest I have ever visited. She was a soft-spoken introvert who organized her day as a cycle of activities and recovery. The volume in her classroom, was reflective of her demeanor, students were subdued relative the volume of the classrooms on either side of hers. Like Mr. Pink, who worked in the same school, she included

the familial and cultural components of the community. Like Steve, she used the schoolyard as a study site and a neighboring park as a place to build relationships.

Elizabeth structured her classroom as a selectively permeable boundary between human life in career and health. She advocated for the removal of grade level requirements for science classes, a dissolution of a boundary. She included next steps for students to take on their path to medical careers, like Steve. I observed the curriculum cycle as a heartbeat at the smallest scale and annually as the longest. Her curriculum was uniquely seeded in that everything was contextualized and embodied in an aspect of the students' lives. For example, in AP Biology, students explored bacterial resistance and in health class, they moved from individual health all the way to environmental health over the school year. I was struck on how well a cell structure complements Elizabeth's classroom routines,

It is the membrane that defines the boundary, the outer limits of the self. Bodies are bound by a multicellular membrane: the skin. So is the psyche, by another membrane: the self. And so are houses and nations. To define an internal milieu is to define its edge – a place where the inside ends, and the outside begins. Without an edge, there is no self. To *be* a cell, to exist as a cell, it must distinguish itself from its nonself. The membrane presents a locus of paradoxes. If it is hermetically sealed, allowing nothing in or out, then it will maintain the integrity of its insides. But how, then, might the cell handle the inevitable requirements--and liabilities--of living? (Mukherjee, 2022, p. 75)

There is an internal and external milieu. Elizabeth's introversion shaped her internal environment, and this was reflected by the classroom community. She reminded me that more-than-human life is also very small. Cells are the smallest unit of life throughout the study. In the human body, cells combine to form tissues, organs, organ systems, and organisms. Viruses, that

have some characteristics of life, and bacteria profoundly shape human life and all life on Earth. All the content she included in her curriculum was nested in a larger functioning system, like a cell nested in our bodies and human health seeded in environmental health.

### **Pine High School**

This opening vignette shares a conversation among corvids that I could not understand, but I did learn that they amplified their voices. Thirty students walked out the front door when I parked my car, I worried for a moment that there was a fire drill or perhaps a national high school walkout for gun reform. When they arrived at the main street, the students dispersed into the neighborhood in smaller groups. On my way to the creek, two crows yelled at each other. They jostled in the pine tree and “caw, caw, caw, caw” incessantly. Their head bowed and shoulders raised each “caw.” Corvids are highly intelligent. I hypothesize they picked this specific tree for their dual. Their calls echoed off the building, so it sounded like twice the number of birds participated in the public airing of grievances. Two more corvids flew in, landed in the tree, and 3 Eurasian Collared Doves flew out. Students left the building in groups of 1 to 6 today. It was lunch time. They disappeared in the surrounding neighborhoods. I heard them laughing and yelling as they walked. Life was dynamic. I learned that human and more-than-human residents moved their voices and bodies fluidly throughout this community.

The Pine High School mission was foster educated participants in a global society. The overall student body participated in 37 clubs and 25 sports (Table 10).

**Table 10***Pine High School Student Demographic Data*

Race	Percentage of Student Population
Black	1
Hispanic/Latinx	30
White	62
Asian or Pacific Islander	3
Two or more races	4
Native American	1
Students in Free and/or Reduced Lunch Programs	29

*Note.* Demographic data were not available on the school's website. I used Great Schools.

Interesting that this school was majority male identifying. The other schools were close to a 50/50 balance.

Pine High School was on a busy road. The building itself was rotated at an odd angle from the road, giving the school a sharp appearance from the street. The school had the most spectacular lawns of the three schools in this study. They extended outwards from the buildings until the lawn met the fences that indicated a border between public and private places. Mature trees grew close to the building, they were nearly two stories tall, Russian olives, Blue Spruces, Cottonwoods, and Ponderosa Pines in various locations. The entrance to the school was mostly poured cement with two large parallel planters that guided folks to the front door. A bike rack was full and there was a bus stop near the school. When I drove to the school before school started, students were lined up for the bus going in both directions on the busy street.



**Sloane**

Science teachers at Pine High School moved classrooms throughout the day. When Sloane entered the room, she brightly greeted all the students, “Hi! How is everyone?” her voice carried well. The volume refined over 16 years science teaching. Sloane was a science teacher who also ran the advisory program and served on the school’s governance committee. She was 50 years old, mother to a teenager, middle class, and identified as a non-Hispanic, white person. During my first classroom observation, she wore a grey sweatshirt with the Pine High School mascot on it. I perceived she was a comfortable and confident educator. The year of this inquiry she taught Biology classes and one section of International Baccalaureate Environmental Systems and Societies (IB ESS). She was passionate about modern environmental issues and encouraged student political engagement. Mostly she wanted students to like and talk about science. Sloane said, “Honestly, like at the end of the day, I want kids to walk away from my classroom saying that was cool.”

Sloane invested in continual improvement, “My teaching is always evolving” and “I’m always striving to do new things as a person and a teacher.” This enthusiasm was present in the way she collaborated with colleagues to plan their biology units. During a science meeting she talked with her peers about what worked well and what lessons they could skip that did not go well the year before.

Sloane effectively navigated the tension between her intentions and collaborating with colleagues who all taught Biology classes. She said this during the interview, “My goal is like how we can change our world for the better through these lessons that I teach, and I know I can do a better job at creating those. Often time is a limiting factor.” I observed the limited time

during the evolution unit in Biology class, they had cut a film about hominid evolution and a timeline activity. I observed the following exchange with a student,

“I feel like there is too much to do in 10 minutes” a student said.

“It’s ok. We are doing the best we can” she replied. Time constraints did not curb her enthusiasm nor evolution as a teacher. What made Sloane unique in the study was how clearly, she connected this evolution mindset with class content with community.

### ***Sloane on relationships***

Sloane participated in the initial interview virtually while she visited the Lamar Valley in Yellowstone National Park. The Lamar Valley was spectacularly beautiful and historically significant in ecological sciences. The region was home to a ubiquitous example of ecological relationships in public education, predator, and prey interactions. Wolves were extirpated from their range throughout most of the U. S. in the late 1800s. Wolves from northern New Mexico were translocated for the initial reintroduction of Yellowstone wolves. Scientists documented relationships among wolves, elk, aspen trees, willows, and riverbank erosion when wolves were reintroduced to the park. Like predators being essential to the functioning of the Greater Yellowstone ecosystem, Sloane described education relationships as interdependent,

I think of relationships in the context of like, say ecology and ecosystems as they’re all dependent on each other if one changes dramatically, another one may change as well as a result of that change. So, they’re all connected as one system and if you take one part of the system out the rest of the system may not operate the way it should. [The system] may lose homeostasis, become unbalanced and become an unstable system. You know, an example we use a lot and was very relevant right now is just removing a top predator from an ecosystem or something like that. What happens when you reintroduce them?

Her explanation expressed the interdependency of a community of life forms, human and more-than-human. Correspondingly, when Sloane described her relationship with her daughter she said, “we’re just very connected and close. I depend on her, and she depends on me in different ways.” Relationships were interdependent in her personal life and expressed interdependence in her curriculum as well.

She described food webs as having the right number of predators and consumers that rightness may not be identical across systems or classrooms. Sloane said, “Homeostasis could look like so many different ways in the biology class, just how our organs function and if one organ system is out of whack, that’s going to affect the other organ systems.” Sloane formed relationships with students in her classroom, “as kids are kind of working independently or in a group, I’ll just kind of walk around the room and check in with them. and sometimes, you know, it’s a time to just even talk about things other than school.” To Sloane, academics was one part of relationship building with Pine High School students. Knowing her students allowed her to create homeostasis in her classroom with strategic student groups.

Sloane identified several “community spaces” that she interacted with during her typical school day. She started and ended her day in the science office where teachers, “kind of talk about what we’re doing in biology or another teacher who I teach with and plan with, and just kind of get started on the day, then, you know, move through my classes.” Sometimes she went to the science office in the middle of the day to talk with other teachers. Sloane collaborated with her colleagues regularly. She served on the school’s governance committee that addressed “issues at the school that need adjusting or working on and we will try to come to an agreement.” She added that she also represented teachers, “they tell me what they want me to address and then we address it.” Sloane is fully integrated into the teacher community.

### *The Place Dimension: Dynamic Places*

The place dimension of the curriculum shaped how the surrounding ecological systems were included in Sloane's Biology and IB ESS classes. The city surrounding Pine High School, Oso Creek in the Windy District, was dynamic and shifting. The schoolyard was surrounded by lawns and large mature trees, there were plenty of places for students to relax and find privacy on campus. The school neighbored an open space area that Sloane visited with her students. Both inside and outside of the building, Sloane put herself in community spaces to build relationships with other folks.

The Pine High School was among an evolving community transitioning from small farms and predominantly Latino community to an exurb, and eventually it will be contiguous with Bear Hills and the rest of the Denver Metro. The city grew in all directions from the school and to the southwest the suburbs were contiguous with the Denver Metro suburban complex. In other directions, a mosaic of small farms and exurban development. There is a clear division between the affluent areas, new developments, and the historical Oso Creek community. When I drove across the city, in a single street crossing, older houses on small farms and apartment complexes with peeling paint give way to glossy five story modern apartments. Expansive, new single-family homes were painted in muted tones. A lot of new home construction surrounded the new grocery stores (yes multiple) and strip malls.

Sloane said the population of the school changed over the last 5 years, the population shifted as whiter and more affluent families moved to the area. Sloane described the community, "[Pine High School] has a high population of English Language Learners as well as students below the poverty line. That has changed since I started working there, just due to how communities evolved over time." She rented in the neighborhood when she started working at

the school and bought in the neighboring town because, at the time, “the property values were less expensive, houses were cheaper.” At the time of this study, median household income in Oso Creek was among the top ten highest for the Denver Metro (Roberts, 2022). Only one house on listed on Great Schools was listed for less than one million dollars and half of the homes were over two million dollars. The school itself, like the other participating schools, had an apartment complex and single-family homes as neighbors.

A trail system, that extended for about 20 miles, was accessible from the southwest corner of the schoolyard. I walked around the school and to the public trail during every visit. The human constructed creek was to maintain flows and was part of a larger water catchment system for flooding events. The creek had willows and other riparian plants. The flanks were covered in tall grasses, mostly dead and dried since the previous summer. Next to the public trail was a field that appeared to grow hay. Trails connected the schoolyard, across the farm, to the public open spaces beyond. During my final observation, western meadowlarks and mountain bluebirds sang in the field. Every visit I saw people walked their dogs, ran, or simply walked on the gravel trail. I observed one person, besides me, walk from the sidewalk to the open space through the schoolyard. Sloane said the creek was,

A little oasis in a natural ecosystem that’s great for studying homeostasis and relationships. I am drawn to it because I love walking down there with students. It’s a time for us to chat and get to know each other and for kids to get to know each other.

The creek was a study site formally and informally a way to build relationships with students as they traveled to and from the creek. Also, for students to know each other.

The school building had several student areas outside. I observed they sat in small groups around the building. There was a sidewalk that wrapped around the whole building. On the south

side, the sidewalk was elevated and sitting there offered warmth, a view of the Rocky Mountains, and privacy from people moving around in the front of the building. There were picnic tables in a few locations around the building one on the north side among a group of mature pine trees. On the west side outside the cafeteria. Next to the cafeteria was a chain link fence enclosure, there was a circle of bright blue Adirondack chairs and raised garden beds. I did not observe anyone use the picnic tables, Adirondack chairs, or garden. Students leaned against the building or tucked into private nooks on the campus. The building's roof was flat and there appeared to be an extensive network of drainage, gutters, and down spouts that moved water to the moat that drained water counterclockwise around the school. The school itself appeared to be elevated to move water away from the building. From inside the classroom, I also observed that the roof collected leaves along the windward walls.

Inside the building, Sloane liked to be in community spaces. She stood in the hallway between classes. "If I'm not totally like, slammed in between classes, I try to like to stand out in the hallway and say hi to who I don't have in the class at the time." She also visited the science office multiple times during her typical day. Before school, during lunch, and sometimes she went there at the end of the day too. Again, Pine High School science teachers moved classrooms throughout the day. The students also had communal spaces that she didn't, "necessarily visit with a school day. They're more geared for students. So that would be like the commons area and the fishbowl." The school campus provided places for students to gather in small groups.

Overall, the place dimension was the context within which the school existed. Sloane oriented her IB ESS course within the larger ecological community. She regularly visited the creek as a study site where they studied macroinvertebrates and birds. Sloane similarly visited communal spaces for teachers throughout the day.

*The Structural Dimension: Open  
School Boundaries*

There were no fences indicating the schoolyard at Pine High School was separate from Oso Creek. Athletic fields had fences with unlocked gates. I observed that students moved freely on and off campus. Their school identification cards opened the front door. While I waited for the front office to answer the call button, a student swiped their card and then held the door open for other students who entered the building en masse. The following vignette shows how students moved through open boundaries with the more-than-human life.

The lawn on the west side of the building has a lot of partially decomposed broadleaf cottonwood leaves. Lawncare folks walked around the apartment complex next to the school in yellow and reflective vests. They wacked weeds and sprayed poison on the plants growing in the river rock around the buildings. Students left the building in groups of 1 to 6 today. I think it was lunch time. They disappeared in the surrounding neighborhoods. I could hear them laughing and yelling as they walked. Someone dumped their lawn clippings in the creek there were several piles of grass clippings. There were Corvids walking across the baseball field. At the water diversion and in the surrounding tall cottonwood trees, many birds sang and flew about. Northern Flickers, Blue Jays, House Finches, and Chickadees sang. I saw Mourning Doves silently drank from the diversion.

Open and free movement across the school boundary was alive in Sloane's classroom as well. She stayed in contact with local environmental organizations to present to her student or for opportunities to get politically engaged. She fostered community involvement in a variety of ways and went on a field trip to a High School Climate Summit.

Sloane invited a local Reptile Conservation organization to her IB ESS class each year. They presented about reptile conservation and brought organisms with them. Sloane said it was

amazing, “kids just get so excited to hold snakes and lizards in such so that’s just always memorable and it is for them as well. I know because they told me it was the best day of the whole year.” I would have loved to observe this presentation. The Reptile Conservation group also facilitated a teen-specific snake count over the summer that Sloane encouraged students to attend. At the local level, the city worked to meet sustainability goals. She knew a local woman was “trying to pass a bill in which gas-powered lawn equipment is banned.” Sloane used the local policy proposal as a teachable moment for her class. They discussed tropospheric ozone and different kinds of air pollution, then how that small gas-powered engines contribute. “I had students write up a letter to city council before city council voted on it,” the students included an overview of the environmental issue and actions for council could take. Students were not required to send the letter, and some students said they did not have enough information to take a position.

Students were very engaged in the community at Pine School. She said, “we have an Ecowarriors Club where students, you know, last year they planted some trees throughout the community and they’re trying to restore some of the vegetation loss after wildfires.” Students serve on the open space Youth Advisory Board to implement outreach programs. Some volunteer at the library to tutor other children in the community. There were many ways for students to be involved and, “build up their resume for college.” For environmental issues engagement, Sloane took a group of students to a Climate Leadership Summit organized by and for high school students every year at Colorado State University. While I did not attend the conference, I heard the students share what they learned at the event. I will discuss what they shared in the curricular dimension section, next. Overall, Sloane utilized the open school boundaries to make



connections with a variety of environmental organizations. This fostered relationships among students in the school and across the state, local conservation groups, and local politics.

***The Curricular Dimension: “It’s All Connected”***

Sloane said this during the interview, “My goal is like how we can change our world for the better.” While this was threaded in both her classes, it was explicit in IB ESS, which was relatively structured. She said, “I always include purpose and environmental issues in the course whether volunteering, careers, or future college connections.” She included many opportunities to get involved in community, city council comments, volunteering, future careers, and by creating “cool” experiences with her students.

As a criterion for participating in the inquiry, Sloane incorporated place into her curriculum in unique, place specific ways. She said, “the whole idea of a system and relationships between the components of this system thread throughout the course.” While she referenced IB ESS, I noticed the same thread in her Biology class when she described hominid evolution. I will describe instances of flow, cycles, and what made Sloane’s curricular dimension unique, in her words, “it’s all connected” and she included the political realm in science.

**Flow.** As described in the place and structural dimensions, Sloane included local human and more-than-human ecological communities. Like Steve and Elizabeth, this included careers beyond high school. Sloane invited outside experts to present in her class and had routines where students were conducting research and presenting to each other. Part of the invitation was, “because I’m not an expert on all things. There’s so many people that are better at this stuff than me and the kids want to hear from other people, they don’t want to stare at me for 180 days.” Everyone was a teacher, and this routine complicates typical teacher and student hierarchy by flowing information in circuitous and novel ways.

During her biology class she used the common experience of COVID to explain hominid evolution. In so doing, she connected the lived experiences of students in the classroom to support the academic content, hominid evolution. The following vignette shares part of the class,

“Is fitness like this?” Sloane squatted and pretended to lift weights. “No, biological fitness is to survive to reproduction.” Like in the hominid lab, the smarter the hominid, the more survived, therefore they were more fit. She explained that there was a struggle for existence and variation. For Natural Selection to happen there must be a lot of individuals, “we are all different and a lot the same. Why is variation important?”

A student answered, “the population survives.”

“Yes, for example, we all have different immune systems. How many of you had COVID?” Sloane asked, and 6 hands went up. “I bet all of you were exposed at some point.”

The virus was, and still is, a fully integrated member of the human community. She also referenced other human traits like diving and thriving at high elevation with a video. In this first example, she used a physically tiny example to show hominid evolution. In the next vignette, Sloane took students birding around the school building with a guest speaker.

We walked further down the path and arrived at the boundary to an Open Space area that followed a creek. The walking and biking trail extended for a few miles to the east and to the west. There was a human constructed creek that followed the property boundaries. The creek turned ninety degrees at the school boundary and between two apartment complexes. The presenter suggested that the creek was a “mixed blessing” because it provided more diverse habitat than Ponderosa forests, but often for species that “don’t need help” like House Finches and Starlings. However, I noticed some willows in this area that suggested this area was

probably used by migrating birds and maybe sparrow species. I did not observe House Finches or Starlings in the creek during my subsequent visits.

A coyote trotted across the field. A student pointed out the animal to the guest speaker who launched into another story. Coyotes were declining because humans were killing them, and coyotes were breeding with domestic dogs. The population rebounded when coyotes shifted their behavior and humans stopped “persecuting” the animals. Coyotes stopped breeding with domestic dogs and utilized human habitats. Coyote populations were rising everywhere. Sloane added a book recommendation, “Coyote America” Was suggested by a councilor on her recent Ecology Project International trip to Yellowstone.

The guest speaker said, “The birds’ songs encode a lot of information. Human and House Finch language is an appropriate analogy in the way tone and syntax communicate meaning.”

In this example, spontaneous observations occurred while the whole class was outside with a bird expert and life happened in its typically dynamic ways. The creek itself functioned as water catchment and water source for human life, but the creek had more complex and emergent relationships with the bird community. The guest speaker was the parent of a student in the class, they pointed out every bird that their father missed and got it right every time. Each animal we saw prompted a story. During the walk to the creek and back, we heard conservation stories about the following birds: Eurasian Collared Doves, Black-capped Chickadees, Nuthatches, Canada Geese, Mallards, American Robins, and Cedar Waxwings. The only bird we did not see was a Cedar Waxwing. Sloane talked with students while we walked. This vignette is a conversation between Sloane and a student.

“I found the perfect job for you!” Sloane said.

“What is it?” they replied.

“The councilors for Ecology Project International have the best time and I think you would like it. We just walked around and stopped to look and learn about lichens growing on trees and all sorts of things. I wonder if they have internships?” Sloane said. The student sounded very interested and said they would investigate. On the walk I also, overheard a conversation among students about the moral and artistic implications of artificial intelligence.

On a different day in IB ESS, Sloane invited students to share what they had learned at the Climate Summit. About twenty students had attended from different science classes. Three people from this class went and they all attended presentations about Climate Ethics and one about Fast Fashion. The following vignette shares the conversation.

A student said, “[Climate] ethics are such big questions, balancing guilt, and personal obligations. The presenter said that to be a good person is to know needs versus wants. From the Fast Fashion presentation, I learned, one in five pieces of clothes you donate are worn. It is better to reduce what you buy.”

A second student added to the first, “I was also impressed by the ethics conversation. She didn’t have anything prepared. She only answered questions from students.”

“What questions did you ask or did other people ask?” Sloane asked and the student replied,

“Who was responsible for fixing the consequences of climate change? Basically, countries that use the most have to pay. Countries who didn’t contribute are most affected. We have to balance living a good human life with [reducing] carbon emissions. A carbon free life is impossible. Reduce your emissions but you don’t have to feel guilty.”

The student also expressed shock at the working conditions of people who made clothing for the Fashion industry. People were paid fifteen cents an hour to make clothes on average, the student shared.

Sloane added, “Humans are involved in making your clothes. Five percent of the process is automated.” She stretched out her sweatshirt, “I bought this \$20 sweatshirt downstairs and its handmade.”

A third students shared, “I also liked the Fast Fashion presentation. I learned that they are the second biggest consumer and polluter of water.” They talked about dyes and washes as the way water was primarily used to make clothes. “We already knew about climate grief. They talked about doughnut economics and how there are societal comforts that we don’t want to go below, like food, education, and stuff.”

Sloane went to her computer and pulled up the economic model, developed by Kate Raworth. She pointed out that we are safe in the green area, “the safe and just space for humanity: regenerative and distributive economy” (Doughnut Economics Action Lab, 2023, Paragraph 3). The class had completed an assignment creating their own doughnut model, so I was the only one who took notes on the doughnut model. The third student stated that there are solutions to the Fast Fashion problem. There were tools to use, “labor regulations, you can regulation imports, and regulate stores. All three are needed.” There are opportunities to reduce clothes consumption. You can mend your clothes, swap clothes, boycotts, or just avoid buying new things. They said, “It sounds stressful, but once you stop [buying new clothes] its easy.”

The students who attended the Climate Summit taught the other students (and me) what they learned. This was not the only example of students teaching. Later in the same class, Sloane

assigned students different topics to quickly research and share for a climate change review in the lead up to the IB ESS exam.

There were nine topics related to climate change: sea ice, sea level, carbon dioxide, global temperature, glaciers, Greenland and Iceland, arctic, antarctica, and NASA images of change. Each student was given a topic and fifteen minutes to collect evidence for climate change by following links in the slideshow. This information was going to be used for creating a climate change concept map. Students made a slide to share with a picture and a few bullet points. Sloane told the students to use “Data and imagery” to communicate the information, this will help prepare them for the IB ESS exam. Students will have to discern information and answer questions with data, graphs, and tables. This interaction shows how she connected the content to the place where they all drank water from the same source.

The glacier student shared their findings, “It’s kind of hard to wrap your brain around that number, so I added these pictures” they said. They picked Kilimanjaro Glacier and, in the Rocky Mountains, Ice Glacier for a “local example.” The images showed a clear absence left by the melting glacier.

“What is the significance for us?” Sloane pointed at the Ice Glacier. She waited. “It’s our water source in Oso Creek,” she said. This sometimes-abstract concept of glacier melting directly related to the water that came out of the taps at the Pine School.

I asked Sloane about how the IB ESS exam influenced her intentions for the class. She said that anyone can take the class and 5 kids will take the exam this year. The explicit goal for the IB students is that they earn the IB diploma. The IB students must get a 4 or higher on the exam. Sloane said the first goal,

kind of goes against my ultimate goal of getting kids involved in environmental issues.

There is a big book to get through for the IB exam, they can ask questions about anything in the text. I always include purpose and environmental issues in the course whether volunteering, careers, or future college connections.

She added that the content was delivered through the textbook and reading. The skills associated with being involved in environmental issues and exam preparation were delivered in class. The skill for the class is to read articles in mainstream media and asking how this article relates to ESS class, to me as a person, and to find another related article. She also included opportunities to get involved in community, city council comments, etc.

Sloane cultivated flow through the structural dimension, open campus. The flow allowed students to learn from each other, with guest speakers, and from more-than-human life as well. It gave an opportunity for Sloane to offer examples of potential careers or internships after high school.

**Cycles.** In addition to inviting guest speakers back each year, Sloane and her colleagues repeated science labs in their classes annually. The labs were also a cyclical routine. Sloane listed the IB ESS labs,

At the beginning of the year, we always go to the creek and do a macroinvertebrate study. Routinely we'll collect specimens to put in eco-columns. So, we'll have those and interact with those over the course of like five weeks. They will often work with like aquatic plants and do some research surrounding those and changing certain variables to see how that affects their growth rate or their dissolved oxygen amounts.

In Biology class she listed seed germination, regeneration in planaria, and glow fish. She said, "where do glow fish get their glow? It was kind of the phenomena for genetics and so we

had some glow fish in the room.” Sloane said that the repetition of labs was sometimes due to time constraints, and she would like to experiment with different labs year to year.

