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Abstract

The climate crisis is an environmental issue that affects people of all walks of life but has disproportionate effects on those living in impoverished communities. The climate crisis therefore is not only an issue of environmental justice, but also social justice. However, incorporating environmental issues within education has typically been left to science classrooms. Teaching for environmental social justice, however, has the potential to extend beyond science content and science classrooms, and instead be incorporated in content across all academic disciplines. This dissertation is a teaching experiment that explored the ways adolescent preservice teachers from various disciplines develop their teaching identities while engaging in a curriculum that centered on environmental social justice.

This teaching experiment was carried out in an Introduction to Adolescence Education Course at a public college in Central New York. The course was designed and taught by myself. Over the duration of the course, I was intentional to use the framework of *conscientious engagement* to support my own teaching identity, and further implemented an intervention. The I chose socioscientific issue-based curricula as the framework of the intervention unit because it most aligned with my teaching identity. This intervention unit served as a base of this teaching experiment to intention of modeling ways content knowledge can be delivered in ways that are interdisciplinary, equitable, promote civic engagement of the twenty-first century, and aligns with environmental social justice. Through the implementation of the intervention learning unit, this teaching experiment explores the developing teaching identities and pedagogical practices of 6 adolescent preservice teachers over the course of one semester. The semester is 16-weeks long and the intervention is conducted for 4 weeks, mid-way through the semester. Six adolescent

preservice teachers agreed to participate in this study, two majored in mathematics education, three in science education, and one in English as a Second Language.

This study revealed ways in which preservice teachers' emerging teaching identities are shaped by influential experiences including their personal experiences as a student, experiences with teachers, family influences, and their experiences in their teacher preparation program. Furthermore, findings in this study reveal that one's teaching identity and values are not always consistent with the pedagogical practices they aim to use as a practicing educator. Two preservice science teachers expressed having teaching identities and implemented pedagogical practices that align with environmental social justice. Four of the study participants expressed having teaching identities whose values aligned with social justice. For those four participants however, the pedagogical practices they implemented were inequitable and societally irrelevant. Additional findings within this teaching experiment demonstrate areas of growth for preservice teachers resulting from this teaching experiment, including shifts in personal perspectives, further aspirations as a teacher, and developing an orientation towards environmental sustainability. Additionally, although this teaching experiment focused on environmental social justice, two preservice teachers expressed developing teaching identities and aspirations of implementing pedagogical practices that aligned with *conscientious engagement*.

This teaching experiment presents ways teacher preparation programs foster unique environments and opportunities for preservice teachers to observe, explore, and experiment with their teaching identities and pedagogical practices. Therefore, teaching preparation programs can be intentionally crafted to support preservice educators in becoming educators who implement equitable learning opportunities for *all* students and promote civic engagement for the twenty-first century.

“But is it Worth the Maintenance?”: Exploring the Ways Adolescent Preservice Teachers Develop
Teaching Identities and Implement Pedagogical Practices

by

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Dissertation

Submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Science Education.

Syracuse University

May 2024

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Acknowledgements

To my family,

To my ancestral court, and

To my community,

I thank you for your continuous support throughout this journey.

Lovingly,

Tiffany

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Chapter I: Introduction

Throughout the history of American education, the goals of education have been to promote civic engagement by means of promoting literacy, mathematics, and the understanding of American History (Mondale, 2002). However, as times have progressed along with technology, what it means to be civically engaged for the twenty-first century has also shifted; therefore, educational practices must shift accordingly. However, over the past thirty years, learning standards and state-wide standardized assessments have remained the same, giving room for preservice and novice teachers to emulate conventional methods of instruction of more experienced teachers. These conventional forms of instruction do not cater to the needs of twenty-first century learners, nor do they promote civic engagement for the twenty-first century. Ultimately, conventional methods of instruction perpetuate inequitable educational practices and learning outcomes that maintain the status quo.

Within the recent past, newly developed learning standards and measurements for assessments are slowly being implemented throughout the nation. To equitably and effectively meet these newly implemented learning standards and promote civic engagement, educators of all levels will need to adopt teaching identities and pedagogical practices that incorporate contemporary methods of instruction. This dissertation is a study that aims to explore the ways adolescent preservice teachers form teaching identities and the ways in which engaging in a socioscientific issues-based learning unit promotes pedagogical practices aligned with environmental social justice. This chapter begins with overviewing the trajectory of science learning standards over the last several decades and the long-standing goal of promoting civic engagement for the twenty-first century through equitable learning goals, and then connects civic engagement for the twenty-first century with an educational lens for environmental social justice.

This chapter then continues with a statement about my positionality and overviews the ways in which my experiences afford me a unique perspective to complete this teaching experiment.

Equitable learning outcomes in Education

Equity and civic engagement have been long standing goals throughout the fields of American Education. Various federal mandates have been implemented in attempts to provide students from historically marginalized communities with “equal” educational opportunities towards college and career readiness, including Elementary and Secondary Education Act of 1965, the No Child Left Behind Act of 2001, and Every Student Succeeds Act of 2015 (U.S. Department of Education, 2015). However, achieving equitable learning standards for *all* students requires more than policy, it also requires intentionality and knowledgeable implementation of pedagogy. In efforts to achieve equitable learning opportunities for *all* students, learning standards and assessments have continually shifted and developed alongside federal mandates.

As laws, programs, and federal mandates regarding equality and equity in education began to shift, the American Association for the Advancement of Science released *Science for all Americans* (American Association for the Advancement of Science, 1989, 1991). *Science for All Americans* (American Association for the Advancement of Science, 1989, 1991) was the first framework for science education that defined science education and outlined educational goals, foundational knowledge, and values that *all* students, across *all* American cultures and diversities, should develop from American science education. Equity and accessibility to science education that prepares *all* students for civic engagement has been a long-standing goal (American Association for the Advancement of Science, 1989, 1991), and remains a consistent goal through recently implemented science learning standards.

The Next Generation Science Standards (NGSS) are the most current set of science learning standards to be adopted in education and further attempt to address issues of inequity in students' science learning outcomes. New York State has adapted the NGSS and developed the New York State P-12 Science Learning Standards (NYSP-12SLS) in which standardized exams will also measure learners' knowledge to these newly implemented learning standards. Although the common core standards from 2010 made some references to science learning, state-wide standardized exams still assessed students' knowledge to the 1992 science standards, known as the New York State Core Curriculum. Therefore, many science educators did not utilize the 2010 common core standards as a guideline towards instructional methods of science teaching.

This is the first time in 30 years that state-wide standardized assessments will be changed, therefore instructional methods must shift as well. This implies that science educators across all levels must incorporate more contemporary forms of education and contemporary methods of instruction in attempts to meet the newly implemented learning standards and further equitably prepare *all* students for civic engagement of the twenty-first century. I argue, however, that equitably preparing *all* students for civic engagement of the twenty-first century extends beyond the borders of science classrooms and instruction, and into the classrooms of math, English, and social studies educators as well.

Civic Engagement for the Twenty-First Century

The development of the American education system, and thus its disciplines all have the goals towards *civic engagement* (Rudolph, 2014). Civic engagement as defined by Rudolph & Horibe (2016) as it relates to science is the action of influencing public concerns that involve science and using means within existing political structures to respond to public concerns. Public concerns that involve science include those that require that use of scientific knowledge, and

those that relate to the production of scientific knowledge, in both cases often deriving from our relationship with the natural world (Rudolph & Horibe, 2016). Understanding the natural environment in efforts to address present day public concerns supports the framework of *science literacy* as defined by *Science for All Americans* (American Association for the Advancement of Science 1989, 1994). Examples of science fields that involve public concern include, but are not limited to, “public health, public safety, the environment, national security, and the economy (Rudolph & Horibe, 2016)”. In all cases of public concerns, scientific knowledge functions as a tool, either to meet a collective goal or to develop *new* tools that will solve current and future challenges (Rudolph & Horibe, 2016). The second chapter, the literature review, further expands on the ways in which science literacy promotes civic engagement for the twenty-first century, by first identifying climate change and natural disasters as civic problems and challenges of the twenty-first century. The literature review further expands to the ways in which the implementation of curricula that caters towards civic engagement for the twenty-first century is a form of teaching for environmental social justice.

Incorporating science-related civic issues within curricula has the potential to equitably prepare *all* students for civic engagement. Science-related civic issues extend to *anyone* within and outside of the community of scientific practice. Further, an educational focus on science-related civic issues has been known to engage students of historically marginalized backgrounds when implemented using culturally relevant pedagogy (Rudolph & Horibe, 2016, Calabrese Barton et al, 2013). Conventional methods of science instruction often teach science in an isolated manner, by topic or phenomenon. However, the science that is found in science-related civic issues is not isolated and has real-life implications. To equitably teach science in ways that

prepare *all* students for civic engagement, the science content cannot be separated from the implications that science has on society.

Pedagogical practices can be understood as the enactment of one's teaching identity and the underlying values through the theory of identity grafting (Hui Lin Lee, 2022). Implementing pedagogy that equitably prepares *all* students for civic engagement of the twenty-first century requires that educators develop a teaching identity whose values align with social justice (Chen & Moore Mensah, 2018). Educators must first develop teaching identities aligned with social justice, and then an educator will be able to implement pedagogical practices that are socially just and address social injustices within education and throughout society. Further, implementing pedagogical practices that effectively equip *all* students with the knowledge and skillset needed to address issues of the twenty-first century requires that educators become familiar with the issues and challenges that are prevalent amongst the communities of their students, and empower them with the tools and resources needed to address them.