The routine of labs also cycled. During the classes I watched, there was a cycle back and forth between short direct instruction, students doing something with their hands, direct instruction, and students doing something, followed by students writing their conclusions at the end. Sloane said, “they like doing things. So, anything where they’re doing something, I think they relate. When I say doing, I mean like physically going outside and collecting data and then analyzing it.” She admitted that some students aren’t into being outside, but most students were excited. She added, “that’s where they get the most learning from and that’s when I see that they’re most engaged is when they’re physically moving and manipulating objects.”

In this vignette, students are completing a lab where they conduct several measurements of animal skulls. Students measured replicas of hominid skulls fossils and used the data to make an argument about how hominids evolved on Earth. She opened class with a video about Tibetan and Bajau people who had unique adaptations to high elevation and free diving respectively. Once the video was over, she started with direct instruction and then released the students to conduct measurements.

Sloane said, “There are lots of examples of human population changes over time. The goal is to observe hominid change over time. Why are they changing over time?” she paused. “The environment is changing over time.” She projected an image of many hominids from different times including a chimpanzee and a gorilla. “What do you notice about these skulls?”

A student raised their hand and described the differences in the jaw and face shape.



Sloane added, “that is the prognathism ratio” and she explained what it was and asked, “Why would they have a high prognathism ratio?” A student said that maybe a change in diet influenced the jaws.

“Our diet changed. We are cooking more now. [in the past] our face needed to be stronger. What is the difference between the chimpanzee and the human [skull]?”

“One stands and one is on all fours” a student said.

“Yes, bipedal and quadruped. Hominids needed to stand upright to be hunted or not to be hunted.” Then she started giving directions to students about how they would complete the measurements and where to find information in the booklets for each hominid skull. “Each table has a booklet and a skull and calipers.” She showed how to use the calipers.

“If I measure A to ... ,” she put on her glasses, “B,” she pushed her glasses back on top of her head, “I use the calipers that are used to measure awkward shaped things.” She held the skull up and measured A to B, then put down the skull, lift the ruler to get the measurement from the calipers, “It’s really a two person job.” She released the students to find their popsicle sticks on the lab tables. These were the lab groups that the students would rotate in for the curation of the hominid skull lab. They had about ten minutes at the table to measure the skull, fill in the data table, and look through the booklet for information about geographic distribution, tool use, geologic age, and any key species traits.

Students worked at the tables. They called out measurements to each other and flipping through the booklets. The pages in protectors slid against each other in students’ hands. Sloane stopped to answer a student question about what tools *Ardipithecus ramidus* used,

“That’s the oldest hominid so they didn’t use tools yet,” then she moved on.

“Take 30 seconds to finish measurements and then we will move clockwise.”

She answered another question about tools, “Homo sapiens, we are everywhere. Stone tools? We use all kinds of tools: computers, cars, and lots of things.”

A couple minutes later, the rotation happened. About half the groups went counterclockwise, Sloane said, “you should have gone here, oh well, it doesn’t matter,” waved her hand. The next station went faster, students jumped right in.

“Start with A to B.”

“How do you know if it’s a stone tool or not?”

“I feel like that one is missing pages” said the group that had just come from *Ardipithecus ramidus* to the *Homo sapiens*. The new *Homo sapiens* group was confused by the stone tool question as well.

Sloane said, “Can we use our own lived experiences to answer this question?,” and she walked around and answered questions with the other groups. Towards the end of class, they packaged up the skulls for the next teacher to use.

“That was just jaw dropping” a student said, deadpan.

“It was jaw dropping, you are right” their table partner replied.

The following day, I observed the conclusion of the lab. The first twenty or so minutes were for students to complete the short answer questions about hominid evolution. They reviewed the answers together. The second half of class was dedicated to natural selection. The lesson followed the same pattern that cycled between direct instruction and doing something. The students listened and then Sloane gave directions for students to make a four-panel comic to show the process of natural selection using examples from the textbook or students could find their own.

I observed cycles happened at two scales simultaneously. There were annual cycles of labs, many with annual data collection components, and there was a lab cycle routine. Sloane said that she saw the most engagement when students were doing something with their hands, and she oriented her class to keep student interest in science content.

**“It’s All Connected”**. Sloane had similar flow and cycle components of her curriculum as the other participating teachers. What set Sloane apart was her inclusion of the political realm as connected with science content. While other participating teachers’ curriculum had political implications, multifactorial genetics for example, she was the only teacher that I observed who explicitly connected science content to political action. She said that her students “were getting involved with local and global environmental issues” during her class. In the following vignette, the guest speaker also connected life, human life (agriculture in this case), and place relationships.

The guest speaker said, “the ability to predict the future in complex systems is pretty poor” and jumped into the next story, Cackling Goose and Canada Goose. Twenty years ago, humans in Eastern Colorado changed agriculture practices which in turn changed the migration habits of both birds. Canada Geese were an icon for long-distance migrations. They no longer migrate. Wildlife managers developed a plan to respond to population declines. The plan was “well intentioned, but not well conceived.” Eggs were taken from nests and the chicks were raised by adults with clipped wings. The offspring never learned to migrate. Combined with the abundant grains from agriculture practices and use of abundant lawns and water catchments, they no longer migrate.

The Cackling Goose migrated from Baffin Island to Mexico. They were relatively rare because many of them died during migration or arrived in the tundra when food was scarce.

When agricultural practices changed, “waste grain” was available all over the Midwest U. S. and including Colorado. The birds ate the grain which increased their survival rates and grew the population. They moved near the north pole to breed and ate so much grass, the albedo affect was altered. Warming and drying the tundra. Fire risk increased and a few years ago, fires broke out all over the Alaska and in some places, fire burned in the exposed peat releasing more greenhouse gasses, raising global temperatures.

“It’s all connected!” said Sloane.

The geese species range was directly related to agricultural practices that were connected to wildlife management and farm policies. This guest speaker was explicitly political by encouraging students to vote and educate their circles about conservation. The Reptile Conservation organization advocated for citizen science and fir student to get involved in ecological conservation efforts. There were other examples of political connections. The climate change concept map included international agreements about climate change and carbon emission reductions. While students worked on their maps, she invited them to consider the true cost of coal and government subsidies, all political. The had previously discussed deforestation and extinction biology, the direct consequence of economic policies in diverse countries. She said, “We talk about animals and extinction rates and things like that and understanding why these animals are important. We may talk about coral reefs ecosystems and climate change,” for example. I previously described student letters to city leaders about gas-powered lawn equipment. There were multiple connections to the political realm at the local and global level.

While the students cleaned up hominid skulls, a student said, “Did we ask for consent?” The comment reminded me that during the interview, Sloane said they did dissections rarely in Biology class and, “we tried to make a point of you know, showing reverence for these

creatures.” I asked Sloane about this student’s question, and she said that the biology class had done a gender and genetics section where they discuss the ethical implications of genetics research. They did a lesson on consent and how consent was needed to participate in research. She used the story of Henrietta Lacs and the Tuskegee experiments as examples. The current and past consequences of research consent are explicitly political in that there were policies that enabled non-consensual research in the past, this tradition continues today. The students made connections across units.

### *Sloane in Conclusion*

First and foremost, Sloane defined relationships as interdependent and this sentiment was embedded in her curriculum. Pine High School existed within a dynamic and changing community. Subsequently, Sloane included local ecology and local experts into her classroom. She utilized an open campus boundary to make connections among place, students, and science content. Sloane was unique in her explicit connection among the science content, more-than-human life, and human political realm. She was passionate about environmental issues and inviting students to get engaged. The opportunities she provided were often local and immediately perceptible by students. She taught me to connect human life within the larger political realm, to think bigger than the school. I remembered that the school was political place, nested within a larger political place.

### **Conclusion All Participants**

Each place where I collected data there was a more-than-human life that drew my eye and taught me something about the educational situation. At my first study site, the Plains School, a dusting of snow revealed animal movement patterns in and around the school. Rabbits, squirrels, cats, Canada Geese, corvids, and dogs, moved freely around the Plains School campus.

The prominent fencing was constructed, surveilled, and obeyed by human life alone. More-than-human beings could fly over or crawl under the fence, they were not subject to the human constructed boundary. Mr. Pink also broadened my view to include not only mythological creatures but also the potential for life beyond Earth. At my second site, Foothill High School, I noticed that leaves and trash gathered along the fence lines. The trash caught my eye first and then the Spotted Towhee going about their daily routine pointed out to me that the leaves offered food. There was sustenance at the boundary. Steve pointed out how ecological movement, flows and cycles, also defined curricular dimensions. Further how an integrated approach to biology curriculum provided the opportunity for students to not only teach each other, but to also be intellectually sustained by what gathered at the academic boundary between science and other academic disciplines.

I returned to the Plains School, outside the building the songbirds had begun to sing and communicate with each other more often. They were at times quiet and other times loud. The birds collectively matched each other's volume much like Elizabeth. Her soft-spoken demeanor and introversion profoundly shaped her classroom and was echoed by students. At the Pine School one day I observed corvids who called back and forth to each other. The sound bounced off the walls of the school building, amplifying their voices. Students moved across the open school boundary and into the neighborhoods. I noticed human life and more-than-human life changed dynamically in this community. Sloane reflected this dynamism in her teaching practice by incorporating environmental issues in her classes. She encouraged students to amplify their political voices about environmental issues.

### **Patterns Across Flows and Cycles**

In the previous section I described the educational situation for four teachers. I used ecocriticism, an offshoot of educational criticism and connoisseurship (EdCrit) to filter participant observations inside the school building to reveal ecological patterns in the education situations (Moroye, 2007; Uhrmacher et al., 2017). I used cyclical coding to continuously review and confirm themes (Eisner, 2017; Saldaña, 2016). To answer the study questions, I coded participating teachers' interviews individually and then I explored global, pattern-finding, and cross-checking annotations as the interpretation and evaluation process occurred (Uhrmacher et al., 2017). For the remainder of Chapter IV, I will share the findings that emerged from looking across participants and their school situations in response to the two research questions:

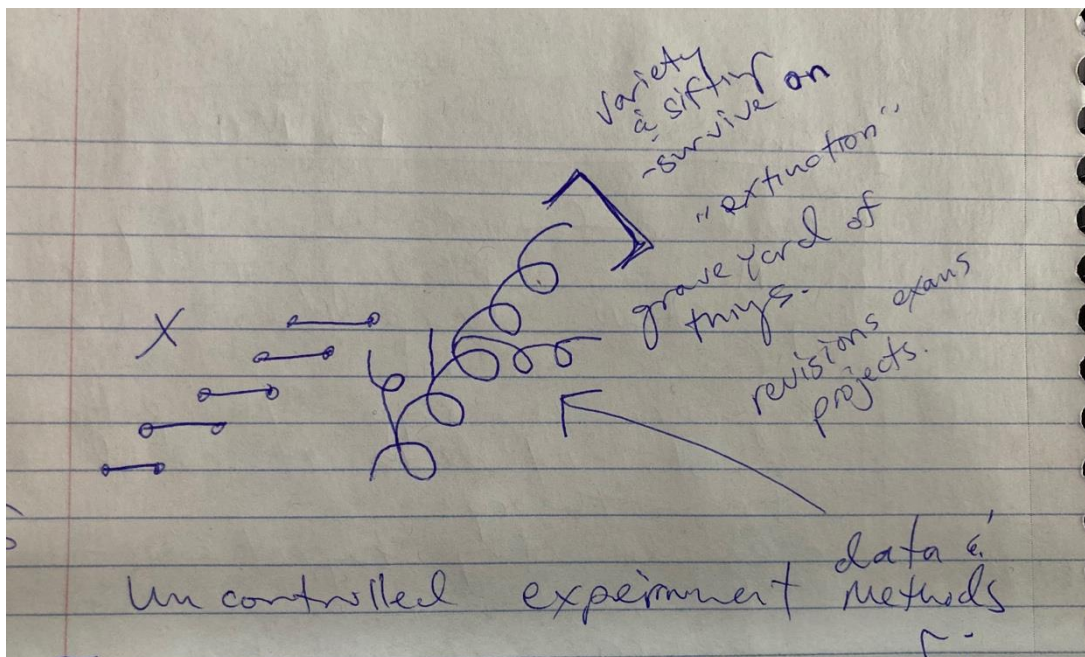
- Q1    What relationships exist among life, human life, and place in school communities?
  
- Q2    How are those relationships expressed in the school curriculum?

The sections that follow begin the response to the questions. Chapter V will further illuminate the findings and their significance. Adhering to my understanding of ecology, a wholistic, interdependent system I open the view widely for the remainder of Chapter IV. For all the following situations happened simultaneously. I could not remove one description without taking from another. I kept thinking about a doodle that Steve and I drew together when we discussed the ecology of schooling (Figure 1). I shared my understanding of time as it functions linearly in schools. What I thought happened and what he described was cyclical, I drew it as a spiral. He took my pen and added the curls and offshoots of the first spiral. He said, "there is a graveyard of things" that he tried and didn't work or were no longer relevant. Some of the activities, "went extinct" and some survived a sifting among a variety of experiments. School was an "uncontrolled experiment." For Steve, the offshoots were the data and methods he used to

sift with the students to improve his courses every year. We can say that this first response to the research questions includes some of the graveyard. I include them because I don't know if they lead somewhere or nowhere, someone else might find them of value or I might find them useful later during the third, fourth, or fifth review. Chapter V holds the findings that made it through the sifting, they will be foregrounded there.

## Figure 1

### *Uncontrolled experiment*



*Note.* This doodle was a spontaneous collaboration between Steve and I that showed how we collective view schooling as an evolutionary or uncontrolled experiment.

## Research Question 1

Q1 What relationships exist among life, human life, and place in school communities?

To respond to the first research question, I foregrounded familiar situations so we may see them anew (Eisner, 1992). I paid particular attention to ecological relationships and what



they may teach me as an education researcher, the meaning for participants, and for education community at large. Extending the teacher descriptions, I organize the response by structure, flows, cycles, and confluence. That said, distinctions among the themes are amorphous. Ecologically speaking, they are interdependent and inseparable. They are all happening simultaneously and organized so that we may see the part and the whole. We may touch the wave and know it is part of the ocean (Doll, 2000). Or, in this study, it seemed appropriate that we touch the stone and know it is part of the Rocky Mountains being transported to the sea. Carrying the descriptive pattern from the individual teacher descriptions, I will go in the same order: flows and then cycles. The confluence of flows and cycles will be in Chapter V along with the significance for participants and educational community at large.

### **Permeability: The Structural Dimension**

Louis Sullivan proposed “form follows function” which is considered an architectural axiom that influences systems design in a variety of disciplines. The concept is used to explain the organization of life from cells (Mukherjee, 2022) to global ecosystems (Carroll, 2016). “To begin with, a bounded, autonomous living unit--a closed unit that bears the laws that govern its existence--must have a boundary” (Mukherjee, 2022, p. 75). Similarly, we can say that to understand the educational situation, we look within the school building. However, to live, the cell and the school must be porous, “A cell needs pores to permit nutrient to move in and out ... Every such opening is an exception to the rule of integrity; after all, a doorway to the outside is also a doorway to the inside” (Mukherjee, 2022, pp. 75-76). From the smallest unit of life to the largest, we see that both the inside of the cell and the surrounding bodily system are interdependent and mutually constitutive. Schools are similar in that permeability allows flow of

bodies, knowledge, ideas, and energy in and out of the building. Teacher participants simply opened the doors to invite flow.

The concept “form follows function” also applies to the ecology of schooling (Eisner, 1992). When I tried to pull apart observations from the curricular dimension from the structure itself, I noticed they were inseparable. The structure enabled the functioning of the school. Eisner defined the structural dimension as, “how the organization forms of schools--how the school day is divided and how subjects are assigned to time blocks--influence what students learn” (Eisner, 2017 p. 74). The organization of time and space shapes teacher practice and student learning. “Understanding the influence of organizational structure in schools provides a basis for considering its utilities and liabilities, its benefits and costs. It allows us to consider other ways of doing things” (Eisner, 2017, p. 75).

During this dissertation, I expanded the view beyond time to physical spaces so that we can see movement in and around schools, or human relationships to place. While I conducted spatial indexing surveys at the Plains School, I noticed that more-than-human life did not obey the human constructed borders surrounding the school property. The mice, corvids, squirrels, rabbits, and house cats showed me that life moves through permeable boundaries. The teachers who participated in this study also utilized permeability to draw from their surrounding community. I begin outside the building, from the largest view of place to respond to the first question: What relationships exist among life, human life, and place in school communities?

### **Permeable Landscapes: Lawns**

Suburban front lawns, public parks, and school properties were aesthetically contiguous at Foothill and Pine High School. I observe, anecdotally, that the continuity is a common feature of suburban schools. Ecologically, the lawn is a relatively homogenous community, Kentucky

Bluegrass (*Poa pretensis*) the dominant species. At the schools, the unmaintained areas around the schoolyards had more diverse plants and animals. The aesthetic connection across lawns and schools appeared to provide a community space for the human residents and their dogs. The park, the school lawn, and individual front yards all contribute to the parklike community aesthetic. As this vignette shows, the lawn required human attention and was a permeable boundary between the schools and the surrounding community.

Pine High School. The lawn on the west side of the building had a lot of partially decomposed broadleaf cottonwood leaves. Lawncare folks walked around the apartment complex next to the school in yellow and reflective vests. They wacked weeds and sprayed poison on the plants growing in the river rock around the buildings. There were several piles of grass clippings in the creek where, the previous growing season, someone had dumped their lawn clippings. At lunch time, students left the building in groups of 2 to 6 people. They walked across the school lawn and disappeared in the surrounding neighborhoods. I could hear them laughing and yelling as they walked.

Humans were not the only users of the lawn, the vignette showed. Two bird species were observed in the lawns of all three schools, Canada Geese and Common Ravens. Additionally, humans and their dogs were abundant on the school lawn at Foothill and Pine High School. At the Plains School and Foothill High School, the lawns were covered in goose poop and their honking in large groups was constant. The geese moved from one lawn to another throughout my observations. While I was at the Foothill High School one day, there was hundreds of geese that were chased by dogs or flushed by students walking across athletic fields. The geese never seemed to rest, always vigilant. Corvids were also observed at all the schools. They walked in pairs or groups of three across the school lawns. Looking for insects or chips morsels perhaps

left behind after an athletic event, lunch, or recess. They were particularly active and thriving around the Plains school where their conversations never seemed to end. Every visit to the school, the corvids called back and forth to each other in and around the schoolyard.

While lawn was the dominant landscape in and around the suburban schools. The areas surrounding the lawns had relatively diverse plant communities that followed the water catchment system and places left unmaintained or unmanicured. The delineation between habitats was mobile and amorphous. All the schools had mature trees. I observed Ponderosa, Broadleaf and Narrowleaf Cottonwood, Russian Olive, Willows, and Common Junipers at all the schools. I observed birds at all the schools. I observed them in trees, foraging in leaf piles, nest building, alarming when hawks flew in, or flying overhead. The species observed reflected favorable habitat for nesting, eating, resting, mating, or simply passing through (Table 11).

The schoolyard was an ecosystem that grew grass, collectively, lawns. The lawn and the relatively diverse pockets and edges housed many bird species. The lawns functioned permeably, through which life flowed. Next, I summarize the patterned from coding across participants for the two pre-figured foci flows and cycles.

**Table 11***Bird Lists for Each School Community*

School Community	Observation Window	All bird species observed
Plains School	January 20-February 20	Canada Goose, Mallard, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Common Raven, American Crow, Blue Jay, Black Capped Chickadees, White Breasted Nuthatch, American Robin, European Starling, English Sparrow, Dark Eyed Junco, Red Winged Black Bird, House Finch,
Foothill High School	February 13-March 22	Canada Goose, Mallard, Turkey Vulture, Rock Pigeon, Common Raven, American Crow, Magpie, Black Capped Chickadee, Cedar Waxwings, Spotted Towhee, Townsend Solitaire, Dark Eyed Junco, Red Winged Black Birds, House Finch,
Plains School	March 7-April 17	Canada Goose, Red Tailed Hawk, Unknown Gull, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Says Phoebe Common Raven, American Crow, Blue Jay, Black Capped Chickadee, Bushtit, White Breasted Nuthatch, American Robin, European Starling, Spotted Towhee, English Sparrow, Dark Eyed Junco, Red Winged Black Bird, House Finch,
Pine High School	March 16-April 26	Canada Goose, Mallard, Eurasian Collared Dove, Downy Woodpecker, Northern Flicker, Common Raven, American Crow, Blue Jay, Western Meadowlark, Black Capped Chickadee, Red Breasted Nuthatch, Mountain Bluebird, American Robin, English Sparrow, House Finch,

*Note.* All observations occurred during spring in 2023. The presence of each bird species indicates that there is favorable habitat for them, a relationship with place, plants, or other birds. Habitat could be for food, hiding, nesting, mating, or migration. Birds were listed in phylogenetic order based on ornithology convention and the Sibley Guide I had on hand (Elphick et al., 2001).

### **Flow: Schools as Water Catchments**

The Denver Metro experiences 14.5 inches of precipitation on average per year (National Weather Service, 2019). What precipitation that does fall can sometimes come in downpours. Snowfall that accumulates in the mountains over the winter melts in the spring. Both kinds of precipitation can produce large volumes of water that runoff the surface. This occasional, intense water flows shaped the current appearance of the Rocky Mountains as erosion by water that moved mountains (Abbott & Cook, 2012). Suburban communities often use water catchments to move water away from homes, or commerce and to store the precious water in reservoirs for use in dry periods. Prairie Heights, Bear Hills, and Oso Creek municipalities captured water for the human community for use in homes, agriculture, and commercial use. Again, the structure of the system determined the flows of water in and around the schools.

Each school had a unique water catchment system that influenced which animals lived at the school and how they moved around the schoolyard. At the Plains School, the school touched a seventy-mile trail system that also served as a channel to move water during extreme rain or flooding events. There was also a catchment pond behind the school that drained the undeveloped area and the AstroTurf soccer field. At the time of the study, an upturned shopping cart was frozen in the middle. Foothill High School was constructed on a piedmont, so water flowed around and away from the school. The surrounding neighborhood had a network of gutters and curbs that moved water to either the creek on one side of the piedmont or lakes on the other. The two lakes were in a public park next to the school and collected water from the surrounding neighborhood. Pine High School was built in a relatively flat area. The school itself was surrounded by a moat like water catchment system that move water counterclockwise around the school to the neighboring creek. This was the water source for Bear Hills and Oso

Creek that originated high in the mountains. At the watershed's headwaters, there was a glacier and a complex water system that delivered water to the community.

Eppert (2009) asserted that water is a teacher. Water may assist humanity in remembering our relationships with the self and our world. She calls this “remembrance learning” (p. 192). Water, as she described, was powerful because it moved, yielded, and followed the least resistant path. Eppert (2009) drew from Eastern thought instead of Western traditions,

When we enter Hindu, Buddhist, and Taoist thought, however, we find expressions of a very different relationship to water. Water is perceived not as an object of control, mastery, exploitation but instead more reverently as a medium for educational insight. Much of this thought articulates the worth in remembering and becoming mindful of the properties of water and ways of water. From this natural resource, we learn possibilities for living with each other and with our environment with integrity. (p. 192)

The Denver Metro, like most of the arid western U.S., meticulously channels and stores water for human use. In this way, humanity attempts to control water flows. However, water control is only temporary. I contend that water catchments striving for predictability is a metaphor that teaches educational theorists and teachers about what we desire. Water reveals what we supply with water as a life force. Water's unpredictability also teaches, water literally changes landscapes as knowledge changes mindscapes. What happens in the classroom when the flows spill out of their catchments or vice versa, new tributaries join the preexisting rivers or streams? In either case, we may learn from “moving with rather than struggling against the forces of life” (Eppert, 2009, p. 198). Similarly, Steve said,

I can think about education in the sense of ecology there is there is flow of things, there's flow of knowledge, flow of ideas. There's, there's also a, there's just there's just a flow

of the of the year. There's a flow along, and then there's this estuary at the end or something and they go off.

Steve similarly highlighted water as a metaphor to describe students and learning in his high school science classroom. Water also reveals movement of knowledge among classrooms. What direction are knowledge and ideas moving about the room? Who stores the knowledge and under what conditions do they flow to the community? All four teacher participants used established routines of direction instruction, a one-way flow through a predictable flume from teacher to student. More often, they created learning flows among students so that student learned from each other. All the teachers organized their classrooms in groups of four and students routinely had time to work collaboratively and to present to each other. Further, they learned from the surrounding ecology, positioning nature as a teacher.

Schools behave as water catchment systems within a larger watershed. Viewed on a long-time scale, a school is one stop on a path to an adult, human life beyond the K12 education. The school is a brief catchment pond as water travels from the mountains to the sea and back again. Water is always moving. The community and colleagues that mix into the school are ephemeral and evolving. On a relatively short time scale, people gather in the building for the day, they collect, and then are released. Flows, become cycles. Further, water flows are a small fraction of the larger hydrologic cycle on Earth. I will discuss predictable and unpredictable flows to respond to the question, what relationships exist among life and place in school communities?

### ***Predictable Flows***

Water moves across the landscape through human constructed water catchment systems. Humans do their best to construct predictability. Suburban settings in the Denver Metro must plan to move water during large precipitation events or during spring, when snow melts.