Connecting Civic Engagement of the Twenty-First Century to Education for Social Justice

The twenty-first century can be defined by advanced technology, globalization, and unprecedented natural disasters that have been exacerbated by anthropogenic climate change. Within the recent past we have experienced natural disasters of unprecedented strengths locally, regionally, nationally, and globally, affecting the lives of people as well as the global economy. In December of 2022, Buffalo, New York experienced a blizzard which produced over 50 inches of snow and killed 46 residents across Buffalo city and Erie County (Ly, 2023). Buffalo city was not equipped to handle a blizzard of this magnitude, disproportionately affecting communities of Color in which majority of the fatalities were Black American residents (Ly, 2023). In June of 2023, Canada experienced the worst wildfire history ever recorded, burning roughly 18.5 million

hectares of Canadian land (D'Andre, 2023). The smoke from the Canadian wildfires traveled southward, affecting the air quality of the surrounding regions, including Central New York, New York City, Philadelphia, Pennsylvania, and Hartford, Connecticut. For residents in New York City, this resulted in one of the worst days of air pollution on record, in which pollution records were 5 times higher than the national average (The Guardian, 2023). Poor air quality has the potential to negatively affect everyone but has more serious consequences for children, elderly people, pregnant women, and those with pre-existing heart and lung diseases (EPA, 2023). According to the United States Environmental Protection Agency, people residing in low socioeconomic neighborhoods are more vulnerable to the effects of poor air pollution (EPA, 2023). From May through September of 2023, China experienced extreme flooding from monsoons across at least 16 cities and provinces, resulting in 370 fatalities (Wilson, 2024). Beijing received a record breaking amount of rainfall, received 60% of an annual average of precipitation in 83 hours, the heaviest amount of rainfall within the past 140 years (Disaster Philanthropy, 2023). Although not every natural disaster is a result of anthropogenic climate change it is important to note there were at least 398 natural disasters in 2023, contributing to the deaths of approximately 95,000 people, and costing the global economy approximately US \$380 billion, approximately 22% above the twenty-first century average (Wilson, 2024).

Environmental disasters are matters of social justice.

Anthropogenic climate change affects the mental health of youth through the direct encounters of natural disasters and the indirect consequences that affect one's social, economic and environmental aspects of life (Clemens, et al., 2022). Furthermore, when exploring patterns of environmental inequities, race and class are the primary factors (Beltrán, et al., 2016). As Beltrán et al., (2016) explain "environmental inequality issues are global, pervasive, and often

detrimental particularly to historically marginalized groups (p. 500)”. As education aims to implement curricula and learning standards that promote equitable outcomes across *all* learners in ways that prepare students for civic engagement of the twenty-first century, educators must also consider ways in which anthropogenic climate change affects the livelihoods of their students and prepare students to address issues of anthropogenic climate change. Developing a teaching identity that aligns with social justice, however, that is not enough to not promote civic engagement of the twenty-first century. To effectively and equitably promote learning opportunities that prepare learners for civic engagement of the twenty-first century, educators must have a teaching identity that aligns with social justice and implement pedagogical practices that are consistent with those values.

This dissertation study implements an intervention in the form of a socioscientific issues-based learning-unit, with the intentions of exploring the development of adolescent preservice teachers’ teaching identities and pedagogical practices that are aligned with environmental social justice. (The literature review provides a synthesis of how this dissertation study extends social justice in education to environmental social justice). Socioscientific issues-based curricula has been known to promote positive learning outcomes amongst science students (Chan, 2013; Herman, et al, 2017a; Kokotsaki, et al., 2016; Lee & Witz, 2009; Pellegrino & Hilton, 2012; Reis & Galvão, 2004; Sadler et al, 2006; Suriel et al., 2018; Tidemand & Neilson, 2017; Xinning and Xinyang, 2013; Ye & Xu, 2023), practicing science teaching (Karahana, 2022; Leung, 2022; Suriel et al., 2018), and preservice science teachers (Karahana, 2022). This dissertation study aims to connect learners of different disciplines with socioscientific issues-based curricula, and further explore their emerging teaching identities and pedagogical practices.

The Development of this Teaching Dissertation Study Through My Positionality

Much of the inspiration for this dissertation study is attributed to my positionality as a woman of Color from an inner-city community, who, fueled by a passion for the natural environment, has navigated academia and in pursuit of a career in STEM, and the ways that I've attempted to integrate my personal and academic experiences with my teaching educator practices. This is important to note because there is a sociocultural disconnect between educators and students in public schools. As per the 2017-2018 school year, approximately 79.3% of teachers identified as White, non Hispanic, 6.7% as Black American, and 9.3% Hispanic (National Center for Education Statistics, 2020). Today, schools are more diverse than ever before, however in schools where the majority of the student population is racially and ethnically diverse, teachers tend to identify as White (U.S. Department of Education, 2020). Historically, this sociocultural difference within education has led to discriminatory bias against culturally and linguistically diverse students leading to inequitable learning opportunities and maintains the status quo.

The demographic of preservice teachers mirrors the demographics of public school educators. Through this awareness and perspective, it is important to me that in my own teaching practices as a teacher educator, I support preservice teachers in becoming teachers who provide equitable opportunities for students of historically marginalized and disenfranchised backgrounds. The following sections describe the ways in which my positionality as a teacher educator and my life experiences have influenced the development of this dissertation study.

Experiences in My Life's Journey That Influenced My Positionality as a Teacher Educator

As I reflect on my own teaching identity and pedagogy, I recognize that they are strongly rooted in my cultural identity and the different stages of my academic journey. My positionality guided the development of this teaching experiment in three sections including my personal experiences, my educational journey, and my training as a science educator.

Personal experiences. When describing one's identities, many people would immediately mention their race and ethnicity, their gender expression, or maybe their careers. As for me, I often identified with my hometown. I grew up in the concrete jungle known as New York City, the Bronx to be specific. I attended public schools where the classrooms were filled with students from various racial, cultural, ethnic, and linguistic backgrounds. Even my own home environment was diverse. My mother's side of the family comes from the small Caribbean Island of Puerto Rico, and my father's side of the family is Black American from South Carolina.

Although I was raised in the inner-city walls of NYC, my childhood also consisted of frequent trips to Puerto Rico. Here, I engaged with the natural terrain, interacted with farm animals like cows and chickens, tried to catch wild *legartijos*, (a native anole lizard), swam in crystal clear waters that were thriving with ocean life, and observed the celestially illuminated night sky. The ecosystem I encountered in Puerto Rico was vastly different than what I encountered in the Bronx. The contrast between the two regions consistently fueled my passion for natural and environmental science.

Academic Journey. Throughout grade school, science continued to be my favorite subject. At a young age, I determined that I wanted to pursue a career as a marine biologist.

However, as a young woman of color from an inner-city neighborhood, I found myself navigating many challenges and hurdles on my route to becoming a marine biologist.

As a student, learning came relatively easy to me, and I met learning standards effortlessly. However, I was also frequently disengaged from the classroom and bored with the conventional methods of instruction. I often found myself in advanced level classes, but also felt isolated from my closest peers. Trying to balance the pressures of academia with the pressures of the high school social scene took a toll on my grades. By the end of my high school career, I had graduated with an advanced regent's diploma, however my grades were not enough to grant me admission into a state university. Instead, I began my journey in higher education at a community college.

Committed to pursuing a career as a marine biologist, I worked on an associate degree in science at the Borough of Manhattan Community College. Here, I enrolled in courses and participated in programs that supported and reflected my interest in environmental science. As I approached my last year of community college, I applied to state universities that offered bachelor programs in marine sciences. This time around, my applications were stronger, my grades were higher, and I was admitted to all the colleges that I applied to. Florida International University (FIU) was my top choice for marine biology, unfortunately, financial constraints prevented me from enrolling at FIU. Instead, I enrolled at Stony Brook University (SBU), where I was finally on route to becoming a marine biologist.

While enrolled at SBU, I pursued a bachelor's degree in marine science with a minor in environmental studies. Here, I participated in field research, took classes at a marine rehabilitation program, and participated in a study abroad in Jamaica. During this study abroad, I worked in a wet lab, participated in marine research, I became a certified SCUBA diver. Within

the combined Marine Science and Marine Biology program, there were only three students of color, a young Black American woman, a young Black American man from Brooklyn, and me. At SBU, I enrolled in courses that reflected my interests and the cost of tuition was affordable, however I was emotionally unfulfilled and socially isolated.

Career in science education. After completing my undergraduate program at Stony Brook University, I moved back to New York City and landed an interview with a principal at a new charter school in the Bronx; my life started to come full circle as my career shifted from marine biology to science teaching. My pedagogical approach to science education reflects my experiences as a young Black and Latina girl from the Bronx, who had the interest, curiosity, and intellectual capacity to pursue a career in STEM, but found herself excluded and discouraged by the systemic and cultural challenges that pervade academia. I was teaching for social justice before I knew what teaching social justice was.

As I began my teaching career, I enrolled in the master's of science in education program at Long Island University (LIU), Brooklyn Campus with a major in Urban Adolescence education and a focus in biology. At LIU my courses centered around the diverse nature of inner-city public schools and ways to equitably support students through core values identified by the program known as the KEEPS Claim: knowledge, enquiry, empathy, pluralism, and social commitment.

I completed my master's program while working full-time as a high school Earth science teacher. I enjoyed my experience working with inner-city youth and attempting to connect them with the natural sciences. Based on my personal experiences as an inner-city youth and my passion for environmental science, I attempted to provide students with experiences and learning activities designed to help them connect to nature. Inner-city communities have fewer

connections and availability to natural environments (Clemens et al., 2020), perpetuating a disconnect between inner-city youth and the natural sciences.

Although I didn't know it at the time, attempting to provide inner-city students with opportunities to connect to nature were pedagogical decisions rooted in social justice. A lack of availability and connection to natural environments have been correlated with higher rates of mental and physical health issues, increased exposure to air pollution, less physical activity, less creativity, and increased inattentiveness (Clemens et al., 2020). Increased greenness within a community has been known to increase gray matter within one's brain, increasing cognitive abilities, working memory, and reducing inattentiveness (Clemens et al., 2020). Industrialization and climate change continue to exacerbate these issues faced by inner-city youth. Not only is an understanding and respect for nature an aspect of scientific literacy defined by the *Science for Americans* (American Association for the Advancement of Science, 1989, 1994), a connection and understanding to nature has the potential to increase the mental and physical health of inner-city students through engaging in curricula that supports them with the tools and resources needed to address environmental issues of the twenty-first century (Clemens et al. 2020). Equitably preparing *all* students for civic engagement in ways that empower students to solve issues of the twenty-first century requires curricula that fosters a connection and understanding to the natural world, and our relationship to it.

I completed my master's program at LIU alongside teaching high school science after 3 years. I couldn't quite place my finger on it, but I knew I wanted to do something *more* in science education, so my third year became my last year teaching high school as I decided to pursue a Ph.D. in science education. I wanted to continue to focus on designing and developing curricula that promoted the connection between inner-city youth and the natural environment,

marking the beginning of my doctoral training at Syracuse University (SU). At SU, I took courses that supported my interest in working with diverse groups of inner-city learners, such as Spanish for research, Linguistics for teaching of English Language Learners, and Equity and Inequality in schools, and courses that would support the development of contemporary curricula, such as curriculum studies, and modeling in mathematics & science education. Over the duration of my doctoral training, I came to realize my teaching identity and philosophy aligns with environmental social justice. I aim to develop curricula and promote pedagogy that empowers *all* learners with the tools and skills needed to address issues of environmental injustice of the twenty-first century.

My personal experiences, academic journey, and a career as a science educator have all led me to this research. This dissertation study is an extension of a pilot study that I have begun over the years of my doctoral training. Throughout the various iterations of this pilot study, I have gained an understanding of the implementation of socioscientific-based curricula and modeling practices in a high school context with high school students and in a high education context with preservice science teachers.

This dissertation study aims explore how engaging in an interdisciplinary socioscientific issues-based curriculum supports the emerging teaching identities and pedagogical practices of adolescent preservice teachers in ways that are aligned with environmental social justice.

Research Questions

The two research questions that this dissertation study aims to address are as follows:

- What influences the emergent teaching identities of adolescent preservice teachers?
- In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy aligned with environmental social justice?

Overview of Chapters

The second chapter of this dissertation reviews existing literature that supports the theoretical perspectives that support this teaching experiment. The literature review is divided into two sections: (1) Teaching Identities, and (2) Promoting Environmental Social Justice through Socioscientific Issues-Based Curricula. The first section, Teaching Identities, synthesizes literature that supports the development of teaching identities aligned with environmental social justice, by extending social justice in education to include the surrounding environment through the framework of conscientious engagement. The second section of the literature review, Promoting Environmental Social Justice through Socioscientific Issues-Based Curricula, discusses the impacts and implications on secondary science students, preservice science teachers, and experienced science teachers when they've participated in a socioscientific issues-based learning unit. This section further justifies why socioscientific issues-based curricula is an appropriate framework for an intervention that aims to demonstrate pedagogical practices aligned with environmental social justice.

The third chapter of this dissertation describes the methodology used in this study. Using frameworks of *teaching experiments* and *situated learning*, this dissertation study implemented an intervention learning unit in an introduction to adolescent education course. Six adolescent preservice teachers, who were enrolled in the course, agreed to participate in this teaching experiment. Overall, 6 sets of data were collected, analyzed, and coded using emergent thematic coding.

The fourth chapter of this dissertation, Findings, describes the findings that emerged from the analysis described in chapter 3. The findings that emerged from this teaching experiment include identifying the most influential factors the shape preservice teachers' teaching identities,

consistencies, and inconsistencies in the implementation of pedagogical practices aligned with their teaching identities, and areas for growth as an adolescent preservice teacher.

The fifth chapter of this dissertation study, the conclusion, provides a discussion of the findings that have emerged from this teaching experiment, and the implications for future research, teacher educators, and teacher preparation programs.

Chapter II: Literature Review

Today, in 2024, we find ourselves at an interesting time in American history. Globally, we have reached a new peak of the warmest weather ever recorded, which contributes to natural disasters of unprecedented strengths (Paddison, 2023). These natural disasters and their destruction are exacerbated by anthropogenic climate change and have destroyed communities directly by affecting the infrastructure and indirectly affecting the economy, and further impacting the mental health and well-being of the residents including youth and adolescents (Clemen et al., 2020). This is a climate crisis. Further, these natural disasters adversely affect people of historically marginalized communities (Beltrán et al., 2016) and are an environmental social injustice. The climate crisis is one of the most identifying markers of the 21st century.

Many would argue that the education system is responsible for preparing youth and adolescents with knowledge and skills to solve twenty-first century issues as part of their preparation for civic engagement (Lin, 2013). However, in 2024, we also find ourselves at an interesting time in educational political history. Science education and the overall education system has been under continuous reformation to provide equitable education that prepares *all* students for civic engagement. On the contrary, prioritizing equity and civic engagement in education has been challenged in many political spheres, for example the in 2023 the U.S. Supreme Court has ruled against affirmative action, removing racial preference from the college admissions process (Supreme Court, 2023).

Though there are many challenges to promoting equitable education in ways that equip *all* students for civic engagement and prepares them to solve problems of the twenty-first century, it is possible. However, teaching for the twenty-first century requires intentionality and the implementation of contemporary pedagogical practices. Creating and implementing equitable

pedagogy in ways that are contemporary, prepares learners to address issues of the twenty-first century, and tends to social justice, goes beyond disciplinary content and instructional methods. Before educators can implement pedagogical practices that align with social justice, educators must first develop a teaching identity that is oriented towards social justice (Chen & Moore Mensah, 2018). This dissertation study aims to explore ways to support adolescent preservice teachers in developing teaching identities and pedagogical practices that are aligned with social justice through engaging in an intervention learning unit that is rooted in environmental social justice.

This dissertation study extends education for social justice to incorporate environmental social justice in efforts to promote equitable learning opportunities towards civic engagement of the twenty-first century. In efforts to provide adolescent preservice teachers with opportunities to engage in contemporary methods of instruction and pedagogical practices are oriented in environmental social justice, this dissertation study implemented an intervention, a learning unit. The learning unit is grounded in the framework of socioscientific issues-based curriculum, (Zeidler et al., 2005), and utilized the Next Generation Science Standards. This intervention aimed to serve as a model for ways in which educators can promote social justice in education through providing equitable opportunities by implementing societal issues into their curriculum while simultaneously meeting state mandated learning standards.

The following literature review is composed of two sections: (1) Teaching Identities, and (2) Promoting Environmental Social Justice through Socioscientific Issues-Based Curricula. The first section, teaching identities, is intended to walk through themes of social justice as it relates to education, and then express the ways *conscientious engagement* as a framework for teaching extends social justice to environmental social justice. This dissertation study aims to support

adolescent preservice teachers in developing teachings identities and pedagogical practices aligned with environmental social justice by implementing an intervention learning unit. The intervention learning unit is intended to exemplify and model ways contemporary methods of instruction can be enacted to promote equity in education in ways that align with environmental social justice. The second section of this literature review, Promoting Environmental Social Justice through Socioscientific Issues-Based Curricula, describes the framework in which this intervention unit is grounded in socioscientific issues-based curricula (Zeidler et al., 2005). The second section of this literature review further provides an overview of how secondary students, preservice science teachers, and in-service science teachers respond to socioscientific issues-based curricula.

This literature review will then end with a summary that introduces the study research questions that are guiding this dissertation study.

1. Teaching Identities

Teacher identities are personal to the educator and based on one's beliefs and core values, which are continuously refined through experiences (Walkington, 2010). Along with one's teaching identity, learning to teach and becoming a teacher is an ongoing process of personal transformation (Chen & Moore Mensah, 2018; Lave & Wenger, 1991). With this understanding, teacher preparation courses and programs provide unique opportunities and environments for preservice teachers to experiment with various teaching identities and values (Chen & Moore Mensah; 2018; Danielsson & Warwich, 2014; Luehmann, 2007; Lave & Wenger, 1991).

One's teaching identity is flexible and can develop and adjust over time. To develop teaching identities that are aligned with social justice, teacher preparation programs must provide

preservice teachers with opportunities to further engage in instruction and opportunities to develop curricula that is rooted in social justice (Kitchen & Taylor, 2020). This dissertation study aims to offer preservice adolescent teachers the opportunities to develop a teaching identity aligned with social justice by engaging in a learning unit aligned with it.

Social Justice in Education

Developing a teaching identity that is rooted in social justice supports educators in developing and implementing curricula that is equitable and prepares *all* learners for civic engagement of the twenty-first century. As described by Chen & Moore Mensah (2018), socially just teachers recognize the societal injustices faced by students across sociocultural groups marked by race, class, and gender, and ways these injustices limit students' access to positive learning experiences. Socially just teachers recognize the potential success of *all* students across sociocultural groups and implement curricula and pedagogy that improves their learning opportunities (Chen & Moore Mensah, 2018). Although there are many challenges and opposition towards equitable educational opportunities for students across sociocultural groups, socially just teachers recognize the structural inequities within education, and work to deconstruct and transform oppressive structures (Chen & Moore Mensah, 2018; Bell, 2016). Furthermore, social justice education can be understood as a way of bringing awareness to oppressive systems and structures, and further providing learners with the resources and skills needed to address societal inequalities through critical pedagogy (Rios, 2018)

Teaching for social justice has the potential to promote equitable learning outcomes for *all* students in ways that prepare them for civic engagement. However, developing a teaching identity that is needed to promote equitable learning outcomes for *all* students, in ways that prepare them for civic engagement is rooted in social justice, is not always inherent in educators.

Teacher preparation programs have the potential to offer preservice teachers opportunities to engage in experiences and experiment with teaching identities that are geared towards greater social justice (Reagan & Hambacher, 2021). As the course designer and instructor, I implement the framework of conscientious engagement to support my own teaching identity, and further implement curriculum materials and teaching practices that aligned with environmental social justice. The following section provides literature that describes the ways that the framework for conscientious engagement can support one in developing teaching identities oriented towards environmental social justice.

Conscientious Engagement

As educators strive to develop and implement curricula that equitably promotes civic engagement for the twenty-first century, educators must first adopt a teaching identity that is rooted in social justice. However, adopting a teaching identity that is rooted in social justice further requires a holistic approach towards education that moves beyond intellectual exercises and understanding, and incorporates the practice of being *wholly engaged* (Reagan & Hambacher, 2021). (For purposes of this paper, *wholly* and *holistic* are used interchangeably.) Being *wholly engaged* involves one's entire being- mind, body, and spirit, (Reagan & Hambacher, 2021) and as educators, we must attend to the *whole* of our students and ourselves while teaching (hooks, 1994). The framework for conscientious engagement (Rios, 2018), expresses that teaching is a holistic practice that incorporates that mind, body, and Spirit Consciousness in education.