Paradoxically, suburbs also plan to store water for dry times or buy water from other places in the state. Planning for consistent water availability as it moves across the landscape is integral to suburbs and all human life. Sloane discussed water during her International Baccalaureate Environmental Systems and Societies (IB ESS) class. Glaciers melting in faraway places, like Kilimanjaro for example. Glaciers melt in near places too, like Rocky Mountain National Park. Both glaciers melting are precarious situations because both glaciers store water and melt predictably to flow to human communities.

Teachers may similarly construct lessons for predictability and a consistent flow of information leading to a specific end. When oriented to exams, units and lessons deliver knowledge from a text, a lecture, a science lab, a research project, or concept map to prepare student to pass an IB ESS exam for example. For the students, there is a known starting and ending point for their year. Throughout the course, they collect information and skills to prepare them for their exam. Sloane, Elizabeth, and Steve similarly prepared their students for AP and IB exams in the spring. Mr. Pink prepares his students for participation in the National History Day (NHD) competition and for 8th grade Colorado Measures of Academic Success (CMAS).

At all the schools, I observed that more-than-humans flowed across the permeable school property boundary. The school functioned as contiguous with the surrounding community. The ambiguous boundary makes the schoolyard a public space that hold many uses for the community involved. Teachers utilized schoolyards and neighboring parks for their classes. Community residents similarly used parks and schoolyards throughout the day. Further, the teachers each integrated unique place-specific elements to their curriculum. Mr. Pink and Elizabeth leaned into cultural, religious, and career connections that increase student engagement. Steve and Sloane used the surrounding ecology to conduct research, opening the

flows of information from beyond the school building into the classroom. All the teachers similarly invited local experts to share knowledge with students.

### *Unpredictable Flows*

As much as humans design water catchment systems. Water still moves in unpredictable ways. Ingman (2013) states that teachers tend to think of education as a straight line or, “experiences as building toward a destination in particular, rather than honoring the unpredictable and circuitous paths our lives may take” (p. 397). Winding and meandering paths also lead to learning, although, not in a straight line (Ingman, 2013). Water movement is impacted by changes in volume, intensity, state of matter, toxicity, slope, substrate, debris, and speed to list a few. Even small changes change flow dynamics and interactions with life. Along the way, human and more-than-human life will interact with that water and may consume it in unexpected ways. I observed Canada Geese drink water from a driveway skirt and two Northern Flickers drink from a tiny puddle of water. Life drinks from the obvious places and unexpected place too. Which led me to observe that students also learn in unpredictable ways.

In Elizabeth’s Health class, she was explaining health risks associated with alcohol consumption. Alcohol affects organs in a variety of ways. The brain, the liver, and heart were all discussed with students. Students made novel connections to cauliflower sandwiches and enlarged hearts. Elizabeth constructed a lesson to deliver information about how alcohol consumption harmed the human body and planned to detail the organs individually. She did share the academic content and students made unpredicted connections to their 5th grade class, fatty liver, and then cauliflower sandwiched from Chick-fil-a. Along the unstructured path, the students laughed, and she celebrated a student for having a useful, big heart. Steve, being a science storyteller, shared Gregor Mendel’s story. He summarized how Mendel had come to

understand the genetics of pea plants and the significance of Mendel's work in the context of human understanding of evolution. A student asked, "What would have changed if [Darwin] had? If he had read Mendel?" In Sloane's class, while the students cleaned up hominid skulls, a student asked, "Did we ask for consent?" I asked Sloane about this student's question, and she said that the biology class had done a gender and genetics section where they discuss the ethical implications of genetics research. They did a lesson on consent and research. She used the story of Henrietta Lacs and the Tuskegee experiments as examples. These connections were not planned nor predictable, they emerged as students encountered planned academic content.

Mr. Pink, who skillfully adapted his curriculum to include emergent happenings in the school community, responded to students who came to class and asked, "What are we going to do about the kitties Mister?" He assured the students that the kittens would be cared for. The Humane Society picked up the cats and took them for medical care. The current and past consequences of research consent are explicitly political in that there were policies that enabled non-consensual research in the past, this tradition continues today. The student made unpredictable connections across units. In all these examples, student questions connected the planned curriculum with something unpredicted by the teachers. The teachers "honor[ed] the unpredictable and circuitous paths our lives may take" (Ingman, 2013, p. 397). Or the moved "with rather than struggling against the forces of life" (Eppert, 2009, p. 198). The teachers let the students drink from wherever they were drawn and let their minds make connections to the academic content in novel ways.

### ***Flow: Schools as Water Catchments in Conclusion***

As a resident of the Denver Metro, I am aware of the role that water catchment systems move water throughout the state to deliver to my tap a predictable stream of water. During this

study, I observed that the water catchment systems in and around schools were reservoirs for biodiversity amongst a lawn dominated landscape. The three science teachers, Steve, Elizabeth, and Sloane all used the human constructed riparian ecosystems on their school properties to conduct invertebrate research. This literal connection is useful. The metaphorical exploration of schools as water catchments is also useful to show how both predictability and unpredictability are educative experiences.

Pinar (1975) conceptualized as *currere* or “running the course.” We may imagine it as a constructed course that student move along towards “testing season” as Steve said. In the case of AP and IB tests, students return to the same end annually, albeit different students. So, the end is fixed and the who arrive there are different. My worry then is that we are teaching that there is one answer to complex questions concerning humans and more-than-human relationships. Further, that this perception is replicated repeatedly in different minds. Pinar (1975) states, “I can look at my life in a linear way, acknowledging its actual multidimensional character, but limiting my view to a linear one, to make it more manageable, and I see that this has led to that” (p. 19). The timeline has a biographical coherence, not always logical, but lived in relationship to past (regressive) and future (progressive). Also, the continuity with the present (analytic) and all of it in a social, political context (synthetic). Pinar (1975) left out the ecological. When we envision schools as water catchments that attract human and more-than-human life around them, we can see interrelatedness of place, people, and life clearly. Further, that anything done to make knowledge manageable, like water catchments, is temporary.

Doll (2000) proposed *currere* as “running water” that “courses through,” culture, time, dream, images, moments, and symbols (p. xi). As she discussed, coursing was “passion and suffering – both necessary to reignite the fires of imagination and recharge world views” (Doll,

2000, p. xii). Water moving across the landscape collects all manner of runoff, leaves, logs, human trash, dead animals, pollutants, or more water from tributaries. Water collects material as student collect knowledge and meaning. Water moves, evolves, and changes direction. Water offers reflective surface and moments of deep, wide internal reflection not always visual in nature. Herman Hesse's *Siddhartha* bends over water to hear and see better. Water is also home to snakes and creates fragile frozen caves that defy human control (Doll, 2000). Doll's discussion reminded me that water, like world views or ways of being, carried many possibilities.

Humans may construct, what they suppose, is predictable flows, but the control is temporary. Water will course through the landscape along the path of least resistance which may or may not always align with human water catchments. Further, reflections are uniquely individual to student, teacher, and community. A curriculum that leaves room for unpredictability is delightfully refreshing, like a swim in mountain stream or lake. The precarious path that humanity is on, is not set in stone. Even if it was, water erodes stone carving new paths to the sea. In the classrooms, circuitous (Ingman, 2013) or unpredictable moments sparked laughter, care, imagination, and ethics into the routine movements of the participants' classrooms. These may not necessarily lead to a correct response on an AP or IB exam, they do honor what students bring into the classroom and make room for relationships among life. The four teachers moved "with rather than struggling against the forces of life" (Eppert, 2009, p. 198). The reflective nature of schools as water catchments, also offer a place where students may integrate themselves into the ecology of schooling instead of simply move through it on the way to something beyond. Eppert (2009) asserts that water is a teacher. Water may assist humanity in remembering our relationships with the self and our world. She calls this "remembrance

learning” (p. 192). In observing the flows across the landscape and among the school communities across permeable boundaries, I remember that a flow is only a part of a cycle.

### **Cycles: Suburban School Commutes**

The second theme that illuminates human relationships with place was cycles. Steve described school that cycles annually. He said, “curriculum tends to cycle starts over again. A group of students coming in, it’s like, Alright, here we go again.” His statement drew my attention to the ways that cycles manifest in the routine happenings of schools. Class periods cycled through school days and science itself is a cycle. Concerning place and human life relationships, the daily commute to and from school happens all over the U. S. I observed children traveled to school by school bus, public transit, private vehicles, riding bikes, and by foot. The embodied oscillation in and out of the building determined by district start and end times. In so doing, they connect the community outside the school and with the innards of the school building. I imagine each building breathing in, filling up with children and school staff. At the end of the day, the building breathes out, releasing the people for the evening. Further children travel through the suburban landscape to get to school. Mr. Pink asked students to apply their map making skills by making a map of how they traveled to school. There was a wide range of awareness about their route and where the students lived. Some drew a short path from the apartment complex next door, other students used google to map their route or to look up street names, and some students did not know their address. There is potential in commutes to foster relationships with place.

The daily, cyclical, commute is a mundane process and integral to suburban life could be a place for renewing relationships among life. Like water flows being predictable and unpredictable, humans coursing through a landscape may learn from the routine (Doll, 2000).

What do students encounter along their walk? Do they feel safe? What questions arise from the experience? Pinar (1975) stated “return to the chair and this dwelling in imagined future states several times on different days over a period of several days or weeks or months. Such elongation of the experiment reduced the possibility of distortion of temporary preoccupations” (p. 25). I observe that when I visit the same place repeatedly, subtle changes become apparent. A flower bloom here or a fallen branch or a dead bird, all invite me to notice, then imagine what happened. In routine observations, the baseline for the place also emerges. Birds preening or Canada Geese resting, indicate safety, for example. Conducting observations outside the school building during each classroom observation taught me to imagine and visualize what may happen when the place is beyond my perception.

Judson (2010) states, “Getting outside and encouraging students to get up close and personal with the land can engage the sense and allow students to learn about nature from nature. We can work to shed the layers between students and nature” (p. 26). While getting outdoors may be difficult because of any number of real or perceptual barriers about what educative experiences exist, perhaps students’ observations from their daily commutes can be incorporated into academic content for any discipline. Commutes could be especially interesting for those students who walk to and from school, but there are plenty of things to observe from a car window since suburbs rely on vehicles to span sprawling communities.

Suburban growth coincided with the rise of the automobile as a form of transportation (Lindstrom & Bartling, 2003). The increased reliance on vehicles instead of walking or biking has physical and mental health consequences for children. Ding et al. (2023) found that long commutes, greater than 20 minutes, negatively affected adolescents’ health status as measured in self-surveys, mental health, body mass index (BMI), and frequency of illness and absence. Long

commutes hampered cognitive ability, particularly in math grades. Loss of sleep and decreased mood correlated with an increase in commute time. The study took place in China, which enacted open enrollment policies in 1997 that transformed school transportation and attendance. For students traveling by bus, they are likely exposed to more particulate matter pollution than students walking or biking to school (Gilliland et al., 2019; Sabin et al., 2005). How children commute to school is determined by a variety of factors including parking, bus availability, vehicle ownership, or parent work schedules which all seems obvious. There are also socio-political factors like redlining, physical safety, sidewalk continuity, or temperatures in treeless neighborhoods (Kowalski et al., 2023). Simply stated, school commutes have physical and mental impacts on young people.

I observed that for all three schools, personal vehicles were the primary way that children commuted to school. There was no school bus service at the Plains School. At Foothill and Pine High Schools, the daily commute included many student drivers. All the schools in this study were on a bus route. Buses arrived the most frequently at Foothill High School and least frequently at Pine High School. I also observed high school students walking to and from school during the school day. Both Windy district schools had bike racks that were nearly full each observation. Walking commuters were also present. At the Plains School, I saw children walking in groups, reflective of the familial relationships that existed across the K12 school. Steve, the only teacher who walked to school, loved his commute through the neighborhood. He experienced the beauty of the place daily. He commuted to and from school by foot, “we didn’t want to drive, we wanted to walk. We wanted our daughter to walk to her schools.” Steve appreciated the aesthetic beauty of the place. The beauty of this school’s campus was undeniable. I think it might be the most beautiful high school location in the Denver Metro.



In conclusion, the daily, suburban commute is mundane, but it could also be fodder for the ecological imagination. Judson (2008) states, “Awareness of our own bodies’ positioning and movement in space represents one of the earliest ways the body situates itself in the world” (p. 198). Bodies traveling across landscape evoke relationships with time, size, weather, and with the more-than-human world. Novel experiences, like a close encounter with a corvid, also foster inquiry in the classroom, how do they make so many sounds? Traveling by car in the Denver Metro, people will observe prairie dogs or roadkill, which also spark questions. Why is there always roadkill at a particular spot on the road? Judson (2008) continues, “our emotions and other senses of sight, sound, smell, taste, touch allow us to connect with the cultural and ecological community into which we are born. ... We reach out to and encounter the world through the use of the body’s tools” (p. 199). This embodied, daily relationship with place in suburban contexts fell outside the scope of this dissertation. However, this warrants further attention because the daily commute may be a course to renewing relationships with place. I will discuss the ecological imagination more in response to the second research question. Humans cannot observe vast expanses of time. Humans can observe a thousand mundane interactions to see something unique or how seasonal changes accumulate on their daily commutes, should they notice.

### **Research Question 2**

Q2 How are those relationships expressed in the school curriculum?

I combined ecological and educational research methods in a postmodern ecological framework. I accept that human life is in relationship with all life of Earth. Life relates in evolving, unpredictable, expected, and unique ways. This complements Eisner’s ecology of schooling as a holistic, evolving, and interacting schema. Eisner’s ecology of schooling sets out a

schema with which education researchers can see schools as comprehensive systems. With the ecology of schooling, we can see the parts and the whole of the school system simultaneously along with how the dimensions relate to each other. He defined five dimensions: intentional, structural, curricular, pedagogical, and evaluative (Eisner, 1992). Wright (2018) added place because, by definition, an ecological system exists and manifests in a particular place. My observations and subsequent findings support her argument for including place in the ecology of schooling. Further, like an ecosystem, it is difficult to isolate one part of the whole, ecosystems function interdependently. In turn, educational situations are shaped by relationships among the dimensions. While I describe the themes in response to the research question, know that the distinctions are amorphous.

In the response to the first research question, I explain how the structural dimension determined flows and cycles to highlight relationship among life in the suburban school situations. I restate that the structural dimension was essential for each teacher participant. The themes that follow, focus attention how relationships among human life, more-than-human life, and place were expressed in the operational curriculum (Eisner, 2017; Uhrmacher, 1997; Uhrmacher et al., 2017). Using the metaphor, schools as water catchments, I will describe how constructed flumes embrace settler consciousness. Then I will explore how teachers used ecological imagination to ferry across temporal and spatial distances with story, local experts, and data and imagery. In Chapter V I will discuss what I call the camouflage curriculum to draw attention to what is concealed in plain view in the four teachers' curriculum.

### **The Flume: Constructed Units and Standards**

The first theme in the operational curriculum behaves as a flume. The path is human constructed and moves knowledge on a planned route through units and standards. The teachers

had their personal intentions which collided with external pressures. Colorado State standards, International Baccalaureate, or College Board developed courses set curricular goals and organize them in prescriptive units. Participating teachers skillfully worked within their place contexts and school structures to craft curriculum with their students in mind. Collectively, the participating teachers taught the following courses: AP Biology, IB Biology, Biology, IB Environmental Systems and Societies, Anatomy and Physiology, Health, eighth grade Social Studies, and Honors eighth grade Social Studies. Mr. Pink described the tension between prescribed content and classroom operations, “I have standards I have to hit, right? But in hitting those standards, I can do it the way I want to.” He had the most flexibility in his curriculum, however, I perceived that all four participating teachers felt similarly. The College Board and IB organizations determined the content and unit structure for their classes. Elizabeth said that the “ecology units cannot be removed” from the AP Biology curriculum. Sloane said that she had an entire IB ESS textbook “to get through” because the exam could include anything. Steve prepared his students for an IB Biology exam within prescribed units. There were certain labs to complete for the AP and IB courses, but the science teachers each added unique flair. All the participating teachers added local contexts and examples to their pre-determined curriculum. However, the role of life in these constructed units and standards remained static and confined to a specific worldview to meet exam criteria. As I will discuss, more-than-human life were “study subjects,” as Steve referred to them, and were with human life in unique cases.

The curriculum path from the classroom to performance on exams is well worn. When testing is the curricular aim, content is narrowed, teacher directed learning increased, and content is isolated (Au, 2007). I offer nothing new to this conversation. While exams are part of schools, exams are not the only part of schooling and hardly the only aims. What is critical here, is that

the AP and IB courses teach students that there is one correct answer that explains ecological relationships among life. When, an exam response is the answer for the test. The exam answer is not the only answer and sometimes it has no bearing on life beyond performance to the standard. I observe that the AP and IB exam embrace settler consciousness in how children relate to life specifically as study subjects.

Grande (2015) connects colonialism to schooling in five ways, I include four relevant expressions. First, children are pressed to achieve to impact the world. Their worth connects to both social and academic standards. “The impersonality of evaluation encourages the development of instrumental attitudes toward achievement and work; the process is perceived as a means for achieving greater ends” (Grande, 2015, p. 101). Successful performance on the AP and IB exams mean college credit and a step towards a higher paying job. Second, children must accept secular humanism which posits “that through technology and scientific inquiry nature’s unknowns can become knowable” (Grande, 2015, p. 101). Implicitly rejecting spirituality or religion as ideological, thus irrelevant to understanding. Third, “detachment from sources of local and personal knowledge” (Grande, 2015, p. 101). The knowledge of those benefitting and accepting of the modern worldview are prioritized. Further, “Children and the reservoirs of local knowledge with which they come to school are not perceived as sufficient or valid foundations of real universal knowledge” (Grande, 2015, p. 101). While this may be the case on a larger scale, the four participating teachers often integrated student inquiries, lived experiences, and knowledge. Fourth, and last, detachment from nature. “The world is studied at a distance; contact with the earth, animals, and plants is severely limited. Students discover through inference that real learning occurs indoors and is composed of knowledge bases separate from life and the natural world” (Grande, 2015, p. 100). Environmental education is tangential and confined, not

impacting that larger functioning of U.S. education (Grande, 2015). In the following discussion, I explore expressions of more-than-human life in the curriculum, particularly how they existed as “study subjects” throughout the science curriculums. This is a critical for it identifies a routine where objectification and division among life is normalized.

### ***More-than-Human Life as Study Subjects***

Flowing from the established AP and IB curriculums, animals and plants as study subjects was a way that relationships among life were expressed. All four classrooms had an animal skeleton and/or a skull. Animals were used as study subjects in different ways. Body parts were used in dissections. Invertebrates were collected for analysis from aquatic and terrestrial ecosystems. Plants were used as living study subjects, they were easily exposed to experimentation. While this way of doing science is well established in U.S. secondary education and students seem to like this aspect of science, it is not set in stone. Speaking about Indigenous knowledge and nature connection with children, Tsosie (2021) stated, “we do not play with life.” He described how western science uses life in experiments and manipulates their living conditions. Indigenous science studies life when it thrives, not when it is suffering nor when taken out of relationship with the rest of life. Life is not a toy to be played with (Tsosie, 2021). First, I review plants and animals as study subjects. Then, I will offer a place of renewal that I learned from Sloane and Robin Wall Kimmerer.

**Plants as Study Subjects.** I observed plants as study subjects in three ways. The first two examples come from Steve’s classroom and then one example from Sloane. Mr. Pink also included plants, but instead of study subjects, he said that he included plants in his geography class as part of biomes and agriculture that shape economics and humans’ life experiences. Mr. Pink was the only teacher to have a non-experimental plant in his room.

Steve was a scientific storyteller. He included stories to show that science was an ongoing, iterative process, and that people were involved in scientific advances around the world. Gregor Mendel and his pea plants is a ubiquitous story in K12 science curriculum, Steve's class was no exception. Students even drew pictures of peas when they listed all their genetics knowledge at the start of the IB Biology genetics unit. The slideshow that Steve used had drawings and pictures of peas throughout. Steve also offered a critique of conceptualizing genetics as the either/or that Mendel proposed. He said it was dangerous to think of genetic traits as static, "people who either willfully or unconsciously believe that race is biological attempt to argue that it is pointless to intervene socially to reduce racial inequality, because race biologically determines ability and thus a person's social experience in the world." So, peas, as a study subject, were only the beginning of the unit and he depicted genetics as multifactorial from that point on, however, for humans. He provided chrysanthemums as an example of this same multifactorial genetic expression in plants. In this case, Steve positioned peas, under the care of a watchful Monk, as teachers that revealed a fundamental understanding about living inheritance.

Steve conducted plant experiments with his IB Biology students in January. The students asked questions, designed, then implemented experiments with the plants. When I began working with Steve, some of the plants were still around the room labeled with various dilutions of salt or vitamin B. He said that some of the students take their plants home when the experiments are over. One group grew microgreens, so they ate their study subjects for lunch. There were two trays of marigolds on the back counter exposed to 12 hours of light and 12 hours of dark a day. Steve told me he tried to make them flower in summer-like light conditions. He also lifted them up during a brief lecture as an example of genetic variation among individuals and how environmental differences influence plant growth.

Sloane also included plants as study subjects. She said the students collected specimens for their eco-column experiments. They would put the plants in one layer of five stacked liter bottles to model plant life on Earth as an important part of regulating the chemistry of the atmosphere, hydrosphere, and biosphere. In April, one eco-column remained on a counter on the side of the room, near the window. The plant looked like it had thrived at some point in the past. There was a branched stalk that grew the height of the liter bottle, but the plant had dried, shriveled leaves. There were some small plants and green algae creeping up the sides of the eco-column.

The second and third examples of plants as study subjects are less experiments *with* plants and more experiments *to* plants that embrace western science as a practice that separates humans from life. Ultimately, the routine contributes to normalizing the objectification of plants. During this study the teachers did not intend to isolate and harm life, they attempted to make their classes more interesting and engaging for students in the context of an AP and IB science course, in this case, intent and impact are not the same. The teachers exist in a larger western science context and the student are evaluated on their alliance with western ways of knowing. I do not aim to eliminate plant studies, to do so would further decouple people from life. Expanding knowledge sources opens a portal to a renewed view of knowing the world. Both sciences already live and evolve together, teacher simply need to notice hidden opportunities to include life in their curriculum, while life is still living.

**Animals as Study Subjects.** Animals were also study subjects. All the science teachers collected invertebrates in the fall. All the teachers had various animal skeletons on display in their rooms. Science teachers also used animals or animal body parts for dissections. Steve used pit traps to capture and kill arthropods for students to learn about edge effects and diversity of

invertebrates. Elizabeth and Sloane conducted an aquatic invertebrate study in the water structures at their schools. Elizabeth, with Ocean First, sampled invertebrates as part of a microplastics a pollution study. Sloane said they collected aquatic invertebrates from the neighboring creek every fall. I understand this was a simple sample to evaluate the health of the aquatic ecosystem.

There was at least one cat skeleton in each of the science teachers' classrooms. Steve had multiple cats and a chimpanzee. Steve's large collection of specimens and models were purchased "thanks to the Foothill parents." There were several glass cabinets full of diverse more-than-human life. During this study period, I observed one lesson that included skeletons. Sloane's Biology class used a set of hominid replicas to observe evolution over time. There was a chimpanzee included in the set of hominid skulls that some of the student measured. Chimpanzees are humans' closest relatives with whom we share common ancestor. Mr. Pink had a human skull replica on top of a file cabinet, no more-than-human skeletons.

Dissections were a part of the science teacher's classes. Steve dissected a chicken wing with his Anatomy and Physiology students. He said they were able to see the muscles, tendons, and how they worked together in a simple system. Elizabeth, and probably Steve, dissected sheep hearts with her AP Biology class. The hearts were on the counter during each of my visits to Elizabeth's classroom. I admit, I wanted to touch the hearts each visit. I was fascinated that a sheep's heart was on the counter, vacuum sealed in a clear bag like a chicken breast at the grocery store. Flesh detached from its boney protection, like the heart from the animal itself. Sloane rarely dissected animals in Biology class. She said, "we tried to make a point of, you know, showing reverence for these creatures."



## **Life as Study Subjects in Conclusion**

While plants and animals served as study subjects, they were also teaching human life something about their relationship. One of Sloane's students asked, "did we ask for consent?" in reference to the hominid skull replicas. This question revealed a critical point about western science, often consent was not given by the plant or animal study subjects. Kimmerer (2020) blends western and Native science during her botany courses and offers five practices for doing science with life: reciprocity, animacy, honorable harvest, gratitude, and reflection. The honorable harvest asks for consent and only take what is needed. She also points out that traditional ecological knowledge (TEK) is not unique to Native America, "but exists all over the world, independent of ethnicity. It is born of long intimacy and attentiveness to a homeland and can arise wherever people are materially and spiritually integrated with their landscape" (Kimmerer, 2002, p. 433). Human connection to community over generations and evolutions of the landscape. Humans not only observe and monitor closely, but they also harvest plants and animals, and hold intimate knowledge of ecological disturbance (Kimmerer, 2002). Humans, by going about their lives, develop deep relationships with their surrounding place. While the notion of sustained connection is antithetical to suburban life (Brooke, 2015), perhaps ecological connection opens the door to human life expanding their view beyond the lawn.