(In this literature review, the term *Spirit* or *Spirit Consciousness*, does not directly reflect one's religion, but instead refers to one's existential being. In various texts and disciplines, *spirit consciousness* might be replaced with words such as energy, or cognition, but overall refers a

universal understanding of “a metaphysical element of our human experience that impacts how one behaves in the world (Rios, p. 90)”.)

Tending to students’ *spirit consciousness* is a form of providing equity for students of diverse sociocultural backgrounds through an in-depth understanding of one’s culture. Culture refers to the total expression of a person’s humanity, however in education, the term “culture” is often reduced to one’s identity politics (Rios, 2018). Masemann, (2023, p. 126) provides an overview for the term culture:

Culture refers to all aspects of life, including the mental, social, linguistic, and physical forms of culture. It refers to ideas people have, the relationships they have with others in their families and with larger social institutions, the languages they speak, and the symbolic forms they share, such as written language and art/music forms. It refers to their relationship with their physical surroundings as well as the technology used in any society.”

An education system that focuses solely on the political aspects of one’s culture and negates their expressive and relational aspects of culture is inequitable, does not promote *spirit consciousness*, does not *wholly engage* culturally and linguistically diverse learners, and ultimately, does not promote social justice in education. The current education system, although it aims to promote equitable outcomes, is hostile to the *spirit consciousness* of students in high minority and high-poverty school settings (Rios, 2018), and thus negatively impacts learning opportunities and outcomes of students from culturally and linguistically diverse backgrounds. It is the responsibility of educators to take action and address the hostility within an educational environment that impedes students’ learning, in ways that address the effects of the hostility faced by culturally and linguistically diverse learners, and reduce it from reoccurring (Polluck,

2019). Through implementing the framework of conscientious engagement, this dissertation study aims to promote teaching identities and implement pedagogical practices that are aligned with social justice and promote equity through nurturing all aspects of culture that is brought into classroom by culturally and linguistically diverse students of historically marginalized groups.

For schools to no longer be hostile environments, and instead become environments where students thrive, educators must adopt mindsets and practices that “leverage students’ cultural, political, and social knowledge as aspects for learning (Dotger & Burgess, 2022). In striving for social justice, utilizing the framework of *conscientious engagement*, engaging students’ culture requires that educator push beyond political identities of culture, and include expressive and relational aspects of culture, including one’s relationship with their physical surroundings. Students who have participated in curricula that incorporated *holistic* (or *conscientious*) *engagement* demonstrated active citizenship, health and emotional well-being, moral and spiritual development, preparation for life-long learning, and sustainable development and global citizenship (Adams, et al., 2015; DCELLS, 2008). Incorporating *conscientious engagement* into one’s teaching identity and pedagogy supports the development and implementation of curricula that equitably promotes civic engagement for the twenty-first century.

In efforts to promote *conscientious engagement*, the course in which this dissertation study is conducted, I as the instructor, modeled aspects of *conscientious engagement* through promoting community, daily wellness practices and the choice of curricula materials. In this course, I was first intentional about arranging seats in a semi-circle to promote a sense of community and encourage discussion between students. Then, I opened the class with first a greeting, an overall review of the agenda, and then a daily 3-minute grounding meditation with

an option to receive reiki. The 3-minute grounding meditation is intended to support preservice teachers' transition into class and clear their mind so that they may mentally prepare to engage in class activities. Reiki is a traditional Japanese practice, or a biofield therapy known to reduce stress and anxiety and further promote relaxation (Bukowski, 2015; Mangione et al., 2017). After the 3-minute grounding meditation, preservice teachers were given the option to share any updates, thoughts, and feelings with the class before officially transitioning into content. Reading materials chosen for this course further supported the development of one's *conscientious engagement* as an education. Course materials included the book *Teacher Agency for Equity: A Framework for Conscientious Engagement* (2017) written by Raquel Rios, *Teaching When the World is on Fire* (2019), edited by Lisa Delpit, and the novel *Braiding Sweetgrass* (2013), written by Robin Wall Kimmerer. The books *Teacher Agency for Equity: A Framework for Conscientious Engagement* (2017) and *Teaching When the World is on Fire* (2019) were implemented in this course to provide preservice teachers with guidance and support in developing a teacher identities and pedagogical practices that are rooted in social justice. The novel *Braiding Sweetgrass* (2013) was included in this course to connect social and environmental justice.

Ultimately, under the framework of *conscientious engagement*, the term "culture" in education, further shifts to include all aspects of one's life, include one's environment and their relationship to it. Using the framework of *conscientious engagement*, this literature review aims to extend the concept of teaching for social justice to include the surrounding environment. This dissertation study aims to support adolescent preservice teachers develop teaching identities that align with environmental social justice through engaging in a curriculum that is rooted in *conscientious engagement*.

Environmental Social Justice

Adopting a teaching identity that is rooted in social justice must also incorporate environmental justice (Beltrán et al., 2016, Dewane, 2011). Natural disasters of unprecedented strengths associated with climate change adversely affect oppressed peoples, indigenous cultures, and traditionally marginalized groups including people from major ethnic and racial backgrounds, people living in poverty, and those at the intersection of these identities (Beltrán et al., 2016, Dewane, 2011; Elliott & Pais, 2006; Gabe et al., 2005; Fraser, 2010; Fallenbaum, 2011; Morris, 2009; Bennett, 2014 Bullard, 1993, 2000; Bullard & Alston, 1990; Pinderhughes, 1996; Rogge, 1993; Westra & Lawson, 2001).

Because environmental justice however is not limited to nature, and instead extends itself to incorporate the immediate environment in which a student resides (Haluza-DeLay, 2013), a teaching lens geared towards environmental social justice also provides equitable opportunities for students of diverse sociocultural backgrounds, including those residing in urban and suburban communities. Developing a teaching identity aligned with environmental social justice allows one to connect “environmental concerns with other societal processes that produce social inequality and recognize these as structure questions about the distribution of resources (Haluza-DeLay, p. 395 2013)”. The recognition of inequitable societal processes allows one to deconstruct oppressive structures, thus instruction and pedagogy that is rooted in environmental social justice empowers *all* students with the tools and resources needed for civic engagement of the twenty-first century to address environmental injustices.

Developing a teaching identity that is rooted in environmental social justice aims to promote equitable learning opportunities that prepares *all* students for civic engagement of the twenty-first century. However, conventional methods of education do not promote equitable

learning opportunities that prepare *all* students for civic engagement of the twenty-first century. Tending towards environmental social justice within education requires contemporary methods of instruction. Many would argue that education for environmental social justice should remain within the science disciplines (Rivera Maulucci, 2023), however I argue that implementing equitable instruction and pedagogy that is rooted in environmental social justice and promotes civic engagement for the twenty-first century is relevant to educators of all disciplines.

In efforts to promote teaching identities and developing pedagogical practices aligned with environmental social justice amongst preservice teachers across different disciplines, this dissertation study aims to incorporate an intervention learning unit, that is grounded in the framework of socioscientific issues-based curricula, within an undergraduate introduction to adolescence education course. SSI based curricula can be implemented to address issues of the twenty-first century, including climate change, but it is not limited to issues of the twenty-first century. However, for the purposes of this study, this teaching experiment aims implement SSI based curricula as a mean to center issues of social justice within learning unit for interdisciplinary adolescent preservice teachers. The next section provides a synthesis of literature on socioscientific issues-based curricula, including a description of socioscientific issues-based curricula (Presley et al., 2013) and its implications on secondary science students, preservice science teachers, and in-service science teachers.

2. Promoting Environmental Social Justice through Socioscientific Issues-Based Curricula

In science, conventional methods of hegemonic secondary science instruction often include a lectured-based approach that focuses on rote memorization of factual knowledge with an emphasis on vocabulary acquisition (Brown, 2019; Omelicheva & Avdeyeva, 2008). Students are often expected to sit in isolation, listen to the teacher recite scientific facts and

formulas, accept the information that the teacher recites without critique, record notes into their notebooks, and then demonstrate their “knowledge” on a standardized assessment. This is a decontextualized form of education, that is not only experienced in science education, but across different academic disciplines. Science courses are often decontextualized and unrelated to ELA, mathematics, and social studies courses, and thus do not reflect the lived reality of our students. This decontextualized, unrelated, and standardized form of education is inequitable, does not promote environmental social justice, and does not promote civic engagement for the twenty-first century. In efforts to support preservice teachers in developing teaching identities and pedagogical practices aligned with environmental social justice, this dissertation study engages adolescent preservice teachers of different disciplines in a socioscientific issues-based curriculum (Presley et al., 2013).

Socioscientific Issues-based curricula is a framework that aims to support environmental justice through focusing on societal injustices that are rooted in scientific and environmental issues (Herman et al., 2017b; Presley et al., 2013). Frequently centered on controversial issues, socioscientific issues-based curricula are socially relevant to the lives of the learners, have a scientific foundation, and do not offer the learners clear solutions (Sadler, 2011). In this way, SSI requires learners to participate in discourse and argumentation, as they utilize their understanding of science concepts and nature of science (NOS) to make informed decisions (Herman, 2018; Kinskey & Zeidler, 2021; Zeidler & Khan, 2014). Further, SSI has been known to provide students with culturally relevant and inclusive curricula through authentic science activities that consider the rights of various societies and individuals, and the societal implications of scientific policies (Kinskey & Zeidler, 2021; Sadler, 2011). In this way, the SSI framework further emphasizes civic engagement by developing students’ functional scientific literacy (Kinskey &

Zeidler, 2021; Sadler, 2011). In addition to civic engagement and science literacy, SSI based curricula present societal issues through a scientific lens in which the content is considered relevant to the students, their families, and/or their communities, (Morales-Doyle 2017; Presley et al. 2013; Zeidler et al., 2005), and increases cultural relevancy. Examples of topics that can be included within socioscientific issues-based curricula include the production of genetically modified organisms, the use of cellular devices, and the construction of nuclear power plants (Atabey & Topcu, 2017).