When TEK is included in biology courses it also fosters cross-cultural competence. "Exposure to traditional knowledge in biology class offers an opportunity to bring much-needed multicultural perspectives directly into the science curriculum" (Kimmerer, 2002, p. 435). Further, the humanities, typically dismissed by hard sciences, returns to biology as a constitutive partner. This prepares young people, scientists or otherwise, to engage with a multicultural, complex, and dynamic world (Kimmerer, 2002). The point was not that Steve should stop

collecting insects to study edge effects or for students to not look, for the first time, at insects under a microscope. Sloane and Elizabeth needed not to remove dissections from their classes. The point was to do science like Sloane who held specimens with reverence and Steve who taught genetics, multifactorial. Science is improved with a plurality of worldviews--in relationships *with* more-than-human life instead of *to* plants and animals. Human life guided by modern science cuts connections to the ecological world, “modern people collectively suffer a kind of sensory and emotional starvation” (Cajete, 2015, p. 122). A renewed science,

must be based on the reintroduction of the participatory mind, one that re-calls and re-establishes the basis of human awareness in a larger ecology of the world. Science must once again become the story of this awareness and relationship to the animate living world. (Cajete, 2015, p. 123)

Children already express this worldview by animating more-than-human life during play (Louv, 2008; Sobel, 2005). Perhaps renewed science simply does not close the door to what children already embody. Judson (2008) similarly proposed that adding the body and emotion back into learning sparks an ecological imagination that fosters relationships among life. When I was a secondary teacher, I heard, “hands on, minds on” to support the idea that children doing things with their hands creates engaging learning experiences. However, a hand is a small part of the body, also emotional and collective knowledge is left out.

### **Ferrying Across Distances with the Ecological Imagination**

The second expression of more-than-human life in the operational curriculum was ferrying across distances with the ecological imagination. Place-based education aims to deliver academic content in a local inquiry (Demarest, 2015). The predetermined curriculum that comes along with AP and IB courses, or Colorado academic standards sometimes makes connecting to

place. For example, over the spring, science teachers cover evolution content. Evolution at the high school level includes the requisite discussion of Lamarck with giraffes, Mendel with peas, and Darwin with the finches. While these are essential for students, particularly those aiming to pass their AP and IB exams, it also creates a distance between the concept of evolution and the places where students live. Doesn't evolution happen everywhere?

The participating teachers bridged the temporal and spatial distance with storytelling, local experts, data, and imagery. They also invited local experts to share knowledge with their classes. Combined these routines foster an ecological imagination which is vital for students to understand ecological relationships. Ecological imagination allows content to “ferry across” ecological content (Fesmire, 2010, p. 191). The ecological imagination cultivates the skill to think in seeded scales and relationships simultaneously,

I am able to zoom in on things, events, concepts, institutions, and persons without losing sight of their relational context--say, a child in relation to family, a sunrise in relation to the solar system, a statement in relation to its interpersonal, sociocultural, or literary context. (Fesmire, 2010, p. 184)

While none of the teachers named their skillful creation as ecological imagination nor place-based education, they had identified that there was a temporal or spatial distance between the classroom and content they delivered. The four teacher participants skillfully created bridges across expanses of time and space. They drew from their local community when possible. Mr. Pink integrated the cultural and religious facets of community life and the science teachers brought invertebrates into their classes. Science teachers used water catchments as riparian ecosystems to study. That said, the bulk of study sites and more-than-human life expressions I

observed during this inquiry were historical and from places far away; teachers connected content with a variety of methods.

### *Ferrying Across Time with Storytelling*

Teachers used story to bridge both space and time to connect academic content to students' present day lives. I will review stories from Steve, Elizabeth, and Sloane. Steve's Gregor Mendel story was historical, but he bridged the temporal distance with story. This vignette shows how Steve connected history with present day students' daily lives.

Mendel was a Bavarian Monk who raised more than 26,000 individual pea plants in 1865. He shared his findings at the Natural Science Society in Brno, currently in Czechia. He was dismissed during his life because he was not considered a scientist, he lacked the credentials. Posthumously, his work was identified as among the most influential in human understanding of genetics. Steve added to Mendel's genetic understandings and positioned his work as vital, however, incomplete. Human understanding of genetics has continued to grow, and we know now that traits are multifactorial, and thus must update our perceptions of human traits.

“I require you to understand that the way you learned genetics in the past is flawed and can lead to misunderstandings about human genetics. People have died and have been killed because of this misunderstanding.”

A few students have furrowed brows and one asked, “What!?”

Steve moved toward the student, “Can you think of an example of many people being killed because of a misunderstanding about their traits?.” He waits a moment.

“Oh!! Oh my gosh. I get it.”

Steve asked to students to name monogenetic traits. Students replied with every middle school genetics word problem that used a Punnet Square to answer “earlobes” a student said.

“False!” “eye color,” said another. “False!” Steve said. I think of all the others I used in my own science classes, widow’s peaks, tongue rolling, hitch hiker’s thumb, pinky shapes, and so on.

Students shifted in their seats, and some talked quietly amongst their tables.

“You were taught that and it’s not your fault,” Steve told the students.

Steve’s point is not that Mendel got it wrong, the point is that genetics is not as binary as Mendel thought. When science teachers use only Punnett squares of an on/off gene expression model, it leads to an inaccurate understanding of the world and ultimately, emboldens oppressive ideas about people. Genetic expression is multifactorial, and Mendel did not have access all the information when he developed the model. Science evolves, like organisms and their relationships evolve. Again, he bridged the distance with story to connect past to present.

Elizabeth and Sloane both featured Charles Darwin aboard the H.M.S. Beagle. He traveled around the southern hemisphere and developed the theory of evolution with the finches he collected on the Galapagos Islands. Darwin’s contributions to human understanding of evolution are valuable and he remains a science icon. In Elizabeth’s classroom, she included pictures of diverse finches, tortoises, and insects all found on the Galapagos Islands. Sloane included a worksheet where students compared finch beaks to human hand tools and different kinds of plant parts that the birds ate. She highlighted how the finches adapted to obtain food, a limited resource, on the islands. Being able to eat different food than other finches reduced competition and increased likelihood that the bird would survive to reproduce and pass on their genes. Like Mendel with the peas and historical figures, Sloane used an example from a faraway place where the students will likely never visit. Images bridged the spatial distance.

Combined, the teachers used story to bridge spatial and temporal distances. I wonder what from the schoolyards can be integrated. When learning about Darwin, what about house

finches in Colorado? Sloane's guest speaker said, "The birds' songs encode a lot of information. Human and House Finch language is an appropriate analogy in the way tone and syntax communicate meaning." House finches, within a diverse community of birds, lived on all the suburban schools in this study. My Windy District researched sponsor asked me, "why can't they learn evolution with a local example first and then have Darwin's finches as the performance task?" If we flipped the direction, the students move from the concrete to the abstract instead of the other way around. We get to ask, what story do the finches tell?

### ***Bridging to Careers and Content with Local Experts***

All teachers invited outside experts into their classrooms. Guest speakers or local experts were from the larger Denver Metro area and, in some cases, the school community itself. Mr. Pink invited an NHD Mentee to work with the students on their writing each year. Steve regularly invited his past students, current university students when he adjuncts on the side, and local science experts from a variety of fields. Elizabeth liked to invite presenters, however, in a "post-corona" world, she was not able to do so as much as she would like. Sloane also liked to bring in local ecology experts and environmental conservation organizations to her class. I observed a parent from her IB ESS class take the students birding on a snowy morning.

Important to note that the teachers invited presenters to their higher-level classes. Mr. Pink had a presenter for his Honors class. Steve had presenters in all his classes, but he taught all higher-level science classes only. Same for Elizabeth. Sloane said it was easier to convince people to present to her IB ESS class because it was one section and not all day. Sloane selected presenters who offered students a way to get involved in environmental issues. What the outside experts offered was expertise that the teachers did not possess and an opportunity to see a person working in their chosen field as a potential career path beyond high school. Mr. Pink invited a

NHD mentee to join the honors class, “she comes into the classroom, and she was helping the kids with their NHD program. So, writing thesis statement, doing research etc.” Steve regularly invited guest speakers from the community into his classroom to share their expertise. Past high school students or university students who he taught as an adjunct or science experts from a variety of disciplines who lived and worked in Bear Hills.

Elizabeth said, “This year, it was someone from Ocean First, but I always like to bring in someone from the community or at large as an outside perspective.” The group focused on human impacts to aquatic ecosystems, invertebrates specifically over time. “Having kids in the field going through the mud looking at invertebrates, thinking about a perspective, like, ‘oh my gosh, this is impacting me and invertebrates’.” The flow of information from outside experts brought about a perspective that human actions impact invertebrate life and human life simultaneously, the impacts were related across species boundaries. The presentation was such a success, she hoped to continue collecting data annually because it was a positive experience with the students.

Sloane invited a local Reptile Conservation organization to her IB ESS class each year. They presented about reptile conservation and brought organisms with them. Sloane said it was amazing, “kids just get so excited to hold snakes and lizards in such so that’s just always memorable and it is for them as well. I know because they told me it was the best day of the whole year.” I would have loved to observe this presentation. The Reptile Conservation group also facilitated a teen-specific snake count over the summer that Sloane encouraged students to attend. Local experts brought relevancy to the curriculum, an opportunity for students to see professionals in their field as role models and supported the predetermined curriculum units. The liquid knowledge was additive to the already flowing content.

*Ferrying Across Distances and Connecting to Life with Imagery*

More-than-human life was included in images, art, and word problems. All participating teachers had landscape pictures hanging in their room and pictures of more-than-human life in spectacular settings. Charismatic life prompted comments from students who described plants and animals as beautiful. Videos were used by Mr. Pink, Elizabeth, and Sloane to re-enforce class content. Elizabeth played a video about the Galapagos, “What Darwin didn’t know.” She did not pause it before David Attenborough’s voice boomed in the speakers for three words. The students let out a collective, “aww” when she paused the video. Elizabeth also referenced images in the book to trigger memories of content with her students. The following conversation shows how Elizabeth made the connections.

Elizabeth described evolution as a process over long periods of time. She said, “Like a mountain over time, organisms can see big changes. What do you remember about Lamarck? Maybe shown with pictures of giraffes.”

“I remember the pictures of giraffes. The ones that have different genes don’t survive.”

“There are tall ones and short ones,” two students replied.

Elizabeth listened then said, “When traits are used, they stay. If they pass [the trait] on, it must be beneficial.” The slide showed a picture of giraffes. Lamarck thought that if animals used traits that made them bigger, faster, or stronger in one lifetime, they were passed on to the next generation. “The textbook describes this, but there are no giraffe neck pictures in the book.”

All four participating teachers included data and images of more-than-human life. All the teachers had more-than-human life represented in posters on their walls. Supporting videos had plants and animals. Mr. Pink showed a video with a bear in a suit. Steve added a variety of images to his slideshows, historical, current, and images of documents or data. What I noticed is



that the students clearly had developed appreciation for the beauty of organisms, and they associated content with pictures or videos.

*Ferrying Across Distances with the Ecological Imagination in Conclusion*

Ecological imagination allows content to “ferry across” ecological content (Fesmire, 2010, p. 191). While none of the teachers named their skillful creation as ecological imagination nor place-based education, they had identified that there was a temporal or spatial distance between the classroom and content they delivered. The four teacher participants skillfully created bridges across vast expanses of time and space. They connected the past to present day, students to career paths, and human life to more-than-human life with imagery.

#### **Chapter IV Conclusion**

Chapter IV described four teachers’ educational situation in three suburban school communities. I used the place, structural, and curricular dimensions in Eisner’s ecology of schooling to organize the individual teachers’ descriptions (Eisner, 1992; Wright, 2018). By using an ecocritical lens that combined ecological and educational methods in this study, I was able to observe commonality between ecosystems and the three suburban schools. I described how place moved through permeable, invisible, and absent boundaries between the school and surrounding community. In the second part of Chapter IV, I began to respond to the two research questions by sharing the themes that emerged from pattern coding across participants. In Chapter V, I will discuss the implications of the findings for the larger education community and an invitation for further research will be discussed. The next chapter I will also discuss further how the camouflage curriculum holds an opportunity for renewing relationships with more-than-human life in school settings.

## CHAPTER V

### EVALUATION, THEMATICS, AND SIGNIFICANCE

#### **Overview of the inquiry**

We are alive during a time of transformation and renewal. While life on Earth has always evolved and fluctuated. Modern human relationships gave rise to social and ecological crisis. In Chapter I, I explained ecological precarity and explain the rationale for this study. “We can count on the permeance of crisis popping up, eroding away, and worsening. We are in times of guaranteed precarity” (Nxumalo et al., 2022, p. 97). Ecological precarity is an opportunity for renewal and reconstitution of relationships among life. Thomas (2022) states, “as a society, we often forget that humans are a part of our global ecosystem and that we don’t exist separately from nature; we coexist with it each and every day” (p. 3). The U. S. education system is nested within the larger ecological system. Schools and individual teachers play mediating roles in children forming relationships with life on Earth because they interact with children on a routine basis, nearly every day. The time is ripe for human life to remember that we are deeply connected to and sustained by life. There are opportunities and examples already embedded and embodied in school communities.

Gregory Cajete (2002) points out that the two quintessential problems facing educators are relational. First, how to get along or create healthy relationships in multicultural society. Second, how to attend to the relationships with the natural world. Sometimes it was helpful to describe these relationships as distinct and sometimes they were related, or even inseparable. Neimanis and McLauchlan (2022) stated that the ecological crisis was “inseparable from the

crisis of colonialism, white supremacy, patriarchal power, and violent body normatives” (p. 218). The authors remind me that we all experience ecological and social crisis and, simultaneously, we are also sites of change. By definition, ecosystems flow into classrooms where relationships may be constituted, then spill back into ecosystems. This permeability and seededness positions education as a primary knowledge and a society constructing entity. Education functions to reproduce the world as is or to transform the world (Jandric et al., 2021). Jaldemark states, “From this it follows that human action in terms of learning, teaching, or participating in education should focus on being inseparable from the surrounding environment” (as cited in Jandric et al., 2021, p. 1423). Given, suburban settings are unique and dynamic environments (Brooke, 2015; Diamond & Posey-Maddox, 2020; Lindstrom & Bartling, 2003). This begs the question, how are teachers representing and/or including the surrounding environment in their curriculum in suburban contexts? Given the vastness of social and ecological situations, I narrow the focus of my inquiry to illuminate relationships among life in three suburban schools. I asked the following research questions:

- Q1 What relationships exist among life, human life, and place in school communities?
- Q2 How are those relationships expressed in the school curriculum?

The continuity of relational crisis among life on Earth invite responses where we find ourselves. We must respond to global ecological crisis. However, change happens at the local level. Suburban schools educate more than half of children in the U.S. and yet are underrepresented in educational research. While suburbs are often perceived as wealthy and white, suburban communities are demographically diverse and evolving (Diamond et al., 2021). Nationally, suburbs are home to more than half Asian American, Black, Indigenous, and Latinx people who live in metropolitan areas. Further, more than half of the people currently receiving

low-income wages live in the suburbs. Suburban demographic shifts have been studied by sociologists, geographers, and urban planners. However, little research explored the implications of demographic changes in suburban education contexts (Diamond & Posey-Maddox, 2020). I chose suburban schools for this study because I have lived in suburbs throughout my life and I find them interesting places. I worked in suburban schools during my public-school teaching career. I was curious how other suburban educators were incorporating place and responding to ecological precarity in their curriculums.

Chapter II summarized relevant literature for this study. The *Curriculum Inquiry* journal curated a special issue to discuss educational responses to ecological precarity. Two lessons were relevant to this study. First, the contributors call for centering nature-culture relations to notice how culture shapes relationships with life and vice versa. This issue asks teachers to take seriously the “knowledge-making capabilities of the more-than-human world” (Nxumalo et al., 2022, p. 98). Hence, the first research question for this study: What relationships exist among life, human life, and place in school communities? Postmodern ecologists and Indigenous scholars asserted that humans talked to nature and nature talked back (Nxumalo et al., 2022; White, 1998). Second, the scholars in this special issue identified discourses that were problematic or impeded collective existence during ecological precarity, individualism, colonialism, antiblackness, human supremacy, and white supremacy. I acknowledged that these were each embedded in educational communities and people were on their journeys to dismantle oppressive systems. What I learned and incorporated into my inquiry, at the outset, was that humans are constantly in interdependent relationships with life on Earth.

While the *Curriculum Inquiry* special issue expresses urgency, environmental education is not new. Environmental education has evolved over time. Generally, environmental education

happens *in, about, for* (Tilbury, 1995), and *with* the environment (Moroye, 2007). Environmental education is notoriously ambiguous and addresses a variety of ecological issues. Colorado is among the few states with specific environmental education standards that promote environmental literacy (Colorado Alliance for Environmental Education, 2022). While there is an urgent need for environmental education, teachers and school administrators perceive that the further students move from their classrooms, the less educational value an experience offers (Navin, 2021). Environmental education is perceived as one more thing for overstretched educators to do (Jardine, 1990; Moroye & Ingman, 2013).

David Orr (1992) proposed that, “all education is environmental education” (p. 134). In other words, we are always teaching children about the environment, deliberately or not, outside or inside the school building. I was primarily interested in education *with* the life in and around the suburban schools. I accepted the notion that the environment is ever present in the curriculum. During this inquiry, I found relationships among life existed in the operational curriculum, explicitly, and sometimes was hidden in plain sight in what I call, the camouflage curriculum.

Chapter III outlined the research methodology I used during this dissertation. To answer the research questions, I combined ecological and educational qualitative research methods in a postmodern ecological framework for this naturalistic study. The blended methodology illuminated relationships that exist among life in suburban settings and renewal opportunities. I used spatial indexing to observe ecological relationships in and around the school (Tuck & McKenzie, 2015). I recruited teachers who went outside with students, incorporated more-than-human life, used interdisciplinary content in their curriculum, or who had attended any amount of place-based education training. Data sources included spatial indexing, initial interviews,

classroom observations with brief pre/post interviews, historical landscape changes, and my personal research journal. I used ecocriticism, an offshoot of educational criticism and connoisseurship (EdCrit) to filter participant observations inside the school building to reveal ecological patterns in the education situations (Moroye, 2007; Uhrmacher et al., 2017). I used cyclical coding to continuously review and confirm themes (Eisner, 2017; Saldaña, 2016). To answer the study questions, I coded participating teachers' interviews individually and then explored global, pattern-finding, and cross-checking annotations as the interpretation and evaluation process occurred (Uhrmacher et al., 2017). Four secondary teachers at three schools participated in this inquiry during Spring 2023. The research took place at the boundary between the Rocky Mountains and the North American Great Plains in the suburban environments surrounding the Denver Metro.

Chapter IV described the human and more-than-human life that existed in three suburban schools. Nested within three places, I created rich descriptions of four teachers individually, through which the meaning of relationships among life was evaluated. Each suburban school was unique in its history, ecology, and in turn the ways that place was integrated into teachers' curriculum. Importantly, observations that occurred while spatial indexing drew my attention to a pattern that I then observed inside the participating teachers' classrooms.

At my first study site, the Plains School, a dusting of snow revealed animal movement patterns in and around the school. Rabbits, squirrels, cats, Canada Geese, corvids, and dogs, moved freely around the Plains School campus. The prominent fencing was constructed, surveilled, and obeyed by human life alone. More-than-human beings could fly over or crawl under the fence, they were not subject to the human constructed boundary. Mr. Pink also broadened my view to include not only mythological creatures but also the potential for life

beyond Earth. At my second site, Foothill High School, I noticed that leaves and trash gathered along the fence lines. Trash caught my eye first and then the Spotted Towhee going about their daily routine pointed out to me that the leaves offered food. Sustenance gathered at human constructed, school boundaries. Steve pointed out how ecological movement, flows and cycles, defined curricular dimensions. Further how an integrated approach to biology curriculum provided the opportunity for students to not only teach each other, but to also be intellectually sustained by what gathered at the academic boundary between science and other disciplines.

I returned to the Plains School to observe Elizabeth. Outside the building the songbirds had begun to sing and communicate with each other more often. They were at times quiet and other times loud. The birds matched each other's volume much like Elizabeth and her students. Her soft-spoken demeanor and introversion profoundly shaped her classroom and was echoed by students. At the Pine School one day I observed corvids calling back and forth to each other. The sound bounced off the walls of the school building, amplifying their voices. Students moved across the open school boundary and into the neighborhoods. I noticed human life and more-than-human life was dynamic in this community. Sloane reflected this dynamism in her teaching practice by incorporating environmental issues in her classes. She encouraged students to amplify their political voices about environmental issues. I ended Chapter IV with further describing patterns that emerged across the suburban teachers. I started the conversation that support the significance that will be discussed in this chapter. Chapter V will answer the study questions by sharing emergent themes across participants.

### **Organization of Chapter V**

In this chapter, I provide responses to the two research questions by discussing themes arising from teacher interviews, classroom observations, spatial indexing, and curriculum

materials. Chapter V contains the two dimensions of educational connoisseurship and criticism (EdCrit), evaluation of significance for education at large and emergent themes that are organized to answer the research questions. To conclude the dissertation inquiry, I discuss the significance for the participants, ecocriticism, and the larger educational community.

Three schools were nested in three unique communities which were in turn expressed in four teachers' curriculum in diverse ways. The combination of ecological and educational research methods in a postmodern ecological framework allowed me to make the familiar strange (Crotty, 2015; Eisner, 2017). I was able to see opportunities for ecological renewal and take seriously the "knowledge-making capabilities of the more-than-human world" (Nxumalo et al., 2022, p. 98). In Chapter IV, I used Eisner's ecology of schooling to organize the description in three dimensions, place, structure, and curricular dimensions (Eisner, 1992; Wright, 2018). Each teacher integrated their specific places in their classes by utilizing permeable, invisible, or non-existent boundaries between the school and the larger community. The subsequent curricular dimensions for each teacher were contextualized in a specific suburban place. In Chapter IV, I also discussed how the curricular dimension combined flows and cycles in a specific place to give rise to a unique education situation for each teacher participant. To answer the first research question, I synthesize ecological patterns, flows and cycles, across three school settings and discuss what exists at the confluence of patterns. I begin with the largest view of ecology with the schools nested within. Relationships among life, human life, and place are many. Some of those relationships fall outside the scope of the dissertation project and I am excited about the next iteration of ecological inquiry.



### Research Question 1

Q1 What relationships exist among life, human life, and place in school communities?

To respond to study question one, I foregrounded familiar situations so we may see them anew (Eisner, 1992). I paid particular attention to ecological relationships and what they may teach me as an education researcher, the meaning for participants, and for education community at large. Extending the teacher descriptions, I organize the response by structure, flows, cycles, and confluence. That said, distinctions among the themes are amorphous. Ecologically speaking, they are interdependent and inseparable. They are all happening simultaneously and organized so that we may see the part and the whole. Doll (2000) said, we may touch the wave and the ocean simultaneously. In this study, it seemed appropriate that we touch the stone and knew it was part of the Rocky Mountains being carried to the sea.

Countless relationships existed among life, human life, and place. In the sections that follow, I narrow the view to what I observed from January to April 2023. “The science of ecology is about studying the relationship and interactions between different parts of the system, and the interactions between systems” (Greenwood, 2009, p. 276). Ecological and environmental education centered relationships and interdependence (Greenwood, 2009). For this study, the definition of relationship was an exchange of matter or energy between or among life. I assumed that ecological relationships were abundant among life and in schools were nested among those relationships. Relationships are inescapable. I illuminated them in this study.

#### **Permeability: The Structural Dimension**

As discussed in Chapter IV, the structural dimension played a significant role in the four school situations I observed. This echoes an architectural axiom, “form follows function.” The concept is used to explain the organization of life from cells (Mukherjee, 2022) to global

ecosystems (Carroll, 2016). From the smallest unit of life to the largest, we see that both the inside of the cell and the surrounding bodily system are interdependent and mutually constitutive. Schools are similar in that permeability allows flow of bodies, knowledge, ideas, and energy in and out of the building. Teacher participants simply opened the doors to invite flow. The axion also applies to the ecology of schooling (Eisner, 1992). When I tried to pull apart observations from the curricular dimension from the structure itself, I noticed they were inseparable. The structure enabled the functioning of the school. Eisner (2017) defines the structural dimension as, “how the organization forms of schools – how the school day is divided and how subjects are assigned to time blocks--influence what students learn” (p. 74). The organization of time and space shapes teacher practice and student learning. “Understanding the influence of organizational structure in schools provides a basis for considering its utilities and liabilities, its benefits and costs. It allows us to consider other ways of doing things” (Eisner, 2017, p. 75).

During this dissertation, I expanded the view beyond time to physical spaces so that we can see movement in and around schools, or human relationships to place. While I conducted spatial indexing surveys at the Plains School, I noticed that more-than-human life did not obey the human constructed borders surrounding the school property. The mice, corvids, squirrels, rabbits, and house cats showed me that life moves through permeable boundaries. The teachers who participated in this study also utilized permeability to draw from their surrounding community. I begin outside the building, from the largest view of place to respond to the first question: What relationships exist among life, human life, and place in school communities?