Through focusing on societal issues that are relevant to learners, incorporating SSI curricula has the potential to promote environmental social justice through connecting learners of diversities to societal issues that are pertinent to their communities while simultaneously engaging them with science content in a way that is culturally relevant. However, the development of a teaching identity that aligns with environmental social justice is not enough to promote equity in education. Promoting equity within education requires that educators implement daily classroom instruction and pedagogical practices that leverage and deepen students' "sense-making" abilities, while connecting their ideas to their peers and science, and further instill them with the resources to critique and challenge injustices (Dotger & Burgess, 2022)". This dissertation study aims to incorporate a socioscientific issues learning unit as a model for adolescent preservice teachers to engage in and reference over the course of the semester. The following sections discuss the implementation of SSI curricula across secondary school settings (Chan, 2013; Herman, et al, 2017; Kokotsaki, et al., 2016; Lee & Witz, 2009; Pellegrino & Hilton, 2012; Reis & Galvão, 2004; Sadler et al, 2006; Suriel et al., 2018; Tidemand & Neilson, 2017; Xinning and Xinyang, 2013; Ye & Xu, 2023), with preservice

science teachers (Karahana, 2022; Leung, 2022; Suriel et al., 2018, and with in-service secondary science teachers (Karahana, 2022).

Socioscientific Curricula in Secondary School Settings

The interdisciplinary methods incorporated in SSI have been known to provide positive learning experiences for secondary students, in-service teachers, and preservice science teachers (Karahana, 2022; Suriel et al., 2018; Ye & Xu 2023). When carried out with secondary school settings, students demonstrated an increase in content knowledge and a deeper understanding of ways to connect and apply content knowledge across multiple disciplines (Suriel et al., 2018). Furthermore, removing the academic borders of decontextualized learning has the potential to enhance the learners' fundamental skills and thinking to understand the objective world and solve practical problems (Xinning and Xinyang, 2013; Ye & Xu, 2023). Lastly, interdisciplinary learning has been known to support learners in developing "4C skills"- critical thinking, communication, collaboration, and creativity (Ye & Xu, 2023). The 4C skills are aligned with competencies needed for science literacy identified by SFAA, and support the standards mentioned by the NGSS and the NYSP-12SLS.

Incorporating interdisciplinary curricula into science curricula has the potential to increase science literacy for all learners through the exploration of complex real-world challenges that integrate various disciplines, concepts, and talents (Weng et al., 2022; Ye & Xu, 2023.). Within an interdisciplinary unit, there is an emphasis on the learner's ability to apply content knowledge in ways that can support them in making informed decisions to solve real-world problems, as well as the ability to evaluate appropriate times and methods of obtaining more information (Pellegrino & Hilton, 2012; Ye & Xu, 2023.). Incorporating learning exercises that are focused on real-world challenges boost learners' motivation and confidence and

strengthen their creative potential and critical thinking skills (Kokotsaki, et al., 2016; Chan, 2013; Ye & Xu, 2023.)

Benefits to incorporating SSI curricula into science instruction include developmental support for the learner's reasoning, perspectives, values, and emotions (Lee & Witz, 2009), help in defining learner's value systems (Reis and Galvão, 2004), development of students' citizenship and socioscientific decision making (Herman et al, 2017a; Sadler et al, 2006, Tidemand and Neilson, 2017)), and further promotes students' critical thinking and help them develop a critical stance towards science information (Chen & Xiao, 2021).

Socioscientific Issues-based Curriculum in Practice: With Preservice Science Teachers

When engaging from the perspective of a learner, interdisciplinary learning units have been known to serve as an exemplary model for preservice science teachers in teacher preparation courses. After engaging in interdisciplinary STEM project (Suriel et al., 2018), one preservice science teacher expressed that the most valuable part of their experience was the opportunity to witness the enactment of interdisciplinary learning unit. Through engaging in interdisciplinary science units as learners, adolescent preservice teachers gain an understanding of the challenges that students may face, providing them with a model for inclusive pedagogy.

Engaging with interdisciplinary learning units from the perspective of a learner provides preservice teachers with opportunities to understand what students may experience including challenges and gaps. By recognizing the challenges, gaps, and troubles students may face, preservice teachers can further support their students' learning by creating tangible steps to address those challenges within the curriculum and learning activities. Additionally, through engaging in a learning unit from the perspective of a learner, preservice teachers are given an

opportunity to develop a meta-awareness of the learning processes that students are going through in real-time and are able to recognize best practices that are needed to support one's learning. Participating in curriculum and learning activities from the perspective of a learner can further promote equitable learning opportunities for students of all diversities through understanding challenges and gaps students may come across and develop best practices within their curriculum planning to maximize learning outcomes.

Engaging with SSI based curriculum has been known to influence preservice teachers teaching identities and pedagogical practices. When secondary science preservice design and teach with SSI based curriculum, it has been known to support changes in their perspectives of science data, the surrounding environment, truth, and ethics (Karahana, 2022). Developing an SSI unit helped secondary science preservice teachers understand the interwoven relationships between humans and the environment, as their views of society shifted from being separate from the environment, to being part of society (Karahana, 2022). Furthermore, developing an SSI unit has helped secondary science preservice teachers develop compassion and empathy for diverse cultures and world views as they began to recognize that insight from diverse perspectives and backgrounds were essential. Additional changes to secondary science preservice teachers include changes to their pedagogy and the incorporation of argumentation, news, and media (Karahana, 2022). Although developing and implementing SSI based curricula has been known to shifts preservice teachers' perspectives and pedagogical practices, participants in this dissertation study will not develop and implement SSI based curricula. Instead participants will engage in the learning unit as a learner and this dissertation study will emergent teaching identities and pedagogical practices expressed by the participants.

Socioscientific Issues-based Curriculum in Practice: In-service Science Teachers

Engaging with SSI from the perspective of a learner offers in-service teachers unique opportunities develop and enhance curriculum that promotes environmental social justice. As secondary science preservice teachers engaged developing SSI, they were also made aware of the dilemmas and struggles that educators would face, including a lack of resources, a lack of community support, and concerns about presenting controversial topics and legal action (Karahana, 2022). Additionally, secondary science preservice teachers found difficulties when trying to change how learners acquire knowledge (Karahana, 2022), as conventional methods promote passive styles of learning, contemporary instructional methods require learners to be active participants in their learning. Furthermore, not only is socioscientific issues-based curricula known to promote scientific equity, but SSI can be implemented to meet recently adopted learning standards identified by New York State Education Department. This dissertation aims to provide preservice teachers with experiences in SSI-based curricula and explore the ways it is adopted and reflected in their pedagogical practices.

Chapter Summary

Through its interdisciplinary nature, SSI based curricula have been known to empower learners with skills such as critical thinking, decision making, and problem solving. Furthermore, the interdisciplinary aspects of socioscientific issues-based curriculum has also helped students develop emotive reason with the environment (Herman et al., 2020) in ways that align with scientific literacy. These are the skills and competencies that are developed in SSI based curricula that are needed for civic engagement of the twenty-first century. To effectively create and implement SSI based learning unit, educators must possess a specific set of skills and competencies are heavily influenced by teacher preparation programs (Karahana, 2022; Simon &

Zeigler, 2003). This dissertation study explores the ways preservice adolescent teachers emergent teaching identities and pedagogical practices align with environmental justice through engaging in an SSI based learning unit.

SSI based curriculum has been studied with preservice science teachers and in-service science teachers, however, promoting civic engagement for the twenty-first century is not limited to science disciplines. As a way to implement SSI based curricula that supports preservice teachers of all disciplines in developing teaching identities that caters towards societal issues of the twenty-first century, this teaching experiment first begins with incorporating *conscientious engagement* as a framework to develop teaching identities for environmental social justice. Teaching for environmental social justice involves the development of a teaching identity and pedagogical strives for educational equity and civic engagement for the twenty-first century through contemporary instructional methods, which further extends the concepts of culture to include one's relationship with their surrounding environment.

I argue that SSI-based curricula are a method of instruction that, when rooted in conscientious engagement, can promote environmental social justice through equitable learning opportunities for *all* students by focusing on environmental issues of the twenty-first century. In all, *conscientious engagement* is the framework for teaching identities that is implemented within this teaching experiment, and SSI based curricula are the pedagogical methods that are employed in this teaching experiment in efforts to support preservice teachers in developing an orientation towards teaching for environmental social justice.

Overall, developing a teaching identity and pedagogy that is rooted in environmental social justice is not intrinsic to all educators. This dissertation aims to incorporate a socioscientific issues-based curriculum in an introduction to adolescence education course with

preservice teachers from various disciplines, with the intentions to support adolescent preservice teachers in developing teaching identities and pedagogical practices aligned with environmental social justice. Because pedagogical practices are understood as an enactment of one's teaching identity, this dissertation first aims to explore the influences of one's teaching identity, and then explore ways in which those influences can be leveraged to promote pedagogical practices aligned with environmental social justice. As preservice secondary teachers engage with a socioscientific issues-based learning unit, this dissertation study explores the changes their thinking as it relates to their teaching identities, pedagogical practices, personal perspectives, and environmental social justice. This dissertation study aims to answer the following research questions:

- What influences the emergent teaching identities of adolescent preservice teachers?
- In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy aligned with environmental social justice?

Chapter III: Methodology

Chapter Overview

Supporting educators in implementing teaching practices for the twenty-first century in ways that are equitable and align with environmental social studies is an ongoing effort. This dissertation study explored ways in which engagement with a socioscientific issues-based learning unit that is aligned with environmental social justice supports the emerging teaching identities and pedagogical practices of adolescent preservice teachers. The rest of the methodology chapter is further divided into 3 sections.

The first section of this chapter refers to the design of this study. The research underpinning this dissertation study began as a pilot study. This section describes the trajectory of this pilot study and the ways it has evolved. This section then proceeds to identify the theoretical frameworks that are supporting this study.

The second section of this chapter provides an in-depth description of the context of this study. Within this section, I describe the location where this study was conducted and provide descriptions of each participant within this study, and the ways in which the participants were selected for this research study.