### *Permeable Landscape: Lawns*

All three of the schools in this study were nested within neighborhoods in Prairie Heights, Bear Hills, and Oso Creek. I noticed the landscape of the school was relatively homogenous and contiguous with the surrounding suburban homes. The physical continuity was the place that people traveled between the school and home. The lawn also facilitated permeability among places for more-than-human life. Lawns are ecosystems. In this study, lawns were also places to pass through to somewhere more interesting like a creek or a home to eat lunch or to play sports they were the place for movement across the permeable school border. The school properties resembled the front yards as expressions of suburban life. Messia (2003) states,

The well-kept, prim and proper, ornamented front yards and the hedonistic nature of the backyard, where individuals seek refuge from the world in a very protective and intimate playground of leisure and relative luxury, are important indicators of American suburban living patterns. (p. 69)

Differences between the front yard are characteristic of suburban communities. Lawns are familiar to suburban residents, mundane even, lawns, for some people are the only nature experience they have. Steinberg (2006) shared his childhood experience, “the lawn was the single most important engagement I had with the natural world. It was the only landscape I had ever known.” (p. xiii). The lawn is integral to suburban life as the literature and my observations confirm. Historically, lawns served as a visual representation of wealth, as in they are rich enough to grow aesthetics and not food on their property (Steinberg, 2006). This sentiment continues to present day and implicitly communicates “the synergism of domination and beauty

that is the contemporary American lawn” (Messia, 2003, p. 71). I will discuss expressions of the lawn in the curriculum in response to the second research question.

The lawn itself is home to paradoxes. In front yard of the suburban home, the lawn is at the same time a privately owned and maintained property. Yet, the beauty of the landscape will be enjoyed communally, by all who live around the home. Children may move freely among properties during play with their neighbors. Teyssot (1999) states, “The ambiguity of the lawn, of the threshold between the public space street and the private, familial, domestic space, had remained a constant of the American landscape since the moment of its colonization” (as cited in Messia, 2003, p. 74). The ambiguous front yard leaves the lawn open to informal social regulations of the space and identifies the school lawn as a contested space.

### *Significance of Permeable Landscapes*

The theme lawns as permeable landscapes emerged from my spatial indexing around the school building. Overall, I propose that the structural dimension of schooling determines the functions. My addition to Eisner (1992) is that the physical structures and environments surrounding the schools also contribute to the ecology of schooling, in this case lawns. I found that lawns acted in two ways, first as a permeable, amorphous boundary for human life that facilitated movement between the surrounding community and the school attendees. Second, as a source of food or habitat for more-than-human life. This finding also affirms Wright’s (2018) position that place ought to be added to the ecology of schooling.

The concept “form follows function” also applies to the ecology of schooling (Eisner, 1992). When I tried to pull apart observations from the curricular dimension from the structure itself, I noticed they were inseparable. The structure enabled the functioning of the school. During this dissertation, I expanded the view beyond time to physical spaces so that we can see

movement in and around schools, or human relationships to place. While I conducted spatial indexing surveys at the Plains School, I noticed that more-than-human life did not obey the human constructed borders surrounding the school property. The mice, corvids, squirrels, rabbits, and house cats showed me that life moves through permeable boundaries. The teachers who participated in this study also utilized permeability to draw from their surrounding community. I begin outside the building, from the largest view of place to respond to the first question: What relationships exist among life, human life, and place in school communities? Next, I review flows and cycle as a theme from Chapter IV and add discussion of its significance.

### ***Significance of Schools as Water Catchments***

In Chapter IV I summarized schools as water catchments, I discuss the significance here. Pinar (1994) conceptualized as *currere* as teachers traveling through a course, as a track, for example. We may imagine curriculum as a constructed course that student move along towards “testing season” as Steve said. Pinar (1975) stated, “I can look at my life in a linear way, acknowledging its actual multidimensional character, but limiting my view to a linear one, to make it more manageable, and I see that this has led to that” (p. 19). The timeline has a biographical coherence, not always logical, but lived in relationship to past (regressive) and future (progressive). Also, the continuity with the present (analytic) and all of it in a social, political context (synthetic). What Pinar (1975) left out was the ecological, specifically the living, place context where learning takes place. When we envision schools as water catchments, we see that they attract human and more-than-human life around them. These may help young people write themselves into their community history, place, and relationships with life that already surround schools.

Doll (2000) proposes a *currere* as “running water” that “courses through,” culture, time, dream, images, moments, and symbols (p. xi). What happens if we add “place as text” (Demarest, 2015, p. 106) as a location for coursing and resource for learning? All four teachers skillfully integrated local experts into their curriculum. Science teachers used the schoolyard or local parks as study sites. Mr. Pink and Elizabeth included family relationships, culture, and religious values from their community. They are each already opening doors to knowledge from place. The four teachers moved “with rather than struggling against the forces of life” (Eppert, 2009, p. 198). The reflective nature of schools as water catchments also offer a place where students may integrate themselves into the ecology of schooling instead of simply move through it on the way to something beyond.

Eppert (2009) asserts that water is a teacher. Water may assist humanity in remembering our relationships with the self and our world. She calls this “remembrance learning” (p. 192). Generally, this is a process,

That includes facing rather than repressing or denying traumatic past; engaging in complex emotions, memories, and knowledge; the eventual mournful and transformational learning that live with loss, variously identified as loss with regard to lives and relationships, to concepts and idealizations, and to conventional self-understanding; a (re)orientation to an ethics of relation and connection and developing commitment to the struggle for social justice/change. (Eppert, 2009, p. 192)

Elizabeth conducted microplastics research with students in a catchment pond behind the school. The students connected aquatic invertebrate unhealth with their own unhealth while wading through the mud. Steve told the story of Gregor Mendel and the pea plants that led to a binary understanding of genetics. This is taught in probably every science classroom in the U.S.

He contends, as does Kendi (2016), that this misunderstanding of genetics leads to violence among people who believe that human traits are immutable. Steve and Elizabeth left the grief element out, however, students talked amongst themselves about how they had changed their minds in response to learns in science and social studies classes. The embodied learning in both cases created a confluence of the past, present, and future along with social and ecological justice issues. This happened as information coursed through place and across content areas. The participating teachers curated experience, students brought the learning together as they coursed through class and community. Teachers could provide a space in their curriculum to incorporate emotional learning to amplify the healing potential of their content (Judson, 2010).

### ***Significance of Suburban School Commutes***

I summarized suburban school commutes in Chapter IV, I explore the significance here. The daily commute is mundane, but it could also be fodder for the ecological imagination. Judson (2008) states, “Awareness of our own bodies’ positioning and movement in space represents one of the earliest ways the body situates itself in the world” (p. 198). Bodies traveling across and landscape evoke relationships with time, size, weather, and with the more-than-human world. Novel experiences, like a close encounter with a corvid, also foster inquiry in the classroom, how do they make so many sounds? Traveling by car in the Denver Metro, people will observe prairie dogs or roadkill, which also spark questions. Why is there always roadkill at a particular spot on the road? Judson (2008) continues, “our emotions and other senses of sight, sound, smell, taste, touch allow us to connect with the cultural and ecological community into which we are born. ... We reach out to and encounter the world through the use of the body’s tools” (p. 199). This embodied, daily relationship with place in suburban contexts warrants further attention because the daily commute may be a course to renewing relationships with

place. I will discuss the ecological imagination more in response to the second research question. Humans cannot observe vast expanses of time. Humans can observe a thousand mundane interactions to see something unique or how seasonal changes accumulate on their daily commutes, should they notice.

### **At the Confluence of Flows and Cycles**

At the end of Chapter IV, I synthesized four participant descriptions to find what they had in common across the pre-figured foci: flows and cycles. Now I will discuss what floats up at the confluence of flows and cycles along with the significance. The first research question asked: what relationships among life, human life, and place in school communities? So far, three themes have illustrated the response. First, permeability was the pervasive structure for the four teachers who participated in this inquiry. Second, the porosity between their classrooms and the surrounding community allowed knowledge and learning to flow from the surroundings into the school building in constructed and unpredictable ways. Third, cycles existed in routine school activities. Daily commutes offered a time to be with place and perhaps the more-than-human world. Observations that occur during commutes could be fodder for teachers to further integrate place into their curriculum. Next, I will continue with two more themes. Schoolyard as ambiguous space is the final theme responding to the first research question. Life eats at school. When I observed the outside of the school building and the teachers' classrooms, I noticed that both more-than-human and human life ate at school. Both final themes came into view when energetic flows mixed with daily cycles.



*Public Parks or Public Schools:  
Schoolyards as Ambiguous  
Space*

The fourth theme from relationships between place and life in suburban schools was the schoolyard as ambiguous space. Parks were next to all three schools, the proximity meant that parks were an integral part of the daily commutes and a source of learning. Parks were at the confluence of human, embodied flows, and daily commute cycles. You could, in one step, travel from the school property to a public park or vice versa. All public parks near the three schools had similar components, a creek, lawns, playgrounds, some athletic fields, and walking trails. The parks near Plains School and Foothill High School had lakes and disc-golf courses. I observed people walked alone or with dogs at all the schools. During the school day, people ran, talked on the phone, rode bikes, or sat in the shade eating lunch at the parks and on the school properties. At Foothill High School and Pine High School, the schoolyard acted as a public space because, people traveled through schoolyard as if it was contiguous with the public park. Aesthetically, parks and school properties looked similar. The parks around the three schools invited people to them for a variety of reasons and activities.

Demarest (2015) invites teachers to consider “place as text” to view and read the world. She found that, when teachers sought to engage students, they moved,

Out of their chairs, out of the classroom, out of the school building, and away from traditional patterns of schooling. This continual search for a more active, engaged way to teach is an enduring aquifer that brings refreshment and renewal to stagnant practices.

(Demarest, 2015, p. 104)

There exist a multitude of activities to do and draw from place as text. “All places have stories to tell” (Demarest, 2015, p. 111). I will share briefly what I observed in and around the schoolyard and how teacher participants and community members utilized the space.

**Teacher Use of Public Parks.** Each teacher utilized the neighboring park differently. Mr. Pink did not typically use the park, although his son walked to school through the park. Elizabeth hosted community running events at the neighboring park for students and families to get involved with cross country running. The cross-country team crossed the busy street from the school for cross country practice. The park offered a place where she built relationships with the community through cross country. Steve personally walked through parks on his daily commute, and he used the park as a study site in his class. Students conducted an annual arthropod diversity study every fall. With Steve’s guidance, students set up pit traps, at the boundary between the schoolyard and the public park. While the study intends to look at “the effect of edge on species richness and diversity,” Steve described additional learning that emerged from the experience. He said, “They’re seeing differences from one collection to the next. One habitat to the next. They write a scientific paper about what they found.”

Sloane used the open space park as a study site for multiple ecological labs in her classes. Overall, the teachers connected students will place. When this happens, “The teacher is no longer the only one who holds the knowledge to impart to the student. She becomes an intermediary between her students and a wide world with real problems and dilemmas” (Demarest, 2015, 112). Or “students learn about nature from nature” (Judson, 2010, p. 27). The knowledge and experience flowed from place to students instead of from teacher curated materials. Teachers and students were not the only life to move through the parks and the schoolyard.

**Community Use of the Schoolyard.** Public school properties and public parks were contiguous at all three suburban schools in this study. I observed people moving freely throughout the landscape in and around Foothill High School and Pine High School. Athletes, geese, disc golfers, pickle ballers, northern flickers, and picnicking students all used the school property and public park as a contiguous landscape during their daily lives. While I did not observe people linger at Pine High School like they lingered at Foothill High School, they walked across the lawn to access the public walking trails. The Plains School was the only school with a locking gate. The school gates were opened in the morning and afternoon for the vehicle commuters. The Plains School was the outlier in this study.

Continuity among public school property and the surrounding community appears to offer a place to literally connect segmented areas. Seaman (1979) calls this “place ballet.” He states, “Residence, business, work, and recreation come together in space and time. Place ballet and caring for place were readily possible. Modern time-space routines, in contrast are often isolated units which rarely fuse in a wider place-space whole” (Seaman, 1979, p. 95). While human life typically organizes life by isolated places for sport, school, work, and recreation. During this study, I observed that the schoolyard was a place that the community holds in common, life moved through the area daily and offered a relational space that tied all life together. The schoolyard could be a place of renewal.

The aesthetic experience of a schoolyard influences children’s familiarity and appreciation for the natural world. A landscape composed of diverse plant life with place to hide, play, and be imaginative relates to children’s knowledge of plant and animal life (Sobel, 2005). A homogenous schoolyard transformed to heterogeneous can “provide the affective basis for stewardship behavior--for acting in ways that improve the quality of the environment” (Sobel,

2005, p. 34). The schoolyard is clearly an important part of the daily movement in and around the three schools. The ambiguity makes room for imagination and perhaps the boundary between the school and the community could renew not only relationship among human life, but also among life. Louv (2008) states, “Look for the edges between habitats: where the trees stop and a field begins; where rocks and earth meet water. Life is always at the edges” (p. 173). The renewing potential of co-existing in place is already happening on suburban school campuses.

**Significance of the Schoolyard as Ambiguous Space.** Aesthetically, parks and school properties were aesthetically similar at the suburban schools. If all life were present in the ambiguous space, further research could clarify how residents use the land, how they value the public land, and the significance of easy access to pleasant places. Sobel (2005) contributes to the established literature exploring playscapes for young children. Similarly, post-secondary student use of campus green space and its aesthetic role in perceptions of the university are documented (Speake et al., 2013). When Steve expressed his desire for the Windy district invest in the aesthetics of the areas immediately around the school. I noticed that the needs of secondary students, middle and high school are un-studied. Especially opportunities to use their bodies to learn with the place that surrounds them. It is apparent that education generally neglects embodied learning of secondary students in favor of intellectual learning. We must not neglect the body in learning. Judson (2008) posits that to foster an ecological imagination, “the body, emotion, and imagination come together in a context and through practices characterized by patterns of relationship, change, diversity, and complexity” (p. 169). Future studies might ask, what playscape may be unearthed from middle or high school imaginations? How do they use their bodies to relate to place? How do they want to play?

### *Crunches and Honks: Life Eats at School*

The fourth theme that responds to the research question was Life Eats at Schools. Doll (2000) states, “tending soil in such ways as watering, cutting, pruning, pinching, digging, sniffing, and watching. This downward shift expresses a primordial truth: What the earth gives forth in the branch form of food--banana, coconut, breadfruit-yam--is the flesh of earth blooming in the vine substance, of which we all partake” (Doll, 2000, p. 176). Both more-than-human and human life ate at school. I previously described lawns as a food source for Canada Geese and foraging Corvids. The Spotted Towhee drew my eye to what eats at the school building and where they eat, at the permeable boundaries. Human life consumed food from three sources while at school. First, lunch was provided by the school district at all three schools. Breakfast was served at the Plains School. Second, students brought their own snacks to class at all schools. Single serving chips were the most popular. Thirdly, take out from surrounding restaurants or grocery stores. These three food sources still draw from somewhere to sustain humans at school whereas more-than-human life ate directly at the school. Food is not only a source of energy, but also a source of learning. Sobel (2005) suggests that we should begin our knowledge of the near things first and move farther away. He states, “you can’t really get much nearer than the internal microenvironment of your digestive system as a focal point for the curriculum” (Sobel, 2005, p. 4). This is another example of how students bring fodder for curriculum, they are literally ingesting opportunities for renewal of relationships among life.

At all the schools, students ate chips, so many chips. During every observation students crunched on fried snacks. Potato chips and processed corn in the form of Cheetos, Takis, and Doritos. Some students were secretive and kept their precious chips hidden in dresses or hoodies, they took one chip or Cheeto out at a time. Other students ate openly and quickly, then threw

their bag in the trash. The reflective, silver chip bags were all over the campuses and collected with the leaves along fences. I noticed many bags had holes like they were pecked by Corvids or nibbled by small rodents.

Take out containers over filled garbage bins near the front entrances at all three schools. Restaurants and grocery stores in the immediate vicinity determined what containers were in the bins. At the Plains School, there were chip bags mostly, likely brought from home or bought at the gas station across the busy street. Starbucks cups were also abundant because there was a store a block away. Foothill high school was a short bus ride from a Whole Foods, City Market, and strip mall with multiple restaurant options. The takeout containers were mostly from Whole Foods, the brown paper folding boxes that you fill up and pay by weight. At Pine High School, McDonalds bags spilled out of the bins after lunch. The fast-food restaurant was less than a mile away through a single-family home neighborhood. What showed up at the trash cans was directly connected to local restaurants and industrial food chains. Students moving across the permeable border surrounding the school to gather food. There is so much to explore from food and food may be the most literal connect between human life and more-than-human life. Humans cannot survive without other life, cannibals the obvious exception.

Judson (2008) argues that food is a valuable teacher because students can participate in growing and eating food from seed to harvest and care for the soil seasonally through composting. All these processes foster ecological community connections that “builds on the premise that ecological imagination may develop through activities in which one’s body, emotions and imagination are engaged in the natural world” (Judson, 2008, p. 176). Human bodies are a tool that grows food that shows up in grocery stores, gas stations, restaurants, and maybe on school properties. Although, I noticed Plains School, Foothill, and Pine High School

all had abandoned gardens on their campus. Neglected gardens do not prevent relationships with plants as sustenance. The chips and meals are already in the building carried by students or district culinary staff. How did the food arrive at the plate? Who and where did it come from? Can students make their own chips?

If teachers do not look to food as a teacher, they can look to more-than-human life to show ecological relationships with food directly tied to place. Perhaps humans may follow the lead of the goose and corvid. Food illuminated ecological relationships accessible on any schoolyard. What are the plants and animal doing to survive, “how they move to get food, how they hide and, so, avoid being food--in ways that engage students somatically in learning. The diversity of animal movements, and strategies they employ to survive is truly astonishing” (Judson, 2008, p. 278). In the case of the schools in this study, geese and corvids were frequently observed eating grass on and around the schoolyard. Geese traveled in groups and ate as they walked. Corvids walked in pairs or threesomes across the grounds, they stopped to investigate chips bags and pick morsels off the ground. One day, at Plains School, I observed a large mixed group of American Robins and European Starlings. They rummaged through a pile of leaves that had collected in the juniper bushes in front of the school. More-than-human life sustained by food at the school is a relationship among life and place. I will discuss how this is expressed in the camouflaged curriculum in response to the second research question.

To conclude this section, I just explored the observations that support the theme: life eats at school and what educative potential lives in the relationship among human life and more-than-human life. I perceived these findings by blending observations outside the school building and inside the teacher participants’ classrooms. When I noticed that more-than-human life ate at

school, I also noticed the schoolyard was an ambiguous space that diverse life used for a variety of activities.

### ***Research Question 1 Conclusion***

In the preceding section, I responded to the first research question: What relationships exist among life, human life, and place in school communities? I foregrounded what was familiar and mundane so we may see them anew (Eisner, 1992). I paid particular attention to ecological relationships and what they taught me as an education researcher, the meaning for participants, and for the education community at large. I organized the response in this chapter to match Chapter IV. I began with structure as the shaping force of the school ecologies that I observed. Flow manifested in predictable and unpredictable ways on the landscape and in the classroom. Cycles showed how life moved across the landscape to and from school. Schoolyards as ambiguous spaces existed at the confluence of flows and cycles along with life at school. While each was discussed in isolated form, I acknowledge that, like all ecology, these all overlap and interact in dynamic ways. The relationships among life that existed at the suburban schools connected lawns, food, and movement across the landscape. In the next section, I will share the themes in response to the second research question, how the four participating teachers expressed these relationships in the curriculum.

### **Research Question 2**

Q2 How are relationships among life expressed in the school curriculum?

In this study I combined ecological and educational research methods in a postmodern ecological framework. I accept that human life is in relationship with all life of Earth. Life relates in evolving, unpredictable, expected, and unique ways. This complements Eisner's ecology of schooling as a holistic, evolving, and interacting schema. Eisner's ecology of schooling sets out a



schema with which education researchers can see schools as comprehensive systems. With the ecology of schooling, we can see the parts and the whole of the school system simultaneously along with how the dimensions relate to each other. He defined five dimensions: intentional, structural, curricular, pedagogical, and evaluative (Eisner, 1992). Wright (2018) argued that place should be added to the ecology of schooling,

Place is, in other words, one of the main qualities of each of the practices of the teachers with whom I spoke; it is pervasive at these sites. What it is to have an awareness of how such quality is present and understood was an aspect of [her] study that seemed to elude Eisner's ecology. (p. 205)

An ecological system exists and manifests in a particular place (Wright, 2018). My observations and subsequent findings support her argument for including place in the ecology of schooling. Further, like an ecosystem, it is difficult to isolate one part of the whole, ecosystems function interdependently. In turn, educational situations are shaped by relationships among the dimensions. While I describe the themes in response to the research question, know that the distinctions are amorphous and evolving.

In Chapter IV I used the place (Wright, 2018), structural, and curricular dimensions to describe the four teachers' educational situations. The structural dimension was essential for each teacher participant. Mr. Pink, Steve, Elizabeth, and Sloane each blurred the distinction between place and their school through a permeable boundary. Like the Spotted Towhee, human life was also sustained at academic boundaries. Subsequently, the themes that follow, focus attention how relationships among human life, more-than-human life, and place were expressed in the intentional and operational curriculum (Eisner, 2017; Uhrmacher, 1997; Uhrmacher et al., 2017). I will propose a new curriculum expression. The camouflage curriculum conceals

potential learning by hiding in plain view and in some cases, obfuscated by relationships among life that are fully embodied in daily life. First, I will review the teachers' intended curriculum. I add the intentional dimension of schooling here as an expression of relationships among life in the curriculum. Then, I share expressions of relationships among more-than-human, place, and human life in the operational curriculum. Lastly, I close with a discussion of the camouflage curriculum to draw attention to what is concealed in plain view in the four teachers' curriculum.

**Intentional Curriculum: “We Can Change Our World for the Better”**

The intentional curriculum is defined simply, what the teacher intends to happen during an educational experience (Eisner, 2017; Uhrmacher et al., 2017). Collectively, all participating teachers showed they wanted to improve some aspect of human life and all life on Earth. While these intentions were not always ecologically minded, the expressed intentions did influence teacher practices and how they structured their classroom as described by Moroye (2007). Participating teachers used words like imperative, hope, want, and goal to articulate their intentions. Over the course of the study, I noticed that how teachers defined relationships sometimes aligned with their intentions. I initially asked about relationships because explicit definition of relationships in an education context appear illusive. So, for me, I needed to begin with how teachers defined relationships to see how they expressed them in curriculum. I will review teacher intentions and their definition of relationship in order of observation.

Mr. Pink intended to create community in his classroom and human relationships were priority, “I think it’s imperative that I foster that love and that respect for others, for self, for our environment, that can be done through relationship building.” He showed that love with consistent greetings, respectful heckles, living in the area, knowing the students, and meeting

their needs. Mr. Pink's definition of relationship: "The sum of knowing, respecting, connecting, and bring consistent" (Table 8). Knowing meant, "knowing things about your student" like siblings, hobbies, sports, etc. Respecting as in showing someone respect for who they are and what they bring to the world. Consistency is invaluable for both knowing and respect. He described it as coming into the class every day and having his head right, so the kids know what to expect from him. Among teacher participants, Mr. Pink had the most specific definition and examples of what relationships meant to him (Table 8). He was a role model for the students and fully integrated himself into the community at school and in his life outside school by living in the community. Mr. Pink prioritized human relationships throughout his teaching.

Steve defined relationships in a way that communicated his intentions for his relationships and his curriculum. He felt responsible for ecological and human relationships in his life, he wanted to keep students safe. Flowing from Steve's responsibility for ecological relationships among humans and all life, he observed that his students developed their ability to think systemically during his course. When I asked about his hopes for his students, Steve said,

My hope is that they can both take a reductionist view but also systemic view of the world, so they can focus in on one thing and try to figure out and understand how it works. Then, they can step back and understand how that thing is part of a big system. Then all those little parts that they can reduce down to their details are all working together. [I hope] that they would be able to do that.

Steve's intentions manifested in the operational curriculum and incorporated the social implications of how science teachers understand and teach genetics. Steve, who has ecological and educational expertise, defined relationships in a way that communicated his intentions for his relationships and his curriculum. He felt responsible for ecological and human relationships in

his life. He called relationships with students, “the most important relationships in my life” other than familial relationships. He described responsibility, “well, the word responsibility is there. I feel responsible for the economy of nature. And natural processes because I depend on them and affect them.” He described mutualistic relationships as beautiful. Other relationships among living things can be horrific and fantastic. Steve states, “I try to impress upon my students that most death in nature is fantastic. It’s not like in a hospital on morphine with family. It’s being eaten alive.” There was a spectrum of ecological relationships from violent to “warm and fuzzy.” When asked about his definition of educational relationships Steve listed: nurturing, challenging, warmth, curiosity, and there can be “communication problems.” He said, “These are other people’s children. And I’m in charge of creating a safe place for them to, to explore their ideas and learn some cool things.” So, for Steve, responsibility cut across species and his curriculum provided opportunities to understand and then act to improve living conditions.