The third section of this chapter refers to the data that is collected and analyzed as part of this dissertation study. Overall, 5 pieces of data were collected, including (1) a pre-unit questionnaire, (2) mid-term assignment, (3) final assignment, (4) final discussion questionnaire, (5) ethnographic notes, and (6) field notes. After overviewing the pieces of data collected, this chapter further describes the methods used to analyze data that is collected.

The chapter then ends with a summary of this dissertation study.

Overall, this dissertation study aims to address the following questions:

- What influences the emergent teaching identities of adolescent preservice teachers?
- In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy aligned with environmental social justice?

Study Context

This section of the methodology chapter incorporates information regarding the context of this teaching experiment. This section includes details about the design of the dissertation study, the location in which this study was conducted, and a description of participants.

Design of the Dissertation Study

This dissertation study is an extension of a pilot study. This following section provides of description of the pilot study, and further extends to the ways in which the pilot study influenced the design of this dissertation study. Over the course of the study, this research has had 2 iterations along with two phases of each iteration: (1) the lesson plan, and (2) the enacted lesson. The following sections provide details to the development of this research and overviews each phase for each iteration.

Pilot study. This dissertation study initially began as a pilot study which partnered with a local initiative, Save the Rain, which developed green roofs throughout Onondaga County in efforts to mitigate flooding in Syracuse City and further reduce sewage pollution in Onondaga Lake. Initial stages of this research included the development of a learning unit developed using framework of socioscientific issues-based curriculum (Zeidler et al., 2005), to be implemented in a high school setting. The first iteration of this pilot study was executed in a social studies class at an inner-city school in Syracuse. In developing the lesson plan for the first iteration, the socioscientific unit was intended to explore the ways in which modeling as a scientific practice

can support secondary students in understanding scientific processes and the subsequent societal implications. The first implementation of the first iteration of the study provided support in understanding ways in which students use modeling to express their knowledge and learning, however students still held misconceptions about the scientific processes that supported construction of the green roofs.

This pilot study was then modified and completed for the second time, making this the second iteration of the pilot study. The second iteration of the pilot study was planned for- and implemented in a methods of secondary science teaching course with preservice adolescent science teachers. The second iteration of this pilot study explored the ways in which preservice science teachers understood the learning tasks of modeling, and ways in which modeling can be applied within their pedagogical practices. When applied in a secondary methods of science teaching course, preservice science teachers understood the scientific processes that were included in the development of the green roofs, however still approached the modeling activity in a conventional fashion, expecting the model to be used a demonstration of one's knowledge, as opposed to a more contemporary fashion in which the models were used as tools to support the development of one's knowledge. During the second iteration, preservice science teachers engaged in an SSI learning unit, and over the duration of the semester, expressed changes in their personal missions as teachers and desires of wanting to become more involved in local environmental activism.

This dissertation study is an extension of the pilot study and serves as the third iteration of this research. The findings in the execution of the first and second iterations of this pilot study influenced the design and execution of this dissertation study. For this dissertation study, I aimed to explore adolescent preservice teachers' emerging teaching identities, and the ways in which

engaging in a socioscientific issues-based learning unit further supports their pedagogical practices.

In the course in which this dissertation study was conducted, adolescent preservice teachers were of various disciplinary backgrounds, and therefore the intention of this research shifted from focusing on science teaching and learning, towards promoting equity through pedagogical practices that are aligned with environmental social justice. Socioscientific issues-based curricula is an instructional framework that focuses on the implications of science practices within society, promotes solutions to twenty-first century issues, and is aligned with environmental social justice. The following sections provides a description of the frameworks that are supporting this dissertation study.

Theoretical Frameworks

This dissertation study is rooted in two theoretical frameworks, *teaching experiments* and *situated learning*. The following sections describe the ways in which these two frameworks support the execution of this dissertation study.

Teaching Experiments. Teaching experiments is a theoretical framework that guides education researchers to develop and implement distinct learning activities that aim to understand students' progress over time as they strive towards a particular goal (Steffe & Thompson, 2000). Furthermore, teaching experiments are a method of conducting research in which teaching is the method of the scientific investigation (Cobb & Steffe, 1983; Steffe, 1983; Steffe, 2017; Steffe & Thompson, 2000; Steffe & Ulrich, 2013). This dissertation is a teaching experiment that explores the ways participating in a socioscientific issues-based learning unit supports the emerging teaching identities and pedagogy of adolescent preservice teachers across

different disciplines. Based on the first two iterations of pilot study, my expectation of this research was that prior to the socioscientific issues-based learning unit, adolescent preservice teachers were not familiar with socioscientific issues-based curriculum, and after the implementation of socioscientific issues-based learning curriculum, adolescent preservice teachers would be willing to implement aspects of environmental social justice within their pedagogical practices.

Situated Learning. *Situated learning* (Lave & Wenger, 1991) is another framework that is guiding the application of this dissertation study. This dissertation study incorporates the implementation of a socioscientific issues-based learning unit. The implementation of a learning unit that is designed for a secondary school setting into a teacher preparation course positions the adolescent preservice teachers as learners providing them with the opportunity to engage in learning activities from the perspective of a student. This utilizes the framework of *situated learning* (Lave & Wenger, 1991). The framework of *situated learning* focuses on the cognitive learning that occurs as one completes tasks that are presented within an authentic situation (Brown et al., 1989; Eick et al., 2003; Lave, 1996). In this teaching experiment the authentic situation will be the participation in the SSI learning unit, and in that way, preservice teachers participate in learning activities for their intended teaching grade band from the perspective of a learner.

Engaging in an authentic learning activity from the perspective of a learner, grants preservice teachers with opportunities to observe models of contemporary learning methods enacted by their instructors and expands learning in preservice teachers through collaboration with their peers (Hostetler Leaman & Flanagan, 2013). Further, engaging in an authentic learning activity from the perspective of a learner allows preservice teachers to recognize potential

learning opportunities, gaps and challenges learners may encounter, and supports preservice teachers in creating, developing, and implementing learning activities.

Overall, the frameworks guiding this dissertation study are *teaching experiments* (Steffe & Thompson, 2000), in which this intervention study is applied to a course with adolescent preservice teachers, and *situated learning* (Lave & Wenger, 1991), where the intervention study takes form of a socioscientific issues-based learning unit, and requires that preservice teachers engage from the perspective of a student. The following sections describe the context of this teaching experiment.

Location of the Dissertation Study

This teaching experiment will take place in an undergraduate, Introduction to Adolescence Education course, at a public state college in central New York. This course is taught by me, the researcher of this study. The SSI learning unit will be incorporated into the curriculum and serve as the anchoring activity for the semester, and data in the form of student work of those students who expressed their participation, as well as researcher field notes, and ethnographic notes will be collected and analyzed.

As part of the institutional policy, faculty members are not permitted to collect data from their students while the course is active. Therefore, at the beginning of the semester, a third-party faculty member was present in the classroom as I explained the details of this teaching experiment, answered questions, and distributed consent forms. After the distribution of consent forms, I stepped out of the room, and the third-party faculty collected the consent forms and stored them in their office until finals grades were submitted. Once final grades were submitted, I retrieved the consent forms and identified adolescent preservice teachers who have provided

consent to participate in this teaching experiment. It is important to note that all adolescent preservice teachers were expected to complete all activities and assignments, regardless of consent to participation of the teaching experiment, as part of their course requirements.

Participants

This section describes the participants of this study. All participants have been given pseudonyms to protect their confidentiality.

Michelle. Michelle is a sophomore pursuing a Bachelor of Art degree in Adolescence Education with a focus in math. Michelle identifies as a White American woman.

Anthony. Anthony is a junior pursuing a Bachelor of Art degree in Adolescence Education with a focus in math. Anthony identifies as a White American man.

Priscilla. Priscilla is a junior pursuing a Bachelor of Art degree in Teaching English as a Second Language for grades K-12. Priscilla identifies as a first-generation American woman of Brazilian descent.

Matthew. Matthew is a junior pursuing a Bachelor of Art degree in Adolescence Education with a focus in biology. Matthew identifies as a White American man.

Johnathan. Johnathan is a sophomore pursuing a Bachelor of Art degree in Adolescence Education with a focus in biology. Johnathan identifies as a White American man.

Christopher. Christopher is a sophomore pursuing a Bachelor of Art degree in Adolescence Education with a focus in biology. Christopher identifies as a White American man.

In all, this teaching experiment is carried out in an introduction to adolescent education course at medium size public university in Central New York. 6 of the preservice teachers

enrolled in the course consented to participate in the teaching experiment. The data collected from the preservice teachers during this intervention study is highlighted in the following section.

Data

This chapter's second section refers to the data collected during the scope of this intervention study and the methods that were used for analysis.

Data Collection. The six pieces of data that this teaching experiment collected and analyzed include: (1) a pre-unit questionnaire, (2) midterm assignment, (3) final assessment, (4) final discussion questionnaire, (5) field notes collected during class, and (6) ethnographic notes recorded during and after class. Overall, this section provides further insight into the six pieces of data that this teaching experiment will collect and analyze. (Rubrics for student work can be found in Appendix C.)