Elizabeth valued reciprocity in her relationships and offered choices in her curriculum because, as she said, “I want them to be invested” in their education broadly and her courses. The options supported student investment in science content. She solicited investment in a variety of ways. She offered example careers and next steps beyond high school. Elizabeth developed a Health class for students who will not enroll in AP courses at Plains School. She also included relatable cultural and charismatic examples in class materials. All the lessons I observed in her classroom were connected directly to the lived experiences of students, content was embodied in personal health, future career, or environmental health. Elizabeth defined relationships as an exchange between people or with pets. She said this about an animal she related to, “Family, comfortable, close, warmth, or physical touch...a literal connection.” The way she defined relationships in education was similar. Elizabeth said,

The word exchange stuck out the most, the literal definition that we're used to. That's where I went with all the things that I'm exchanging, like, opinions, feelings, support. And, I think I also related that to connection of some sort. Not just exchange but sometimes, if there is a connection with the exchange of words or with like, facial expressions or body language or again, like, comfortability. A material sense [that] there's connections and exchanges.

She gave an example of saying hello to someone. We can say hello, but that doesn't necessarily imply relationship. She added, "The acknowledgement and then some effect connection or exchange, so, not just one directional." At this point in the interview, I asked if she agreed with Nel Noddings (2005) care theory, and she said yes, "the other person acknowledges the exchange." For Elizabeth, relationships had some kind of reciprocity. Elizabeth's definition of relationships most clearly embodied Noddings (2005) care theory.

Sloane said this during the interview, "My goal is like how we can change our world for the better." While this was threaded in both her classes, it was explicit in IB ESS, which was relatively structured. She said, "I always include purpose and environmental issues in the course whether volunteering, careers, or future college connections." She included opportunities to get involved in community, city council comments, volunteering, future careers, and by creating "cool" experiences with her students. Sloane described education relationships as interdependent, I think of relationships in the context of like, say ecology and ecosystems as they're all dependent on each other if one changes dramatically, another one may change as well as a result of that change. So, they're all connected as one system and if you take one part of the system out the rest of the system may not operate the way it should. [The system] may lose homeostasis, become unbalanced and become an unstable system. You know,

an example we use a lot and was very relevant right now is just removing a top predator from an ecosystem or something like that. What happens when you reintroduce them?

Her explanation expressed the interdependency of a community of life forms, human and more-than-human. Correspondingly, when Sloane described her relationship with her daughter she said, “we’re just very connected and close. I depend on her, and she depends on me in different ways.” Relationships were interdependent in her personal life and expressed interdependence in her curriculum as well.

Collectively, all participating teachers showed they wanted to improve some aspect of human life and all life on Earth. Participating teachers used words like imperative, hope, want, and goal to articulate their intentions. Concerning relationships, teachers’ definitions of relationships varied widely. Mr. Pink elevated consistent respect and knowing. Steve felt responsible for ecological and social relationships; he worked to create safe places for both. Sloane described interdependence among people and ecosystems. Elizabeth used economic terms and reciprocity. There is a connection between definitions of relationships and teacher intentions, however, the variety of responses warrants further study. The findings in this dissertation supported Moroye’s (2007) contention that teachers ecological beliefs manifested in their intentions and complementary curriculum.

### ***Significance of the Intentional Curriculum***

Moroye and Ingman (2013) outline three themes of ecological mindedness: ecological care, interconnectedness, and ecological integrity. Teachers who participated in my dissertation inquiry expressed interconnectedness, defined “as an acknowledgement of various and eclectic notions of the relationships among all things” (Moroye & Ingman, 2013, p. 599). Albeit each teacher expressed that interconnectedness in unique ways. Mr. Pink, who valued human

relationships, expressed an emergent teaching that was immediately responsive to student needs, questions, and comments. Steve who felt responsibility for the community, leaned into an integrated biology schema to teach all his classes (Carroll, 2016) such that students could think at multiple scales to solve social and ecological issues. Elizabeth, who wanted students to invest in their classes, consistently seeded her curriculum in embodied experiences. She created a health class for students that progressed over the year from personal health to environmental health. Sloane connected her curriculum directly to opportunity for students to participate in local environmental issues. She invited students to write and send (optional) letters to Oso Creek city council about a ban on gas-powered lawn equipment. Ultimately, all the teachers utilized a permeable border between the school and the surrounding place to make their curriculum relevant with their students.

The experiences that the four teachers were ecologically educative as in connected common past and future, oriented towards growth. “As students come to an understanding of interconnectedness, they begin to see themselves as central components of content; the separation between self (subjective) and other (objective) is diminished and the experience becomes one of relationship” (Moroye & Ingman, 2013, p. 606). Steve, Elizabeth, and Sloane consistently offered a path from high school towards science careers. Overall, findings from my dissertation confirm the connection between teacher intentions and operations (Moroye, 2007; Moroye & Ingman, 2013). However, operations of the classroom, as I observed, existed between predetermined curriculum and their own intentions. In Chapter IV I described how the AP and IB curriculum formed a flume. Now, I will discuss this further in the next section, operational curriculum, how daily relationships among life were integrated into the curriculum.

## **Operational Curriculum: Constructed Flumes and Free-Flowing Rivers**

The operational curriculum was how teacher intentions came to life in classroom happenings. Eisner (1992) states, “No curriculum teaches itself and how it is mediated is crucial. ... The operational curriculum is the curriculum that is played out in the context of classroom life” (p. 624). As previously described, each participating teacher drew from their local contexts to craft curriculum, this was a criterion for participation. Each teacher integrated place and relationships with more-than-human life in unique ways as we would expect in diverse suburban contexts. Looking at all the teachers collectively, all the participants include local ecological or cultural examples in their annual unit cycles. Typically, local environmental education and ecological examples in mainstream education were relegated to the null curriculum, teaching that ecological systems happen far away from where we are. So, the participating teachers, by connecting the immediate surroundings, moved ecological education from the periphery to the core of their classes. However, the expressions of more-than-human life were constrained to roles by constructed units and imagery in the classroom. In the following operational curriculum section, I will describe themes illuminated during this study. I observed teachers navigated constructed units, used life as study subjects, and free-flowing day-to-day relationships. Teachers bridged distances by inviting local experts, using data and imagery. I will end the operational curriculum section with two unique expressions of more-than-human life.

### ***The Flume: Constructed Units and Standards***

In Chapter IV I discussed the “flume” of constructed units and standards and how they shaped curriculum and how children related to more-than-human life. I briefly restate the points here. The path is human constructed and moves knowledge on a planned route through units and



standards. The teachers had their personal intentions which collided external pressures. Colorado State standards, International Baccalaureate, or College Board developed courses set curricular goals and organize them in prescriptive units. Participating teachers skillfully worked within their place contexts and school structures to craft curriculum with their students in mind.

While exams are part of schools, exams are not the only part of schooling and hardly the only aims. What is critical here, is that the AP and IB courses teach students that there is one correct answer that explains ecological relationships among life. When, an exam response is the answer for the test. The exam answer is not the only answer and sometimes it has no bearing on life beyond performance to the standard. I observe that the AP and IB exam embrace settler consciousness in how children relate to life specifically as study subjects.

While plants and animal serve as study subjects, they are also teaching human life something about their relationship. Kimmerer (2020) blends western and Native science. She points out that traditional ecological knowledge (TEK) is not unique to Native America, “but exists all over the world, independent of ethnicity. It is born of long intimacy and attentiveness to a homeland and can arise wherever people are materially and spiritually integrated with their landscape” (Kimmerer, 2002, p. 433). Human connection to community over generations and evolutions of the landscape. Humans not only observe and monitor closely, but they also harvest plants and animals, and hold intimate knowledge of ecological disturbance (Kimmerer, 2002). Humans, by going about their lives, develop deep relationships with their surrounding place. While the notion of sustained connection is antithetical to suburban life (Brooke, 2015), perhaps ecological connection opens the door to human life expanding the view with and beyond the lawn. Further, the humanities, typically dismissed by hard sciences, returns to biology as a constitutive partner. This prepares young people, scientists or otherwise, to engage with a

multicultural, complex, and dynamic world (Kimmerer, 2002). Science is improved with a plurality of worldviews – in relationships *with* more-than-human life instead of *to* plants and animals. Forming the ecological connection take more than intellectual knowledge, it also requires a bodily and emotional relationship (Judson, 2010).

Human life guided by modern science cuts connections to the ecological world, “modern people collectively suffer a kind of sensory and emotional starvation” (Cajete, 2015, p. 122). A renewed science,

must be based on the reintroduction of the participatory mind, one that re-calls and re-establishes the basis of human awareness in a larger ecology of the world. Science must once again become the story of this awareness and relationship to the animate living world. (Cajete, 2015, p. 123)

Children already express this worldview by animating more-than-human life during play (Louv, 2008; Sobel, 2005). Perhaps renewed science simply does not close the door to what children already embody. Judson (2008) similarly proposes that adding the body and emotion back into learning sparks an ecological imagination that fosters relationships among life. When I was a secondary teacher I heard, “hands on, minds on” to support the idea that children doing things with their hands creates engaging learning experiences. However, a hand is a small part of the body, also emotional and collective knowledge is left out. I propose in the next section that noticing the daily relationships with the more-than-human world create a portal to ecological relationships among life.

### ***Free-Flowing: Daily Relationships Among Life***

The second theme that helps answer the research question: how relationships among life are expressed in the curriculum? Is Free-flowing relationships were not part of the predetermined

curriculum, they are relationships that are fluid across species and express themselves in the classroom as relationships builders among human residents. Relationships among life are ubiquitous, mundane even. Each of the examples that support this theme show how the rigid boundary between schools and all life is a human construction making it permeable, amorphous, open to evolution. All four teachers shared their love of pets and three had mammalian pets or plants at home. I hope it is not too soon, bacteria and viruses are in relationship with human life into perpetuity. There were also unique expressions of relationships. At Foothill High School councilors' dogs were part of the community and the school sometimes went on a hold when local large predators were near the building.

Human life, teachers and students, bring themselves into the school building. What they bring with them as they course through life, are all fodder for the discerning teacher to include in the curriculum. The examples that follow support the free-flowing relationships theme show how the teachers observed their community, listened to their students, and incorporated daily relationships among life into their curriculum. Demarest (2015) states that listening to students,

Is an immensely simple and profound practice to invite student into the planning process. They have so much to say about how they can best learn, what connections are important to them, and how they can demonstrate their learning. Such reflection fuels their own learning and the learning climate of the school. (p. 163)

As described in Chapter IV, the four participating teachers skillfully integrated place relationships into their predetermined curriculum. Day-to-day life was also included. Simply by going about their lives with students, in so doing, the teachers opened the permeable boundary between school and community making a space for curriculum that courses through life and place (Demarest, 2015; Doll, 2000) moving fluidly, in and out of the classroom.

*Co-Existing with Pets at Home and at School.* The significance of classroom pets is understudied in education research. Smilie (2022) points to valuable contributions of classroom pets that may bridge complex topics like sex education and death. The presence of rabbits and dogs may be valuable for autistic students. Only Mr. Pink had a class pet. Nefertiti, the tarantula was front and center of his classroom every day. They ate cockroaches that Mr. Pink kept in a small box next to Nefertiti's home to be dispensed weekly. I observed the students looked in on Nefertiti often. In a school where students did not go outdoors often, the tarantula may be the only connection with animals aside from their meals. The spider sparked curiosity for students.

Mr. Pink and Elizabeth both described in their interview how the more-than-human life, pets and plants, was a relationships builder with students. Mr. Pink shared a story about a plant he gave to a student after learning how much she loved tropical plants and how many she had in her home. Elizabeth described how she loved cats. She and her TAs often connected by watching cat videos between classes, "it's a thing" she said. Her students gifted her cat themed cards and trinkets. However, all four teacher participants had pets and/or plants at home. Plants and animals were relationship builders among the human community. Pets were particularly prominent at Foothill High School where I felt like I was the only person without a dog while I walked around the school. Pets, while easily dismissed as a relationship that steal agency from the animal. Classroom pets may be the only bridge to relationships with more-than-human life for some people. In which case teachers may utilize the relationship as an example of stewarding or care of plants or animals. "They could provide a sense of comfort for students within these heavy complex topics, such as through caring for a pregnant rabbit or mourning the death of a gerbil" (Smilie, 2022, p. 246). Classroom pets also provided opportunities for teachers to elevate careers in farming or animal sciences. They also, "provided authentic connections and examples

outside the reach for educators” (Smilie, 2022, p. 250). Further research will expand what little is known about the role classroom pets play in the classroom.

*Bacteria and Viruses.* All life co-exists with bacteria and viruses. Bacteria are among the oldest animals on Earth. Humans coevolved with pathogens for all their existence on Earth (Carroll, 2016; Mukherjee, 2022). Humans use medicines derived from their surroundings to treat illnesses that arise from those pathogens. In Colorado several plants have antiviral and anti-bacterial properties. Osha (*Ligusticum porteri*), for example, is especially affective at treating a persistent cough (Moore, 2003). In the last few hundred years, humans developed, then manufactured at a large scale, antibiotics and vaccines which dramatically reduce deaths associated with communicable diseases (Carroll, 2016). Even with all this human engineering, humans are still subjected to bacterial and viral diseases. Four years ago, I doubt I would have even noticed this relationship except for the occasional cold or stomach flu associated with being in schools. The COVID pandemic profoundly disrupted the routine operations for schools around the world during spring 2020. This will likely be present in the minds of school staff, families, and students for a long time to come. In spring 2023, the impacts of COVID are still being felt.

During this study, COVID lived in the school communities. At the Plains School, Mr. Pink’s son, and Elizabeth both caught COVID during the time I was observing their classrooms. They both said that COVID was “going around the school” again. During our interview Elizabeth described school life at Plains School as a “pre-corona to post-corona.” After observing all my student teachers, at different schools, and then observing Steve’s class, I caught a viral cold that prevented me from conducting observations. When I returned to Foothill High School, I observed that Steve was congested. Some students wore masks, and some were out sick. Bacteria and viruses were part of school life. The science teachers Steve, Elizabeth, and

Sloane included bacteria and viruses in their classes explicitly as determined by their standards. Elizabeth used MRSA as an example of human driven bacterial evolution in the following vignette,

“How is MRSA a direct observation of evolution?” Elizabeth asked.

“You can tell if someone only took the first round of antibiotics because the bacteria can stick around after” and “you need to take all of the antibiotics,” a student replied.

Sloane used COVID as an example of diverse immunity among humans and how that was an example of natural selection.

Pine High School. “Is fitness like this?” Sloane squatted and pretended to lift weights. She explained that there was a struggle for existence and variation. For Natural Selection to happen there must be a lot of individuals, “we are all different and a lot the same. Why is variation important?”

A student answered, “the population survives.”

“Yes, for example, we all have different immune systems. How many of you had COVID?,” Sloane asked, and 6 hands went up. “I bet all of you were exposed at some point.”

Humans will always be in relationships with bacteria and viruses. As a ubiquitous state of being, this relationship is fully embedded in the daily operations of schooling. They are directly knowable more-than-human life that already exist in the classroom as examples of evolution, public policy, environmental relationships, and anatomy. Chances are good, like Sloane pointed out, that everyone understands how bacteria and viruses shape human life. A trauma informed approach is essential when integrating COVID as a topic or example and it offers a somatic relationship with more-than-human life.

*Unique Expressions More-Than-Human with Human Life.* There were three unique expressions of free-flowing relationships among life. First, Foothill High School occasionally went on a hold because bears or mountain lions were outside the building. In this case an intimate relationship between humans and more-than-human life was not desirable. However, in this action, we see that humans do not sit atop a hierarchy of life. Large predators were a threat to children's safety. The second, Elizabeth included intoxicating plants in her Health class curriculum. She briefly connected alcoholic beverages with their source plant "fruit and corn." Also, yeast, a single celled eukaryote. How alcohol affected the human body was the focus of the lesson. The most interesting to the students was how alcohol shrunk the human brain over time and a spontaneous conversation about cauliflower sandwiches. The third, Foothill High School counselors sometimes brought their dogs to school. Steve said, "their dogs are either up there in the counseling center or they're walking through the halls. For kids to just stop and pet and have a little moment life that, with something that's not going to judge them." This echoes Smilie (2022), who advocates that animals are valuable for autistic students in the classroom. These three expressions of relationships were unique in this study.

### ***Free-Flowing Relationships in Conclusion***

Judson (2010) states, "the body comes equipped with different tools for encountering the world and making sense of those encounters that include, for example, emotional responses to attachments, the senses, the body's sense of pattern musicality, and humor" (p. 39). Each of these examples show how teachers integrated daily relationships with more-than-human life into their curriculum. The free-flowing relationships are relationships that are fluid among life and express themselves in the classroom as relationships builders among human residents. Dissolving the rigid boundary between schools and all life allows human life to perceive that connectivity as it

courses through school communities. These free-flowing relationships were loving relationships with pets. Human relationships with bacteria and viruses, perhaps less loving. Demarest (2015) states, “when teachers take a critical stance toward learning in the community, there are no limits to what can serve as sources of knowledge” (p. 107). Participating teachers integrated them into the classroom community. While they may not be explicitly academic, they are “a valued pathway to learning” (Demarest, 2015, p. 108). I just explored free-flowing and embodied relationships in classrooms, next I will explore the significance of the ecological imagination for bridging distances when content isn’t local.

### ***Significance of the Ecological Imagination***

Place-based education aims to deliver academic content in a local inquiry (Demarest, 2015). The predetermined curriculum that comes along with AP and IB courses, or Colorado academic standards sometimes disconnects place from content. For example, over the spring, science teachers cover evolution content. Evolution at the high school level includes the requisite discussion of Lamarck with giraffes, Mendel with peas, and Darwin with the finches. While these are essential for students, particularly those aiming to pass their AP and IB exams, it also creates a distance between the concept of evolution and the places where students live. Doesn’t evolution happen everywhere? I discussed and provided examples in Chapter IV of how teachers bridged the temporal and special distance with storytelling, local experts, data, and imagery. I expand the significance of this practice in this section.

Combined these routines foster an ecological imagination which is vital for students understand ecological relationships. Ecological imagination allows content to “ferry across” ecological content (Fesmire, 2010, p. 191). The ecological imagination cultivates the skill to think in seeded scales and relationships simultaneously,



I am able to zoom in on things, events, concepts, institutions, and persons without losing sight of their relational context – say, a child in relation to family, a sunrise in relation to the solar system, a statement in relation to its interpersonal, sociocultural, or literary context. (Fesmire, 2010, p. 184)

While none of the teachers named their skillful creation as ecological imagination nor place-based education, they had identified that there was a temporal or spatial distance between the classroom and content they delivered. The four teacher participants skillfully created bridges across expanses of time and space. They drew from their local community when possible. Mr. Pink integrated the cultural and religious facets of community life and the science teachers brought invertebrates into their classes. Science teachers used water catchments as riparian ecosystems to study. That said, the bulk of study sites and more-than-human life expressions I observed during this inquiry were historical and from places far away; teachers skillfully connected content across distances with a variety of methods.

Judson (2010) carries a vision of an Imaginative Ecological Education (IEE) that supports ecological understandings in five ways. First, ecology is central in the curriculum by integrating ecology into all topics. Second, learning happens outside the school building. Third, IEE supports embodied understandings. “By routinely and meaningfully developing the body’s tools for making sense of the world, students may be able to not only directly experience wildness that surrounds them, but they may also learn to pay more attention to their somatic encounters” (Judson, 2010, p. 158). She is especially interested in children experiencing the “heterogeneity of nature, may support their sense of being part of a larger community and interconnected in the world” (Judson, 2010, p. 159). Through experiences in a variety of settings or the same place in a variety of weather or seasons may foster connection and will inevitably lead to student curiosity

about their personal or ecological observations. Fourth, cognitive tools must engage emotion and imagination so that students may create novel connections generally and with nature specifically. Fifth, sense of place. Leveraging connections that situate students in the place where they live (or go to school), “may develop lasting emotional connections” (Judson, 2010, p. 158). This may lead “students to identify with, and develop a sense of self that is informed by, the natural context in which they live” (Judson, 2010, p. 158). I found that the four teachers expressed their intention to connect students to self, place, and environment.

The teachers employed strategies to make ecological, social, and political connections. I observe that the body as source of embodied knowledge was missing. It is entirely possible that the fall, when the teachers went outside with students, had more opportunities for bodily learning. An essential point from IEE is the emphasis on “routinely and meaningfully developing the body’s tools” (Judson, 2010, p. 158). After all, students have bodies year-round. In the upcoming section that will define and explore the camouflage curriculum, embodied knowledge will rise to foreground again.

### ***Operational Curriculum Conclusion***

The operational curriculum combines teacher intentions and constructed curriculum in classroom activities (Eisner, 1992). As previously described, each participating teacher drew from their local contexts to craft curriculum, this was a criterion for participation in the study. Each teacher integrated place and relationships with more-than-human life in unique ways as we would expect in diverse suburban contexts. Typically, local environmental education and ecological examples in mainstream education were relegated to the null curriculum, teaching that ecological systems happen far away from where we are. So, the participating teachers, by connecting the immediate surroundings, moved ecological education from the periphery to the

core of their classes (Demarest, 2015; Moroye, 2007). I observed teachers navigated constructed units, used life as study subjects, and free-flowing day-to-day relationships. Teachers bridged distances with story, local experts, and they used data and imagery. I will end the operational curriculum section with unique expressions of more-than-human life. Next, I will share what I noticed in the camouflage curriculum.

### **The Camouflage Curriculum**

Using ecocriticism in a postmodern ecological framework to foreground the relationships among human life, all life, and place allowed me to see familiar relationships that escape perception. Through the ecological lens, I focused on all the more-than-human life in the classroom and in the schoolyard. The familiar and taken for granted parts of school life were made strange (Eisner, 2017). I noticed expressions of more-than-human life in the curriculum that I initially thought were in the null or hidden curriculum, however, upon reflection, they weren't omitted nor hidden, these three expressions were integral parts of our daily lives: Canada Geese, school meals, and clothing. Human life engaged with all three examples I will explain every day. First, Canada Geese are ubiquitous in suburban communities in the Denver Metro they thrived in lawns ecosystems Human life vigorously maintains lawns, food for geese, with their labor, water resources, and mowing equipment. Geese are often described as pests and not included in the explicit curriculum. Second, no teachers said that school meals were part of the school's relationship with more-than-human life. Food that was eaten from chip bags or school lunches or as unique expressions of culture around the world. Food is the very foundation of human existence on Earth. Third, right now, I am dressed in cotton, hemp, leather, and polyester all derived from more-than-human life. I did not notice clothing as an expression of more-than-human life until students discussed fast fashion in Sloane's IB ESS class. It is not that these are

missing or concealed. They are in plain sight, camouflaged by their familiarity. To clarify the distinction between the null, shadow, and camouflage curriculums, I will review the null and shadow, then share three examples of the camouflage curriculum.

Null curriculum is what is not taught, omitted on purpose or by accident from the curriculum (Uhrmacher et al., 2017). The null curriculum “calls our attention to that which is not there, and as a linguistic tool it reminds us that the neglected may be very important” (Uhrmacher, 1997, p. 320). While geese, school meals, and clothes were largely absent from the science curriculum, they were each present in the daily lives of human communities and part of the larger ecology of schooling. Related is the hidden curriculum, which “generally looked at issues of social control, of covert actions, and of nonacademic consequences of schooling” (Uhrmacher, 1997, p. 320). The case could be made that lawns and dissections affirmed separation and dominion over life. However, they were not hidden. I did not perceive there was any deliberate effort for social control involved teachers omitted geese, food, and clothing from their science classes. I noticed they were ubiquitous, and yet no teachers brought them up.

Shadow curriculum is a part of all curricula. Finding the shadow could help teachers improve their class curriculum and, in the context of this study, draw relationships among life in previously camouflaged ways. Uhrmacher (1997) states,

One may find the shadow of a particular curriculum by reflecting on what the curriculum privileges--a certain way of knowing and being--and by what it dismisses and scorns--other ways of knowing and being, which are, however, ironically inherent though neglected attributes of the curriculum or consistent with its presumptions. (p. 318)

I did observe examples of the shadow curriculum in that science teachers privileged a western view of science in AP and IB science classes in preparation for exams. However, they

did resist by working with the communities where they taught. More-than-human life were examples, like Darwin's Finches or Mendel's peas which we could say occupied the spotlight casting shadows ironically over what we related to daily (Uhrmacher, 1997). However, I don't think irony fits the camouflage curriculum.

In this study, I used an ecocriticism to pair ecological and educational realms in secondary, suburban education settings. In so doing, I noticed that human constructed boundaries between schoolyard and everywhere else were invisible, permeable, or completely open to the surrounding community. It was impossible to consistently maintain the rigid boundary when observing relationships among life. It follows then that education settings were equally as fluid between school and place. Humans brought their routines of daily life, and all that sustained them, into the school building daily. Despite the abundance of daily encounters with more-than-human life that could be educative examples faraway places, and historical examples, were privileged over what was directly outside the building. As teachers highlight what was at a distance, students miss what is quite literally concealed in plain sight.