1. ***Pre-unit questionnaire.*** The first form of data collected and analyzed was a pre-unit questionnaire consisted of open-ended questions that gathered insight on adolescent preservice teachers self-perceived identities as educators, including the purpose of education, the values they aim to uphold as educators, and the influences as preservice educators. This questionnaire was administered in paper form at the start of the semester, before starting any form of content, then was collected and stored on a secured online database. The questionnaire was used as a baseline to understand preservice teachers' teaching identities, values, and beliefs about education. (Appendix C.1)
2. ***Mid-term assessment – Teaching Philosophy.*** The second piece of data that is collected in this teaching experiment are adolescent preservice teachers' mid-term assignment

submissions. As part of the requirements for this course, adolescent preservice teachers are required to create and submit a teaching philosophy that expresses the values that they aim to uphold as an educator. The mid-term assignment was assigned and collected on an online platform after adolescent preservice teachers engaged in the socioscientific issues-based learning unit and explored the development of their teaching identities. This mid-term assignment served as the first assessment that explored preservice teachers emergent teaching identities after the implementation of the intervention learning unit. (Appendix C.2)

3. ***Final Assessment – Teaching Portfolio.*** The third piece of data this teaching experiment collected and analyzed are adolescent preservice teachers' final assignment. As a requirement for the course, adolescent preservice teachers are expected to complete twenty-five hours of field work over an 8-week period. For the final assignment, adolescent preservice teachers submitted a portfolio that included a proposed learning unit comprised of multiple lesson plans and a reflection paper. This teaching portfolio explored preservice teachers' pedagogical practices and the reasoning that upheld their pedagogical decision making. The final portfolio was submitted on an online platform. (Appendix C.3)
4. ***Final Discussion Questionnaire.*** During the last class of the semester, a questionnaire was distributed the prompted adolescent preservice teachers to answer questions regarding their key-take aways from the course. Adolescent preservice teachers completed the questionnaires individually, and then discussed their answers as a class. (Appendix C.4)

5. ***Researcher Field Notes.*** During the course, adolescent preservice teachers frequently engage in discussions about the course content and learning activities. The fourth piece of data that this teaching experiment collected and analyzed were researcher field notes gathered while students were participating in learning activities and class discussions. Field notes were gathered to explore preservice teachers' thoughts, ideas, and questions within the course. Throughout the course, field notes were transcribed and stored.
6. ***Ethnographic notes.*** The fifth piece of data that this teaching experiment gathered includes ethnographic notes that were recorded by myself. There are 17 ethnographic entries gathered over the course and after each class session. Ethnographic notes varied in length, spanning from entries that are 1-2 sentences long to entries that were 4 pages in length. Overall, ethnographic notes captured adolescent preservice teachers' thoughts, questions, expression, and performance, and instructional decisions made by me over the course of the semester.

Over the duration of the semester, this teaching experiment collected and analyzed six pieces of data, including: (1) a pre-unit questionnaire, (2) mid-term assignment, (3) final assignment, (4) final discussion questionnaire, and (5) research field notes, and (6) ethnographic notes.

Omitted Data. Data in the form of student work that was not incorporated within this study includes (1) the modeling activity that participants engaged in during the intervention learning unit, and (2) early drafts of their lesson plans that were created throughout the course. The modeling activity was not included in the scope of the data analysis because analyzing models would provide insight about participants' scientific knowledge, however this study sought to participants' conceptual understandings of modeling and ways it can be applied as a

pedagogical practice. Incorporating participants' models of the green roof was not aligned with the questions of this research study and therefore omitted. Additionally, incorporating earlier drafts of participants' lessons plans would have revealed information about participants' pedagogical growth over time. Although that is valuable information, exploring participants' pedagogical growth over-time did not align with the scope of this dissertation study and therefore that information was omitted from the data analysis.

Overall, the findings that are presented in this study are based on 6 pieces of data collected over the duration of one semester, and the ways in which the data was analyzed is described in the following section.

Methods of Data Analysis

Data was gathered and stored over the duration of the semester, lasting for a total span of 16 weeks. The pre-unit questionnaire, midterm-assignment, final assessment, and final discussion questionnaire are 4 distinct pieces of student work that were collected pre-, mid-and post- teaching experiment. Ethnographic notes and field notes were collected simultaneously over the duration of the course to further support the data that was collected. All adolescent preservice teachers were required to submit student work as part of their course requirements; however, data was analyzed after students' grades were submitted as part of standard procedure at the research location. Only the work of preservice teachers who have expressed interest in participating in this teaching experiment were uploaded and stored in a secure online database. After the 16-weeks of the semester, I was able to retrieve the consent forms and identify who would participate in the teaching experiment and who did not. The statements and examples of student works of preservice teachers who did not consent to participate in this teaching study were redacted from field notes and ethnographic notes. After all participants of the study were

identified, the work that was submitted was sorted by participant, and then were assigned pseudonyms to protect their confidentiality. The data that was data was analyzed using an open-coding method. The following section describes in detail the ways in which the data collected from this teaching experiment and further analyzed for emergent themes and findings.

The data that was collected as part of this teaching study was analyzed and coded three times. A priori codes utilized when analyzing data centered themes of teaching values and beliefs, beliefs about educations, aspirations as a preservice teacher, and influences as a that contributed towards their teaching career.

During the initial analysis, I created a table on Google Drive titled “student work: initial analysis”. This table had a row for each participant and class field notes in the first column, and each subsequent column referred to the activities of the class on each day. Each cross-sectional cell included codes for actions taken place by each participant and observations made by me. After all the examples of student work, field notes, and ethnographic notes were analyzed and coded into the table “student work: initial analysis”, I began the second round of coding.

During the second round of coding, I created another able in Google Drive titled “emergent themes”. The table “emergent themes” consisted of two columns; the right column was labeled “emergent themes”, and reflected the themes that emerged as I colored coded the data set. The left column was labeled “codes” and reflected the different codes that emerged as I analyzed the data set in “student work: initial analysis”. In completing “emergent themes”, I analyzed codes that emerged in “student work: initial analysis” per student across the duration of the semester, I highlighted codes that were related to teaching identities, pedagogical methods, environmental social justice, and beliefs about education. As I highlighted these codes, I placed

them into the column titled “codes” of the table “emergent themes”. As I completed this process, patterns and correlations began to emerge as themes.

After this process was completed, a third table was created that served as the third round of coding. This third table was titled “findings” and identified patterns and claims that were evident based on emergent themes. For example, one emergent theme was labeled as “purposes of education”, and in the codes which fell into the that theme included codes such as civic engagement, worldly knowledge, and fun. Each code also had direct quotes and examples which serve as evidence of that code. Through these codes, I was able to make connections within different themes and provide evidence in the form of student work and quotes to support emergent findings.

Chapter Summary

Overall, this dissertation study is qualitative in nature, reflects my positionality, and is designed to provide additional literature and insight to the field of teacher education and teacher preparation programs. The qualitative methods chosen for this study are intended to capture the experiences, thoughts, ideas, and challenges, and overall changes to thinking of adolescent preservice teachers as they engage in an SSI learning unit that is rooted in environmental social justice and intended to promote civic engagement for the twenty-first century. Using frameworks of *teaching experiment* and *situated learning*, this study will take place in an undergraduate education that includes the implementation of a socioscientific learning unit, and will collect and analyze six sets of data including work that is produced by the participants over the duration of the of a 16-week long semester, ethnographic notes, and field notes. The trajectory of data collected in this teaching experiment includes first the administration of the pre-unit questionnaire during the first week of class, secondly the implementation of the

intervention study across weeks 5 through 8, then preservice teachers' mid-term assignments were due week 9, and during week 16, the final discussion questionnaire was administered and their final assignments. Throughout the 16-weeks of the semester, field notes were recorded in a notebook during class, and ethnographic notes were collected after class. For additional context, the syllabus of this course can be found in Appendix B. The overall research goal of this teaching experiment is to explore the ways participating in an SSI learning unit influences the emergent teacher identities and pedagogical practices of adolescent preservice teachers of different content discipline towards a lens of environmental social justice. As part of this teaching experiment, this dissertation study aims to answer the following two research questions:

- What influences the emergent teaching identities of adolescent preservice teachers?
- In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy aligned with environmental social justice?

Chapter IV: Findings

Chapter Overview

For this teaching experiment, 50%, or 6 of the 12 preservice teachers who completed the course agreed to participate in this study. When developing their teacher identities and pedagogical practices, emerging themes included influences in education, consistencies and inconsistencies of their teaching identities and values reflected in their pedagogical practices, and growth.

The development of preservice teachers' teaching identities were primarily influenced by their own life experiences in their journey with education. Influences to preservice teachers' developing teaching identities include their experiences as a student, their experiences with teachers, and family influences. Further, preservice teachers are likely to implement pedagogical practices that they have experienced in their own educational journey, whether or not they aligned with the values and beliefs reflected by their teaching identities. In this chapter I present the findings of this research study. I aimed to answer two research questions:

- Research questions I: What influences the emergent teaching identities of adolescent preservice teachers?
- Research Question II: In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy aligned with environmental social justice?

In this chapter, I use data gathered from participating preservice teachers to present findings on preservice teachers' teaching identities and pedagogical practices. Data gathered and analyzed in this section include (1) pre-unit questionnaire, (2) a mid-term assignment, (3) final assessment, (4) final discussion questionnaire, (5) field notes collected during class, and (6) ethnographic notes collected after class. Over the duration of this study, there were two pieces of student work that was omitted from the study. Findings revealed in this study are categorized

into three sections (1) Developing Teaching Identities, (2) Pedagogical Practices, and (3) Growth as a Preservice Teacher.

This chapter is presented in three sections. The first section, Developing Teaching Identities, aims to address Research Question I. The second section, Pedagogical Practices, aims to address Research Question II. Research question I was intended to serve as a baseline in understanding the values and ideologies that preservice teachers enter teacher preparation programs with, and further understand the ways in which those identities are enacted throughout their pedagogical practices, connecting with research question II. The third section of this chapter, Growth as a Preservice Teacher, does not directly answer either of the research questions, however this section provides findings the I believe are relevant to the scope of this study.

Research Question I: Developing Teaching Identities

- **Research Question I:** What influences the emergent teaching identities of adolescent preservice teachers?

This first question focuses on differing factors that influenced preservice teachers' developing teacher identities. To answer this question I assessed examples of student work that was submitted over the duration of the semester, along with field notes collected during in-class instruction. In the analysis of this data, the common theme of *influences* continued to emerge, in which there were four distinct types of influential experiences that shaped preservice teachers' emerging teaching identities including (1) experiences as a student, (2) experiences with teachers, (3) experiences with family, and (4) experiences within teacher preparation program. This next section describes the ways in which these four influences shaped preservice teachers' emerging teacher identities.

Influences

The development of preservice teachers' teaching identities were primarily influenced by their own life experiences in their journey with education. Influences on preservice teachers' developing teaching identities include their experiences as a student, their experiences with teachers, family influences, and experiences within their teacher preparation programs.

Experiences as a student. Over the duration of this teaching experiment, preservice teachers Priscilla and Anthony described their personal experiences that they faced as a student which influenced their teaching identities.