Camouflage is blending in to the surrounding so well, the organism is hidden in plain sight. Predators blend in to capture prey. Prey blend in to avoid being eaten. Basically, the animals avoid detection (Miller & Spoolman, 2015). There are also fish who camouflage themselves as different genders to mate. There are many ways or reasons to camouflage. Animals use sound, coloration, behaviors; they camouflage as other animals or different genders. All that to say that camouflage is diverse as are the reasons to do so. Brighenti and Castelli (2016) pushed the concept of camouflage into the human, social world. They organize camouflage into strategies that prevent detection and those that avoid recognition by masquerading or movement. They add "motion dazzle" and "motion camouflage" that are aimed at confusing

perception (Brighenti & Castelli, 2016, p. 231). During this inquiry, the more-than-human life I will discuss how relationships with life avoid detection not by blending in, but by being routine parts of suburban life – so much so that they hide in plain sight. Canada geese are so common, we don't see them and often there are referred to as a nuisance, their existence and significance hidden by mundanity. The word mundane refers to something, “of the world; worldly as distinguished from heavenly, spiritual or commonplace, everyday, ordinary, etc.” (Agnes & Guralnik, 2001, p. 948). There are certainly issues of privilege and wealth that emerge when we look at mundanity in suburban communities, I fully recognize that mundane interactions with food, parks, or wildlife is not everyone's experience. Further, safe travel to and from school does not exist in all suburban communities. The following sections summarize what I found camouflaged in the educational situations where the four teachers worked.

When humans eat, sometimes we do not perceive that what we are eating was once alive. So, it is not that these more-than-human life are escaping being eaten, they often escape our perception all together. Humans accustomed to their presence, do not see them. Like a coyote in the city, they simply go about their lives and humans do not often notice. I call attention to the camouflage curriculum in the next section by illuminating three examples of camouflaged curriculum. I begin with this definition: camouflage curriculum is what is hidden by familiarity, mundanity, or routine interactions, their presence is forgotten. I close with a discussion on why revealing the camouflage curriculum is an essential part of renewing relationships among human life and the more-than-human world (Cajete, 2015; Nxumalo et al., 2022).

### ***Canada Geese and School Lawns***

Never in my life did I expect that Canada Geese would be a part of my dissertation project, but here we are. Canada Geese were observed at all the school sites, and I hypothesize

the geese could be observed in suburban communities across the U.S. The animal is familiar and yet, escapes human perception. Human life and Canada Geese interact so frequently, we can call it mundane, or commonplace. I observed people were indifferent to geese during this study.

Foothill High School. Two geese walked east along the sidewalk, eating as they walked.

Students got out of their vehicles and walked west towards the front entrance. The geese's heads were bowed and bobbed as they ate grass. One goose raised their head when a student or bus passed, the other continued eating. The geese minded their business. From my view, one of nine students looked at the geese when they walked past them. The one person stepped around the geese because they were between the garbage bin and the sidewalk. For the most part, the geese were equally indifferent towards the students.

Sloane's guest speaker said, they used to migrate, and then human agricultural and landscaping preferences changed Canada Geese behavior. They no longer migrate and are connected to suburban development and agricultural practices. Further, as human enthusiasm for constructing and maintaining vast lawns continues, so to do the population of Canada Geese continue to thrive. The Canada Geese reveal a deep relationship between human and more-than-human life. "Once considered a symbol of wilderness, this goose has adapted well to civilization, nesting around park ponds and golf courses; in a few places, it has even become something of a nuisance" (Kaufman, 1996, p. 79). Despite this rich history, no teacher participants included the lawns or geese in their curriculum despite covering social studies and science content that could feature the relationship: geography, climate, agriculture, biodiversity, evolution, and human life impacts on all of them. Canada Geese and lawns live in the schoolyard. Why then, did our more-than-human neighbors get left out?

Humans build buffets for the geese and yet, the living example of co-habitation off curriculum plans. What happened when I paid attention to the geese? I noticed there was a clear baseline and disturbance pattern. I the Canada Geese (and Corvids too) were at ease when they walked at a in the lawn eating or stood together gently honking and preening, this was the baseline. Other days, they flew about in large groups. They honked and circled, in what I perceived as attempts to land in lawns. Dogs and people traveling in the lawns would disturb the geese and prompt movement. Understanding baseline in an ecological community allows humans to notice when disturbance occurs. This awareness can key humans into precariousness and healthy responses.

I also noticed that the more-than-human ate at the school where humans also eat meals. The geese ate as local as you can get, right where they live. Could humans use the schoolyard to grow food for humans and animals alike? An ethical spin, is the lawn aesthetic more valuable than food? Water used for lawns is certainly a luxury of the times when we live (Steinberg, 2006). What do we owe geese if we transform lawns to grow human food instead of grass? The educative potential of relationships among Canada Geese, human life, and lawns remains unutilized to my knowledge. However, the living story offers a place for renewal. Demarest (2015) suggests, "Take your students outside and watch them learn. They will teach you a lot about how to have an authentic experience" (p. 163). As discussed previously, the schoolyard is an ambiguous and contested space, making it ripe for further study with students who routinely pass through and utilize schoolyards with geese. I shared my ideas; I am more curious about what story will students tell with their more-than-human neighbors? What stories live in the suburban wilderness?



### *School Meals and Human Nourishment*

The second example of the camouflage curriculum is school meals. Humans are heterotrophs, we must eat other organisms to survive and thrive. Humans are in deep reciprocal relationships with grains, animals, fruits, and vegetables. Humans grow these foods around the world, they sustain us and we sustain them. Schools feed children at least one meal a day, typically lunch, sometimes breakfast and a snack too. When I asked the four participating teachers how they routinely interacted with more-than-human life, no one mentioned food. Yet, when I asked about their daily routines the teachers said they did eat lunch, occasionally with other teachers. Students ate chips during all the teachers' classes. Steve hosted a regular lunch group in his room. So, food was not concealed, it was in plain sight. Again, plants and animals were a part of the daily operations of the educational situation, but they escaped our perception and in turn were a part of the camouflage curriculum.

With the ecological lens, I perceived that food, more-than-human life, that humans rely on to exist was not included in science curriculum that I observed nor was food described by teachers during interviews. Mr. Pink included food in the biomes unit of his middle school elective, geography. The four participating teachers were not unaware of the importance of food, perhaps they are merely expressing a modern, U.S. cultural relationship with food. The neglected school gardens at all the schools also indicated that growing food with students was not a priority. Is food's abundance so normalized into all our lives, that we simply expect it to be there? It seems that when food is absent, we notice as soon as our bellies rumble. It is important to acknowledge that the abundance of food available at and near all the three suburban schools in this study is certainly a privilege that not all communities experience.

Food is not only a source of energy, but also a source of learning. Sobel (2005) suggests that we should begin our knowledge of the near things first and move farther away. He states, “you can’t really get much nearer than the internal microenvironment of your digestive system as a focal point for the curriculum” (Sobel, 2005, p. 4). This is another example of how students bring fodder for curriculum, they are literally ingesting opportunities for renewal of relationships among life. Judson (2010) highlighted the Edible Schoolyard that beautifully blends agriculture, history, culture, embodied experiences, and food preparation. While she dismisses the program as another iteration of objective oriented environmental education, I disagree. Everyone in the school community has relationships with food that renders any structured curriculum immediately multicultural and embodied. Further, teachers who open the door to embodied experiences with food will have many opportunities for adaptation to students’ interests. I do think Judson’s (2010) proposal that teachers invite the emotional potential of learning with food is valuable. Overall, school meals existed in what I call the camouflage curriculum and once seen, offers a portal to renewed relationships among life.

***Clothing Combined Human Labor  
and Plant Life***

The third and final example of the camouflage curriculum that holds expressions of relationships with more-than-human life is clothing. I admit, I did not perceive clothing as a human and more-than-human relationship present in the school settings. It was not until students described how much they learned from a Fast Fashion presentation at the Climate Summit, that my perception was drawn there.

“Children want things. We, [our society] are always wanting more and we never have enough. In Fast Fashion there are a thousand new styles per day of shitty clothing.” Sloane referenced her thrift store jeans. She added to student

comments, “Humans are involved in making your clothes. Five percent of the process is automated.” She stretched out her Pine High School sweatshirt, “I bought this twenty-dollar sweatshirt downstairs and its handmade!” (Sloane)

Circling back to previous observations, I notice that Steve’s morning routine involved trading a warm coat that he wore on his walk, for a blazer to wear in the school building. Elizabeth was a sharp dresser and always prepared with layers to adapt to the classroom temperature. Mr. Pink said that when he taught biomes, he had an activity where students described what was in the closets of people in different climates around the world. Clothes were not concealed, but fully integrated into human life, mundane even.

Clothing, however, is far from mundane. Clothing express cultural and place relationships. Clothing holds symbolic meaning or messages and people cultivate identities with clothing choices. Teenagers may wear or reject clothing based on their symbolic meaning for them and what it communicates to others (Piancentini & Mailer, 2004). In other words, clothing is very important for secondary students. They already value clothing and wear them to school, could easily be integrated into academic content. For the career oriented, Shepard (2023) suggests that textile literacy is valuable for students working towards fashion careers. There are more than 300,000 textile jobs in the U.S. and (Shepard, 2023). I hypothesize that the leaning into students’ acute awareness of clothing as a status symbol will be more productive for teachers, “it would be difficult to find a product that is consumed more conspicuously than clothing by adolescents” (Piancentini & Mailer, 2004, p. 261).

Clothing is a highly contextual relationship among place, human life, and more-than-human life that people wear every day. Clothing is fully embedded in daily life, so pervasively, it is mundane, and escapes our perception as a relationship among life. Like the two previous

examples, clothing resides in the camouflage curriculum and offers a door to renewing relationship among life in schools.

*Significance of the Camouflage Curriculum*

Like the food humans eat, we can easily forget that humans were involved in growing, making, and delivering material goods to us. The work of feeding and clothing our bodies does not go away simply because we purchased them instead of made them ourselves, it is camouflaged. Inexpensive clothing hides social and environmental costs in the same way the consistent and abundant food exists at the grocery store. The camouflage curriculum is paradoxical in that the organisms involved aren't necessarily trying to hide, they escape the attention of the perceivers, human life in suburban schools. The relationships among life aren't hidden, they are fully embodied in school life. Brighenti and Castelli (2016) conclude,

Camouflage is not necessarily only about believing and make-believe but also, and perhaps above all, about desiring, as well as the social transmission of unmanaged or never fully manageable desire even when what is desired is not exactly clear. Camouflage is an apprenticeship in desire. Learning to desire is also that component of camouflage that pushes its consequences to systemically spin out of control. (p. 246)

What is it that human life desires by camouflaging their neighbors? For me, I perceived that Canada Geese weren't interesting or perhaps that there were "better" plants or animals to find on the school properties. I constructed a hierarchy of life in my mind, constructed boundaries around what I deemed worthy of my attention. In so doing, I positioned less frequently and charismatic birds like cedar waxwings, warblers, or novel migrants over the bird that I shared space with routinely. Further by enacting the hierarchy, I position myself as an ultimate decider of what is significant, as the superior. The very thing I aspired to avoid by using

postmodern ecology, an ecocentric framework. Watching and looking for the geese, required me to “re-see” them and perhaps reveal “what it looks like to make change in everyday life” (Bang et al., 2022, pp. 154-155). Suburban residents interact with geese in their everyday lives, and yet they remained camouflaged, the relationship forgotten.

Greenwood (2009) argues, “ecological studies are concerned with deconstructing and reconstructing identities through the construct of relationship” (p. 276). The plants and animals that human life co-exists with are the ones we are in a relationship with acknowledged or otherwise. I propose that revealing what is camouflaged is paramount to fostering renewing relationships among life. This is a critical difference between the hidden and shadow curriculum, which do important work for human relationships, but more-than-human life are left off implications. In all three examples, I observed a distance between the local and faraway places. Much of our mundane, material needs were met by places and life from far away communities and away from our perception. The camouflage curriculum is not shadowed nor omitted, it fully expressed and embedded in our daily routines and the workings of our bodies. The relationships among life that currently resided in the camouflage curriculum were geese and lawns, school meals and human nourishment, and clothing as a combination of labor and life. These relationships need not remain camouflaged, when seen they offer an opportunity to renew relationships among life.

The camouflage curriculum emerges from ecocriticism in a postmodern ecological framework. During the research, I foregrounded the relationships among human life which allowed me to see familiar relationships that escape perception. The question then follows, what can teachers and students learn with the camouflage curriculum? Once teachers or students see the life that surrounds them that was hidden in plain sight by mundanity (camouflaged), they

may draw their gaze to the life and learn together. A routine I use in teaching is to give students enough information about a phenomenon so that I can propose a question with multiple responses or open a path to more questions. The routine is a Next Generation Science Standards lesson flow. The following quick example highlights geese. Sloane's guest speaker pointed out; Canada Geese used to migrate huge distances every year. They were a symbol of wilderness in the U.S. I could ask, what do Geese symbolize today? Why might geese change their migration patterns? Next, I would go outside with students to observe the geese multiple times to get a better understanding of what they routinely do in the schoolyard. Each time, I would ask the students to talk with each other about what they observed with their senses and write questions they have on sticky-notes for a bulletin board. Returning to the classroom, post the questions on the wall for everyone to see. By listing questions, the students create curriculum from more-than-human life that was camouflaged and is now visible. Next, the teacher aligns curriculum with the questions so that students may explore the responses to all their questions while delivering prescribed academic standards. Ultimately, the camouflage curriculum provides a space for renewed relationships with more-than-human life in school communities. While Canada Geese were ubiquitous during this study, diverse life may exist in the camouflage curriculum. I invite teachers to widen their view and connect with the camouflaged life that surround them.

### **Research Question 2 in Conclusion**

Research Questions 2 asked, how are relationship among life expressed in the school curriculum? I responded by looking across participating teachers' expressions of those relationships in the curriculum. I shared expressions of relationships among more-than-human, place, and human life in the intended curriculum. Teachers aspired to improve the living conditions of human and more-than-human life alike. The operational curriculum contained the

following themes: constructed units and standards, more-than-human life as study subjects, and free-flowing relationships. Teachers bridged distances by fostering ecological imagination with story, data and images, and local experts. Lastly, I closed with a discussion of the camouflage curriculum and drew attention to what is concealed in plain view in the four teachers' curriculum. To conclude the dissertation, I will now discuss the implications of the findings for the participants involved, for ecocriticism, the larger education community, and the opportunities for renewal among life. I will also share the questions I am left with that may guide the next iteration of research.

### **Significance for Participants**

In this section, I will respond to the question, what is the significance of this study for those involved in the educational situation? I will share observations from each teacher participant. Following each classroom observation, I shared what I noticed with the teachers in-person or over email. They were curious about what I had seen. I perceive that Mr. Pink, Steve, Elizabeth, and Sloane clarified their teaching practices by participating in this study. I think that I achieved Eisner's aims to highlight what is already good in education situations because the participants expressed their gratitude. It was apparent when teachers utilized a permeable boundary between place and their classroom, they gave relevance to their prescribed content. Further, interviewing teachers offered a place to be heard and seen.

Mr. Pink initially said that there was no connection to more-than-human in his classroom. For his community, he saw engagement go up when he included religion and culture reflective of his student body. He said, "anytime we have the opportunity to study the students' culture or religious faith, you just see participation skyrocketing. You see engagement go up." He was not

neglecting more-than-human life, he was aware of his students, the place where they all lived, and skillfully integrated relationships among people in his classroom to elevate his curriculum.

I sent Steve his description from Chapter IV. He said via email, "I've never read anything like this before and I love reading (in so much detail!) another person's experience in my world of teaching and learning. I really don't have any feedback other than to say thank you!" As mentioned in Chapter IV, Steve was the only teacher to interview me back. We had thought provoking conversations during the interview and during the pre/post observations. When I asked about how he saw his classroom similar to an ecosystem, he leaned back in his chair and said, "hmmm. That is an interesting question." Then he described how flows and cycles manifested in his classroom. Steve was excited to consider Eisner's ecology of schooling. He asked, "Where is the feedback?" I am still pondering the question. We spent time in the school library drinking coffee and discussed how education is an evolutionary process as well. We made doodles and lines to show how we envisioned it linearly or circuitously. We plan to collaborate on a publication over the summer.

Elizabeth was the most formal of all the teacher participants. I perceived that she was serious because she was always impeccably dressed and so deliberate in her daily activities on account of being an introvert. She taught at the college level prior to working at the Plains School. She was an enthusiastic participant but offered little feedback on her description section from Chapter IV.

Sloane expressed that she had "low-self-esteem" about her teaching. I noticed the tone of her speech was passive. She used, "kind of" or "sort of" to describe her skillful integration of place and opportunity for students to get politically involved in environmental issues. From what I observed, she had every reason to be confident. After Sloane's hominid skull lab, I heard a



student ask, “Did we ask for consent?” When I brought this to Sloane’s attention, she was surprised and excited. The student remembered and applied the science of ethics in a new context. She lit up. On the last day I said to her that her goal of getting students involved in environmental issues was very apparent and clearly a part of her daily practice. She said, “Aw, thank you so much! That is great to hear” and she smiled hugely. Overall, the teachers were appreciative and wished me luck in the dissertation process. They thanked me for observing their classrooms. My hopes are that by participating in the study, they walked away feeling heard and seen as talented educators.

### **Significance for Education Communities**

Educational criticism and connoisseurship (EdCrit) outlines four processes. In this section I focus on the third process, evaluation. EdCrit asks, “what is of value here, both for those involved and for the educational enterprise generally speaking?” (Uhrmacher et al., 2017, p. 50). I used ecocriticism to illuminate relationships that exist in suburban schools among life and what opportunity exists to reconstitute relationships between human and more-than-human life. Evaluation of significance for the education community, in this case will begin with human life then venture into relationships among life. I begin this section by discussing the reframing of public perceptions of suburban schools to accurately include all the complexity and diversity that lives in suburban communities and their schools nested within (Diamond et al., 2021). Next, I will add to Wright’s (2018) dissertation that proposed that place should be part of Eisner’s ecology of schooling (Eisner, 1992). Lastly, I will share what I observed to be opportunities for renewal of relationships among life in suburban schools. I included the literal constructed environment surrounding the three schools, lawns as the dominant ecology, along with the educative and edible ways more-than-human life exists in schoolyards.

## **Reframing Suburban Schools**

Educational researchers need to pay attention to the educational situations in suburban schools. This study provided a more nuanced understanding of three different suburban schools and describes how each place shaped curriculum within four teachers' practices. Suburban schools are relatively underrepresented in academic research. The word, "suburban" is not a keyword option for AERA journals. Yet suburban schools educate more children in the U.S. than rural and urban districts combined. Further suburban schools face all the same challenges of urban settings. We often equate suburbs with white, affluent folks and urban with poverty, diversity, immigrants, and minoritized people. "These common perceptions of urban and suburban belie the contemporary reality of these spaces" (Diamond et al., 2021, p. 249). As seen in (Table 12), there was socioeconomic and racial variation among the three communities.

Plains School served a majority Black and Latino student population that were also mostly first- and second-generation immigrants to the U.S. The community prioritized close family relationships. Sibling and extended family groups traveled to and from school together. Conferences were attended by whole families and extended families. Older siblings were sometimes responsible for caring for their younger siblings after school and preparing family meals. The school culture supported diversity by hosting community events focused on countries or regions of the world. Africa Night, for example, featured potluck, shared meals, music, dance, and cultural dress unique to African countries. Towards the end of the study, the new auditorium opened with a celebration. School leadership acknowledged the strong academic programs and valued the staff's work to fostered community among immigrant families. The added that the auditorium was a gift for the entire community not just the school's families.

**Table 12***Student Demographic Data Across Three Suburban Schools in the Denver Metro*

Race	Plains School	Foothill High School	Pine High School
Black	42%	1%	1%
Hispanic/Latino	40%	11%	30%
White	15%	71%	62%
Asian or Pacifica Islander	2%	9%	3%
Two or more races	1%	7%	4%
Native American	1%	Not reported	1%
Students from low-income families	81%	10%	29%

*Note.* Racial identity of enrolled students and percentage of students from low-income families. Demographic data accessed on school websites for Plains School and Foothill High School. I used Great Schools for the Pine High School data. Plains High school is in the Grasslands district. Foothill and Pine High School are both part of the Windy district.

Foothill High School was a well-resourced and a predominantly white school. Perhaps this school could be described as the stereotypical suburban school. Of the homes around the school, very few were valued at less than a million dollars. I observed fine, as in expensive, automobiles driven by students and regularly passed on the street into the neighborhood. One day, Steve opened his cabinets to reveal they were full of muscle models. I was surprised and he said the models were thanks to the supportive parents at Foothill High School. Academics at the school were a launch to higher education post-high school graduation. The Bear Hills community was influenced by white supremacists in the 1910s-1930s as many communities in the Denver Metro were at the time to restrict and exclude Black folks and other minoritized identities from

the community. A documentary film interviewed children from the Windy district who reported experiencing racism from their peers and teachers. The first day I interviewed Steve, all Foothill High School students attended an assembly to address sexual harassment in among students.

Pine School was similarly resourced and more racially diverse. The community itself was changing rapidly as the Latino community and working-class folks were being priced out of housing and small farms gave way for new commercial and residential development. Sloane herself commented that they bought a home in the community because it was relatively less expensive than the surrounding suburbs. This was still the case. However, a teacher salary was not sufficient to purchase any housing options listed for sale on Zillow at the time of this study. The community shifts were what Diamond et al. (2021) describe as the replacement of minoritized communities that resemble settler colonialism. They state that some, “suburban development required building onto the hinterlands where minoritized communities were confined due to legacies of systemic racism, limited economic opportunities, and racist policies” (Diamond et al., 2021, p. 250). Throughout the Windy district, Hispanic and Latino parent groups called for the district to change disciplinary policies and practices that disproportionately punished Hispanic and Latino students. Students and families of color expressed that they felt excluded by their school communities. This reflects, again, the findings of Diamond et al. (2021). Children of color navigate the racialized terrain in suburban districts, which can be exclusionary. Latinx children,

confront racialized social and academic boundaries as well as limited resources devoted to supporting ELL in new Latinx diaspora suburbs. Asian families face microaggressions from white families and community members who view their presence in suburban spaces as a threat to white status and dominance. (Diamond et al., 2021, p. 251)

While I did not intend to collect data on experiences of families in the district, I attended two public meetings through my workplace relationships and observed similarities between Windy District experiences and Diamond et al. (2021). I included the observations to support their claim that complex challenges surrounding race and class typically associated with urban schools also persist in suburban schools. This study provided a more nuanced understanding of three different suburban schools and describes how each place shaped curriculum within four teachers' practices. Suburban schools are relatively underrepresented in academic research. Yet suburban schools educate more children in the U.S. than rural and urban districts combined (Diamond et al., 2021). Including and naming suburban research will allow a clearer view of the U.S. education system as a whole and respond to the specific needs of suburban schools.

### **The Place Dimension in the Ecology of Schooling**

Eisner's ecology of schooling includes five dimensions that all add constitutively to schools and that improving education must consider all the dimensions. The five dimensions are intentional, structural, curricular, pedagogical, and evaluative. Eisner (1992) argued that reforming education cannot happen with isolated ecology, the system functions interdependently, so it must be studied that way. Wright (2018) added the place dimension to Eisner's ecology of schooling, because, by definition, an ecological system of any scale happens in a place. 'Eco' etymologically descended from *oikos*, meaning house. She states, "ecology is significant because it is rooted *somewhere*--the places which these sites are located in and of themselves are unique and un-replicable, however transcendent the curriculum taking place in that location might be" (Wright, 2018, p. 47). In her dissertation, she interviewed educators with self-identified as place-based education programs. The participants in her study each had different reasons why they loved their place and how they included place in their teaching. She states, "Through my study, I

proposed the addition of place as a dimension of Eisner's ecology of schools as an additional lens for viewing and evaluating this aspect of classrooms" (Wright, 2018, p. 205).

My dissertation adds weight to Wright's proposal that place is a necessary inclusion into Eisner's ecology of schooling by pairing teachers interviews with classroom observations. Additionally, by closely observing place surrounding the school buildings. Chapter IV summarized the place, structural, and curricular dimensions of the four participating teachers' educational situations. I will briefly review the flow of the place dimension through a permeable structural boundary between school and the larger community and, in turn, how place manifested in curricular dimension.

The Plains School was a K-12, public charter school in Prairie Heights. Mr. Pink and Elizabeth were both secondary teachers at Plains School. Mr. Pink taught middle school social studies and lived near the school. Elizabeth taught high school science and was the only participating teacher who did not live in the community where she worked. The student population was made up of many first- and second-generation students from all over the world, many from North Africa and the Middle East. Elizabeth described the Plains School as "their central hub for their family." Mr. Pink similarly described families with multiple nuclear and extended family members all attending Plains School at the same time. They incorporated the same place relationships in unique place as was appropriate for the content that they were required and inspired to teach. Mr. Pink included religious and cultural connections with his students. He said the connection gave weight to the content and immediate relevancy for the students. He loved seeing Plains School families when he was at the grocery store or out to eat, he seemed to thrive with close connections. Elizabeth included embodied examples of biology and shared many examples of local career paths beyond high school. She also used a water

catchment pond as a study fight to explore plastic pollution and impacts on aquatic invertebrates. Both teachers deliberately included relevant and relatable examples for their students.

Steve and Sloane both worked in the Windy district at two different high schools. Steve taught science at Foothill High School, in Bear Hills, incorporated place primarily as a study site for his curriculum. He felt a deep sense of responsibility for the human and ecological relationships. He did two ecological studies during the fall: patterns in nature and an arthropod study at the edge of the lawn and unmaintained natural area. Ultimately, he curated an integrated view of life on Earth from cells to global ecosystems that included the school's surroundings as nested in both large and small scales. Sloane, who taught science at Pine High School, in Oso Creek, connected her class to local political actions around environmental issues. She included the neighboring creek in her classes and opportunities for students to get involved in local politics. Sloane taught human evolution as intertwined with climate and more-than-human life.

Mr. Pink, Steve, Elizabeth, and Sloane rooted their curriculum to the places where they taught. The teachers incorporated place through local inquiry and cultural integration (Demarest, 2015). In so doing, the teachers also expressed relationships with more-than-human life in the intentional and operational curriculum in the context of their predetermined standards or courses (Eisner, 2017; Moroye & Ingman, 2013). The inclusion of place benefits children by inviting them to into their learning, “and caring more deeply about one’s home community and all the places beyond the classroom” (Gruenewald, 2003, pp. 638-639). The teacher participants made those connections that will ideally extend into their adult lives.

### **Significance for Ecocriticism**

This dissertation attempted to implement “research at the borders of the humanities and the new postmodern biological sciences” (Garrard, 2011, p. 204). The combination of ecological

and educational research methods in a postmodern ecological framework allowed me to make the familiar strange (Crotty, 2015; Eisner, 2017; Oppermann, 2022). I was able to see opportunities for ecological renewal and take seriously the “knowledge-making capabilities of the more-than-human world” (Nxumalo et al., 2022, p. 98). I used ecocriticism to see that mundane occurrences in the suburbs and daily routines hold educational potential. I do not think that I have illuminated anything new for educational communities, I think I have only shined light onto something that was forgotten.

In such curated environments, the suburbs, it is easy to forget that humans are a part of a larger, interactive ecology. Bang (2020) states, “a fundamental aspect of seeing anew is in cultivating our abilities to see remembered places and newly made places while we learn to move and be differently in the world, collectively” (p. 441). While I was walking around the schools, I remembered something simple, human life constructs the world to meet its needs and more-than-human life responds. In the case of the school’s ecology, human life constructed monocultures of lawns and in turn attracted birds that thrived in the monoculture. A human, ecological expression of form dictates function. Suburban communities favor the lawn ecology and many life forms moved throughout the lawn in predictable ways. The baseline, pleasant walk thought the neighborhood schoolyard with a dog (certainly a place of privilege). When I noticed what I had forgotten, I also opened the door to renewal. What if we flip the axiom around, to ask how does function dictate form? What functions do human and more-than-human life need to thrive beyond the lawn? This question asks, what other possibilities are possible (Nxumalo et al., 2022)? What do we desire to cultivate in the ambiguous space surrounding the school?

There is no shortage of folks who point to blurring the distinction between activities in the school building and the community beyond as a valuable practice (Banks, 2007; Gruenewald,



2003; Sobel, 2005). Similarly, ecologists know that the structure of ecosystems, the flow of energy, and the cycling of matter determines what life thrives in each community. Teachers and education scholars understand that schools are embedded in the social, political, ecological, and economic situation that surrounds them. We know all these things already. However, the knowledge is not static, it flows, or “is not set in stone” (Uhrmacher et al., 2017, p. 24). To set something in stone is to freeze it in a position. However, there is nothing in life that is static, relationships are always shifting. We will remember how a microscopic virus disrupted the routine workings of human life. The current formation of the Rocky Mountains is not permanent, they will erode as they have three times before. Among humans, “there are undoubtedly differences between people and cultures, from an ecological perspective, people, cultures, and places are inescapably interconnected relational systems” (Greenwood, 2009 p. 277). Reconstituting the ecology of schooling is part of the evolutionary process. As other folks are invited to do, I added my perspective. During this study, I illuminated opportunities to renew relationships with life. By using ecocriticism, I was able to see what is in plain sight, the camouflage curriculum, and expose its educative potential as a (re)sourcing knowledge from faraway to local (Eppert, 2009). Further, the ecological imagination may assist in making connections across time, space, and labor (Fesmire, 2010).

I observed many instances of relationships human life and more-than-human life. Many of them were so familiar, they were not perceived, they were camouflaged. For example, all teachers described their daily routines and shared ways that they observed relationships among life. Yet, none of them mentioned food as a relationship, but they all ate lunch as part of their daily activities. Students regularly crunched on chips during class, yet no teacher listed this part of their more-than-human life in their classroom. Mr. Pink identified a classroom plant for

aesthetics or Steve, a study specimen. No one named the plants consumed to sustain their bodies. Food, plants, and animals were concealed by their ubiquity in the suburban schools.

Lawns and Canada Geese were commonplace. I observed them both every observation either walking across the schoolyard at the Plains School and Foothill High School or flying overhead at the Pine School. I admit that I was initially blind to the geese. I grew up in Minnesota where they are considered a nuisance. They produce so much poop, they closed lakes where I regularly swam and worked. Ecocriticism prompted me to ask the question, what are the Canada Geese teaching me? What can they teach the school community? Subsequently, I also began to see the lawns as contiguous with the surrounding suburban homes and that people used the schoolyard as a public park.

The science teachers used the schoolyard and neighboring parks as study sites, the lawn was the are they passed through to get to the interesting place beyond the lawn. The lawn was also concealed by its familiarity, in full view of all involved in the educational situation, hence the camouflage curriculum. The curriculum could be hidden because, in my perception, there was an element of dominionism as a social norm as part of the educational situation (Uhrmacher et al., 2017). However, people interacted with the lawn daily, it was not hidden. The curriculum could be included in the shadow because faraway examples were privileged over the local to provide examples of evolution or genetics. However, “disdain” does not quite fit because the communities ate food every day to sustain life (Uhrmacher, 1997). The human community actively cultivated lawns that brought in the geese. The school districts invested money and labor in lawn maintenance. Humans want lawns in suburban communities, it is fully integrated into the aesthetic. I add camouflage curriculum to the intended, operational, received, hidden, null, shadow, and complementary (Uhrmacher et al., 2017). Camouflage curriculum is what is

concealed in the daily operations of schooling, in plain view, yet escape perception. The camouflage curriculum, in this study, held opportunities to renew relationships among life. Educators and connoisseurs must look at the mundane aspects of schooling because they are pervasive and often escape perception.

We can say that relationships among life are so common they are mundane. I found little in academic literature on the mundane expression of more-than-human life in education settings. However, the mundane activities in school can challenge or reinforce aspects of democracy and power dynamics. In Thailand, democracy and learning routines were contradictory to each other (Assapun et al., 2019). Similarly, day to day interactions with teachers and school policies reinforce anti-blackness (Zaino & Bell, 2021). If anti-democratic practices and anti-blackness are taught in mundanity, then relationships among life are also being taught. Educators must look at the mundane to see what they are teaching. Assapun et al. (2019) state, “An education for democracy means socializing students in an environment that not only talks the talk, but also walks the walk of democratic practices” (p. 139). Deliberately role modeling healthy relationships with more-than-human life with Canada Geese, by growing food, caretaking school grounds, or conducting science experiments with plants and animals while they are living are all possibilities that emerge from the mundane.

This dissertation conducted “research at the borders of the humanities and the new postmodern biological sciences” (Garrard, 2011, p. 204). The combination of ecological and educational research methods in a postmodern ecological framework allowed me to make the familiar strange (Crotty, 2015; Eisner, 2017; Oppermann, 2022). I was able to take seriously the “knowledge-making capabilities of the more-than-human world” (Nxumalo et al., 2022, p. 98). I

used ecocriticism to see that mundane relationships in the suburbs and daily routines that hold educational potential and a portal to renewed relationships among life.

## **Implications**

### **Suburban Teachers**

Public school teachers are skilled practitioners in their educational craft. Each of the participants in this study went about their daily lives in the tensions between what was prescribed to them and their own vision for a better future for humanity and the more-than-human world. They were each doing constitutive work for all life. All educators engage in this work in their unique way. Participants went outside the building into their communities to do science and they welcomed students' lives into the curriculum where they belonged. In so doing, they met prescribed content standards and taught the children that they and their place were valuable. In diverse suburban environments, this is essential because the built environment, roads, malls, vehicles, and lawns, look aesthetically similar. However, there were unique human and more-than-human relationships when I took the time to see. The implications of this study for suburban teachers are twofold. First, pay attention to the daily lives of students and the more-than-human life around the suburban school. What is commonplace for your community? What does it teach? The suburbs are far more nuanced and interesting than we were taught in our own schooling or that we perceive. Human and more-than-human life is communicating to you and have something valuable to teach. Mundane aspects of suburban life are rich with educative potential and are ubiquitous. Second, to reveal these teachings, regularly go outside the school building with students and invite them to be present in their bodies, to notice their place, and to ask any questions that arise. Teachers do not need to know the answers, in fact, it is better if they don't. Learning with community upsets traditional educational roles of teacher and student and

positions students as knowers and creators of knowledge. Further, the more-than-human world are important teachers. Long-term studies in any academic discipline show how communities change over time and offer a place for children to imagine, then enact their own changes. In both implications, there are no right answers nor perfect relationship with life – we can learn from all of them. Relationships are complex and evolving. Suburban teachers open a portal to relationships with life by seeing them with our neighbors first and then the world.

### **Policy Makers and School District Leaders**

We must let go of the notion that environmental education is supplemental or external to public schooling. This is tired and a pervasive misconception about education that prevents many public school teachers from exploring their surroundings with students. The teachers in this study showed us how to teach academic content as integrated into the lives of their students. Teaching with ecological connections offered relevancy to secondary students who need, more than other age groups, to know that their education is meaningful and applicable in their lives. Secondary students want to explore their identities and their role in U.S. society, these teachers gave students a way to do that while meeting academic goals. The implication for school district leaders are twofold. First, policies can widen what counts as educative experiences. The Windy School District encouraged teachers to make environmental education part of their routine classroom activities. Second, in addition to the policy, they are developing community based training or collaboration opportunities for the school communities and environmental education partners. While the policy may reach an entire district, the implementation happens at the school level. While there is a tendency to want more sameness to meet objectives, the district, as I perceive, can handed over creativity to the teachers and school communities. Communities can

tailor experience for local issues and local curiosities. This provides a policy structure that opens the school doors to local knowledge and for relationships among life to flourish.

### **Further Research**

#### **School Lawn as Contested Space**

Social and ecological questions about lawns remain unanswered at the close of this inquiry. Lawns are clearly a valued aesthetic in suburban communities, how does the value transfer to school communities? With the ambiguous nature of the public-school lawn, we can ask, who uses and how do people in the community use schoolyard? As a contested space, who claims the lawn as their own and for what purposes? Given the relationship between race, suburban growth, and the aesthetic of lawns in suburban settings and elite institutions, what does this mean for suburban schools that also invest in expansive lawns? Who is excluded from the public-school property? I conducted a quick google image search for private school landscaping and I cannot help but notice similarities among early U.S. elites, private schools, and current upper-class landscaping for homes. If there are cultural judgements of “goodness” based on how well a lawn is kept surrounding a home, does the same curbside judgment extend to suburban school landscaping? The lawn as an artifact of suburban development born parallel to overt expression of white supremacy and humanity over all life. How do suburban school students and their surrounding communities perceive the lawn? What does the lawn communicate to them? Are the school properties a public infrastructure expected from affluent folks?

Affluent suburbs avoid most regional responsibilities and burdens. They do not pay for city services and infrastructure that commuters especially use on a regular basis (including sanitation, police, bridges, airports, sports complexes, and so on), let alone caring for the poor and providing affordable housing. At the same time, these affluent

suburbs deplete remaining greenspace and endanger fragile and precious environmental resources. (Hayduk, 2003, p. 141)

Ecological questions persist as well. Competition among water users in the Denver Metro will only increase as human population grows. The Windy district already has long term plans for water efficiency as their institution's water needs are expected to grow over time. What will happen to the school lawn as water resources become scarcer at the three schools in the study and for the Denver Metro at large? Irrigation infrastructure is already established on some school properties, besides lawns, what other life can be grown on school properties? I look forward to exploring the significance of school lawn or landscaping aesthetics in the future. I would love to interview widely to include people whose labor cares for the lawn, students who attend suburban schools, and teachers who utilize (or do not utilize) the space. Additionally, collaborate with colleagues of different expertise than my own.

### **Received Curriculum**

Steve invited me to attend the Windy district's Science Symposium in April 2023. I attended a presentation by a high school student called "Adolescent sense of place." They described place as an interaction between people and their perceptions that are reciprocally shaped and reshaped by the surroundings. Adolescents reported that they found community in sports, extra-curricular activities, and work. The survey respondents described outdoor spaces, recreational opportunities, and proximity to the Rocky Mountains as special. Further research could affirm and explore this more from the high school student view. Specifically, into the received curriculum could help educators understand what among the intentional, operational, and camouflage curriculum makes its way into the consciousness of children.

## **Camouflage Curriculum**

I propose the camouflage curriculum is a new type of curricula that is hidden by familiarity, mundanity, or routine interactions. Further research could clarify the camouflage curriculum and discover more opportunities for reconstituting relationships among human and more-than-human life. If we accept the statement, education is always environmental (Orr, 1992), then the camouflage curriculum is also educative. Some lifeforms were so common at the three schools, their presence is forgotten. I hypothesize that the camouflage curriculum is diverse and nuanced. I hope to look for camouflage curriculum in more educational settings in the future, ideally with folks with other connoisseurs who view the world through their own expertise. In the process of revealing camouflaged curriculum, we may also “make change in everyday life” (Bang et al., 2022, pp. 154-155) by co-existing with more-than-human neighbors instead of passing by indifferently. Suburban residents interacted with geese in their everyday lives, and yet they remained camouflaged, the relationship forgotten. Greenwood (2009) argues, “ecological studies are concerned with deconstructing and reconstructing identities through the construct of relationship” (p. 276). The plants and animals that human life co-exists with are the ones we are already in relationship with acknowledged or not. Exploring the camouflage curriculum may reconstitute human relationships among life.

## ***Oikophilia* Conclusion**

For me, the term *oikophilia* arose from E. O. Wilson’s Biophilia, the love of life (Wilson, 1984). Wilson explored the notion that humanity exists with a constant love for life and that we unconsciously construct our places to resemble the place where *Homo sapiens* became bipedal. I love the term and find it fascinating to explore ancient human ancestors. However, for me, something was missing from biophilia.



I took on the moniker, *terrabilia* when I was a volunteer disc jockey (DJ) in Gunnison, Crested Butte, and Jackson. The love of land fit the place where my volunteer DJ hobby began, Gunnison, CO. Out among the sagebrush sea or scrambling around mountain peaks, I felt home and at peace. As a child of divorce, feeling at home was a new experience for me. So, of course, I loved the land and its residents. Twenty plus years later, I realize that *terrabilia* isn't quite right either because it leaves out the complexities and tensions that exist among life on Earth. Like Steve said, there was a spectrum of ecological relationships from violent to “warm and fuzzy” and all of them teach. Hence, *oikophilia*, Payne (2010) states,

*Oikos* can be traced to its origins in classical Greece and needs to be understood in relation to the *polis*. That is, the ecology of Greek homes, whose economy included animals, was always cast in the political tension between the private and the public. (p. 225)

The *oikos* forms through daily routines, activities, homemaking, and school making perhaps. Each of the teacher participants shared what they loved about the places where they taught. Sir Roger Scruton featured *oikophilia* throughout his literary works. He proposed that love of home flows beyond our home and into the moral, aesthetic, and spiritual aspects of human life (Maritz, 2022). In *oikophilia* as he defined, there exists ownership and movement tensions that may or may not be resolved (Gescinska, 2019).

I propose that *oikophilia* is alive in education settings. Certainly, in suburban communities which embody moving in pursuit of newness and transient relationships with place (Brooke, 2015), love of place is essential. I close with their words of love for their communities as an overt expression of the possibilities of renewal. Love of the house offers a spring from which to begin and a place to return to. I do not aim to obfuscate the less “warm and fuzzy,” but to say

returning home is restorative once we find it. For example, Mr. Pink said this about his decision to buy a home near the school,

I also did it to expand my cultural awareness, we're so culturally rich...Some of its selfish proximity, I have a five-minute commute which is awesome. But you know, things like community presence, awareness. I can't go to the grocery store without seeing a kid I know or that graduated. Me and my wife went to Pho and I saw students with their parents. ... I don't know, I love it.

He felt and maintained a strong connection with the students and the community by living in the school community. This love flowed into his classroom and among his students.

Steve constantly evolved as an educator which grew from the love he felt for the community where he lived and the community where he taught. Steve said,

I feel very fortunate. I love where I work. I love where I live. I love that I can walk to where I work. I love that it is beautiful. It never gets old. I love teaching. I love interacting teenagers. I'm living my best life and I hope they can tell [students gave thumbs up] ... I think that every year is my best year teaching. Even when we were, you know, teaching from home. I was doing my best work yet. Because I had to, I had no choice but to be absolutely creative as possible to be inspiring, to be helpful, to be patient. How else would you be as a teacher?

Each year offered a new opportunity to improve. The love he expressed in this response was perceptible during each observation. He smiled often, was enthusiastic about science content, students' lives outside class, and engaged with every student during class.

Elizabeth said, "I love the job" and "the pay in Colorado, not so much." Despite her low enthusiasm for the compensation in Colorado, she worked to make her curriculum relevant with

the students. She smiled often and supported her students without hesitation. She showed her love by investing in her students.

Sloane had a slightly different take. She spoke about the creek where she took students for local ecological research. Sloane said,

a little oasis in a natural ecosystem that's great for studying homeostasis and relationships. I am drawn to it because I love walking down there with students. It's a time for us to chat and get to know each other and for kids to get to know each other.

The creek was a study site formally and informally a way to build relationships with students as they traveled to and from the creek. Also, for students to know each other. For Sloane the creek itself was interesting for study and part of being with students. Each teacher participant loved their place uniquely and integrated their place into their curriculum. The teachers expanded our view of love in the school setting.

In conclusion, this dissertation endeavored to illuminate opportunities for the reconstitution of relationships among life in suburban school communities. Contributing authors to the *Curriculum Inquiry* special issue called for centering nature-culture relations. They asked teachers to take seriously the “knowledge-making capabilities of the more-than-human world” (Nxumalo et al., 2022, p. 98). Postmodern ecologists and Indigenous scholars asserted that humans talked to nature and nature talked back (Nxumalo et al., 2022; White, 1998). So, what did the more-than-human teach me during this inquiry? What significant teaching can be passed to the education community?

Reformation work begins where we find ourselves and I observed at the close of the inquiry it is also a cycle. I noticed, like I have many times before, everything we need is already here. Everything I need to heal already exists in the surroundings; we simply must notice.

Further the body is a source of healing (van der Kolk, 2015) and a (re)source for learning (Eppert, 2009; Judson, 2008). For me, I notice that the combination of ecological and education research methods brought me to realize again that humanity and all life, actively co-construct the world--we build worlds if we are conscious of it or not. Education can help all of us remember our relationships with the more-than-human world. We can begin remembering by simply (re)seeing life where we live.

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APPENDIX A  
SEMI-STRUCTURED INTERVIEW QUESTIONS

## SEMI-STRUCTURED INTERVIEW QUESTIONS

### Initial Interview

1. Picture a lifeform of your choice, how do you feel with it and how do you relate to it?
2. The term relationship has many meanings depending on context. From an ecological view, this is an exchange of matter or energy among living or non-living things. In education, we agree it is important, but a specific definition is illusive. How do you define relationship(s)?
3. Describe a place on the school campus that you are drawn to. What about it connects with you?
4. Walk me through a typical day at school for you (& actually go for the walk if participant would like to). Please identify or describe relational or community spaces along the way.
5. What relationships are fostered in this school among human life and the more-than-human residents (non-human living things)? Are there any you would like to highlight more or bring less attention to?
6. Describe a memorable interaction among students and the more-than-human residents of the school. Was it a planned or unplanned experience?
7. What more-than-human life do you and/or your students interact with? routinely? How?
8. Describe the relationship between the school and the community.
9. Do you live in this community where you teach? What influenced your decision to live and teach where you do?
10. How long have you been in education and what is your current role?
11. As a place-based educator (one that that draws from local ecology, economics, social, geography systems), how do you incorporate place into the curriculum?
12. What dimension of place do students most relate to? How so?
13. Who is invited into your practice and what relationships do they bring to the community?
14. What expressions of human and more-than-human relationships exist in this community? In the curriculum?
15. What else would you like to share about you, your teaching practice, the place you live or work?
16. Are there any questions you feel that I should add or remove from this interview process?

### Demographic Information

17. Age
18. Gender identity
19. Ethnicity
20. Race
21. Highest Education
22. Class
23. Anything else you want to share about your identity?

**Pre-observation Interview**

1. What relationships do you intend to express in today's curriculum?
2. How will the students experience that relationship?
3. Is there anything you want me to look for today?

**Post-observation Interview**

1. How do you feel today went?
2. How did the students experience relationships today?
3. I observed \_\_\_\_\_, can you share what that meant to you and the students?
4. Is there anything else you want to share?

APPENDIX B  
CONSENT FORM



CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH  
UNIVERSITY OF NORTHERN COLORADO

Project Title: *Oikophilia: Relationships among life, human life, and place in school communities and their expressions in curriculum*

Researcher: Mandi Leigh, MS Ed. Doctoral candidate, College of Education and Behavioral Sciences

Phone: xxx-xxx-xxx

Email: [REDACTED]

Research Advisor: Christine McConnell, Ph.D., College of Education and Behavioral Sciences

Phone: 970-351-2438

Email: christine.mcconnell@unco.edu

The purpose of this naturalistic, non-experimental study is to describe existing relationships among life in suburban school settings along with the expressions of those relationships in curriculum. There are many dimensions of relationships, the researcher will observe and share the relationships meaning for the community participants involved. This information contributes to education research overall and fills a gap in understanding the particularities of suburban settings. The research questions for the study are: What relationships exist among life, human life, and place in school communities? And, how are those relationships expressed in the curriculum?

While participating in this study, you will participate in an initial interview that will take approximately sixty minutes. There will be a brief three questions, pre and post interview on the same day researcher conducts participant observations. Ideally, the researcher will conduct a series of at least four observations (no more than six) in succession in the span of a few weeks. The researcher will also collect existing teacher curriculum materials, the researcher will not request additional tasks to what teachers already do in their classrooms. All data will be de-identified. Pseudonyms will be used during the inquiry process and for the subsequent reports.

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(Participant's initials) for PAGE 1

There are no costs except time for those who participate in the study. No financial compensation will be provided to participants, however, in exchange for your time, I offer to volunteer three hours of my time in your school community or classroom. The benefits to participants may be a clarification of teaching practice with communities. Foreseeable risks are no greater than those encountered during a routine workday as a teacher in a public school setting.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Nicole Morse, IRB Administrator, Office of Sponsored Programs, 25 Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-1910

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Participant's Signature

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Date

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Researcher's Signature

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Date



APPENDIX C  
CONSENT FORM



Date: 11/02/2022

Principal Investigator: Mandi Leigh

Committee Action: **IRB EXEMPT DETERMINATION – New Protocol**

Action Date: 11/02/2022

Protocol Number: 2209044186

Protocol Title: Oikophilia: Relationships among life, human life, and place in school communities and their expressions in curriculum

Expiration Date:

The University of Northern Colorado Institutional Review Board has reviewed your protocol and determined your project to be exempt under 45 CFR 46.104(d)(7)(1) (7)(2) for research involving

Category 1 (2018): **RESEARCH CONDUCTED IN EDUCATIONAL SETTINGS.** Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Category 2 (2018): **EDUCATIONAL TESTS, SURVEYS, INTERVIEWS, OR OBSERVATIONS OF PUBLIC BEHAVIOR.** Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (i) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects; (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or (iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7).



You may begin conducting your research as outlined in your protocol. Your study does not require further review from the IRB, unless changes need to be made to your approved protocol.

**As the Principal Investigator (PI), you are still responsible for contacting the UNC IRB office if and when:**

- You wish to deviate from the described protocol and would like to formally submit a modification request. Prior IRB approval must be obtained before any changes can be implemented (except to eliminate an immediate hazard to research participants).
- You make changes to the research personnel working on this study (add or drop research staff on this protocol).
- At the end of the study or before you leave The University of Northern Colorado and are no longer a student or employee, to request your protocol be closed. \*You cannot continue to reference UNC on any documents (including the informed consent form) or conduct the study under the auspices of UNC if you are no longer a student/employee of this university.
- You have received or have been made aware of any complaints, problems, or adverse events that are related or possibly related to participation in the research.

If you have any questions, please contact the Research Compliance Manager, Nicole Morse, at 970-351-1910 or via e-mail at [nicole.morse@unco.edu](mailto:nicole.morse@unco.edu). Additional information concerning the requirements for the protection of human subjects may be found at the Office of Human Research Protection website - <http://hhs.gov/ohrp/> and <https://www.unco.edu/research/research-integrity-and-compliance/institutional-review-board/>.

Sincerely,

A handwritten signature in black ink that reads "Nicole Morse".

Nicole Morse  
Research Compliance Manager

University of Northern Colorado: FWA00000784