Priscilla expresses having inequitable experiences throughout her life and in her educational journey that impacted her pedagogical approach. When talking about homework, Priscilla states:

“I had a different experience, because my parents are immigrants, and they couldn't help me. So I was calling friends and family to see if they can help me, they can be a good resource, but methods changed also.”

In another document, as Priscilla further discusses her childhood experiences in reference to her educational journey, Priscilla states:

“for a lot of my childhood I had a lot of anxiety surrounding schoolwork because I felt I had no one to ask for help.”

In both of these statements, Priscilla expresses that she had difficulty completing her school assignments because as a first generation American, she did not have the academic support from her immediate family due to linguistic differences. The expectation that she does have access to immediate familial assistance that will support her education is inequitable and further does not tend to the lived experience of culturally and linguistically diverse students. Priscilla then continues her statement to express that her lived experiences as a first generation American influenced her pedagogical approach. Priscilla states:

“I never want my students to feel neglected or that no one is paying attention to them. In my case, I was given equality not equity. And I believe that when dealing with students that English isn’t their first language, equity trumps equality.”

Priscilla’s experience as a first generation American, in which she was not granted equitable opportunities in school, directly reflects her desire to provide equitable opportunities to students of culturally diverse backgrounds. Based on her experiences, Priscilla’s teaching identity values equity and inclusivity.

In another scenario, Anthony explains that when developing his lesson plans for math, he reflects on his experience as a student in math. Anthony states:

“I recall taking math classes throughout grade school where they never applied to my personal life, and I dreaded going. When I created my lesson plans, I wanted to keep this in mind, hence why I incorporated a project into my lesson plan where the units are practical for the students.”

In this statement, Anthony recalls his experiences in math class where the content was unrelated to his personal life. Due to these experiences as a student, Anthony desires to create lesson plans that are culturally meaningful and relevant to his students’ lives.

Experiences with teachers. In addition to preservice teachers expressing that their teaching identities were influenced by their experiences as students, preservice teachers Priscilla, Johnathan, Christopher, and Anthony expressed that their emerging teaching identities were influenced by both positive teacher role models, and the absence of a positive teacher role model.

Positive teacher role models. As Priscilla reflects on her educational journey, Priscilla expresses that she had a physical education teacher who, although she did not enjoy attending physical education, inspired her to attend class. Priscilla states:

“I had *that* teacher in high school, he was my gym teacher, and I hated gym, but he made me want to come in.”

In an additional document, Priscilla continues to express the type of teacher her physical education teacher was, and her aspirations of adopting his teaching styles. Priscilla expresses:

“I had a teacher in high school that is one of my greatest inspirations to becoming a teacher. He was a friend to all of us but a teacher first. He had authority over the students and respect from the students, but he made it very easy to talk to him and made us all aware that he was always open to help no matter what the situation. He was very personable and he most definitely showed vulnerability in the classroom, which made it easier to connect with him. I would love to take his teaching styles and adapt them into my own. I aspire to be like him and more.”

In these two statements, Priscilla expresses that she was not a big fan of the educational content presented in her gym class, however her gym teacher maintained a positive relationship with her, that demonstrates mutual respect and inspiration. Priscilla further expresses her aspiration to adopt his approach to teaching. These statements suggest that as a preservice teacher, Priscilla aims to adopt a teaching identity that balances a sense of authority and respect with vulnerability and personability.

In addition to Priscilla, Johnathan also expresses that his teachers held a positive influence over his developing teaching identity. Johnathan expresses that his pedagogical aspirations were inspired by his former teachers. Johnathan mentions:

“My teachers that I had were so engaging with us as students and showed real passion in their work, which made me love not only them as a person, but the class as well”

In this statement, Johnathan expresses that his teachers demonstrated passion for their work as a teacher, and the passion that they demonstrated earned his admiration. Christopher, expresses similar sentiments to Johnathan, in which Christopher experiences positive role models of educators. Christopher states:

“My past teachers were my influence, not because they were bad but because I enjoyed them and [I] want to pay what they gave me forward.”

In these two statements, both Johnathan and Christopher express that their teachers’ pedagogical styles were engaging and enjoyable.

All three students in this instance express that their pedagogical perspectives and aspirations were inspired by positive experiences from their teachers. However, not all preservice teachers expressed having a positive teaching influence in their educational journey. The following section describes how Anthony did not have a supportive teacher who positively influenced his emerging teaching identity.

Lack of a positive teacher role models. As Anthony discusses his emerging teaching identity, he expresses that he did not have a positive teacher influence. As Anthony explored his sexual identity in high school, Anthony expresses never having the type of teacher that he can confide in. The lack of a positive teacher role model guides his desire for being a supportive teacher. Anthony states:

“The biggest part of my teaching philosophy comes from my own personal experience regarding my sexuality, where I felt I was silenced because I had nowhere to go and no one to talk to.”

In this statement, Anthony expresses feeling silenced and isolated in highschool due to his emergent sexual identity. In another passage, Anthony states:

“High school was an interesting time for me, as I learned about my sexuality, ultimately realizing that I am not straight but unable to fully identify myself with a label. As I was figuring this out in high school, I needed a staff member I could go to, but had no one there. Additionally, this self-realization took a massive toll on my mental health four years ago that I continue to struggle with today, hence influencing my decision to become a teacher so I can create a place where students know they can go for anything.”

Anthony further continues:

“My past experiences as an LGBTQ student are my biggest motivator to becoming a positive educator and influence in the schools.”

In Anthony’s case, he describes feelings of being isolated and silenced as he navigated his sexual identity throughout his adolescent years. Anthony expresses that the lack of emotional support he experienced, while navigating his sexual identity, severely impacted his mental health.

Anthony's experience speaks to the inequities commonly faced by students who identify as a member of the LGBTQAI+ community. As a result, Anthony desires to become the type of teacher to foster a safe-space for students.

Family Influences. In addition to personal experiences as a student, and experiences with teachers, preservice teachers Priscilla, Matthew, and Johnathan, express the ways in which their families played an influential role in the development of their emerging teaching identities.

Priscilla expresses that as a first generation American, she was inspired to be a teacher because she has spent a large portion of her life supporting her family in their English development and acquisition. Priscilla states:

“My parents were the biggest influence on choosing my major, Teaching English as a Second Language. I have been teaching English my whole life to both my parents and my younger sister, and helping them to connect with the people around them has inspired me to continue to help those around me gain that same sense of understanding and connection.”

Priscilla's professional career was shaped by her childhood experiences in relation to her family. This statement demonstrates how Priscilla aspires to continue to help people, influencing her decision to pursue a career as an ESL teacher.

In contrast to Priscilla's experience with her family, who needed her help, Matthew and Johnathan express that their parents were educators, and witnessing their parents' career path is what inspired them to pursue a career in education. When describing his inspiration for teaching, Matthew states:

“Inspired by my mom's dedicated teaching career, I believe in the power of education to inspire growth, instill love for learning, and contribute to the betterment of society. My commitment to recognizing and addressing privilege drives my determination to create an inclusive classroom that values diversity and equity.”

In this statement, Matthew attributes his aspirations for pursuing a teaching career, his perspectives of education, and the values that he aims to uphold as a teacher to his mother.

Similar to Matthew, Johnathan also expresses admiration towards his father's career as an educator. Johnathan mentions:

"I hope to be like my dad in which every time we go out he gets recognized and still interacts with previous students and how they tell me the influence he left on them."

Johnathan expresses that he admires the impact and relationship that his father has with his students and aspires to be like his dad.

Priscilla, Matthew, and Johnathan all describe the ways in which their interactions with their families have influenced their decision to pursue a career in education, and the values in which they aim to uphold as a teacher.

Teacher preparation. As preservice teachers' developed their teaching identities, their past experiences as students, with teachers, and with their families inspired their emerging teaching identities. However, this teaching study also revealed that teacher preparation programs can also shape preservice teachers' teaching identities. The following are statements from Priscilla, Michelle, and Matthew that express their experience within their teacher education programs, specifically this course and their field placement, and the ways in these experiences supported their emerging teacher identity and furthermore, their pedagogical practice. This section is divided into two subsequent sections. The first section highlights the ways in which preservice teachers' experiences within the course where this teaching experiment takes place have influenced their emerging teaching identities. The second section describes the ways in which preservice teachers' teaching identities were shaped by their field placement during their teacher preparation program.

Course of the Research Site. During their participation within this course, preservice teachers Priscilla and Matthew expressed the ways in which course materials influenced and activities influenced their emerging teaching identities.

During this course, I opened every class with a 3-minute grounding meditation. My intentions of holding a 3-minute grounding meditation in the beginning of every class was to support preservice teachers transition into class, maximize their mental presence in class, and was further an enactment of me practicing *conscientious engagement* as the instructor of the course. In the following statement, Priscilla expresses that she enjoyed the silent meditation practice and aims to implement a similar practice within her class. Priscilla says:

“I don’t have any time throughout my week to be present with a clear mind. The 3-minute meditations were perfect, and a perfect length of time because I think with anything more, I would’ve fell asleep. I want to do something like this in my class.”

This statement by Priscilla suggests that from engaging in this course, she developed an emerging teaching identity that values mindfulness and aims to implement mindful practices within her classroom. For Matthew, however, it was engaging with course materials that further influenced his emerging teaching identity. In the following statement, Matthew expresses the influence that the novel *Braiding Sweetgrass* has on his emerging teaching identity. Matthew states:

“The book “Braiding Sweetgrass” significantly shaped my approach to education, with a particular quote resonating deeply: ‘Scarcity and plenty are as much qualities of the mind and spirit as they are of the economy; gratitude plants the seeds for abundance.’ This quote, in a chapter featuring the mythical creature Windigo, discusses the idea that the state of mind and spirit influences our perception. The narrative warns against greed through the Windigo’s story, emphasizing the negative consequences of greed. In my journey as an educator, I aspire to teach this theme to my students, that gratitude serves as an antidote to the destructive forces embodied by the Windigo.”

This statement demonstrates the ways in which Matthew developed a teaching identity rooted in environmental justice due to the influence of the novel *Braiding Sweetgrass*. In this statement, Matthew connects the concept of greed to capitalism, expresses how greed can be destructive to the environment, and further suggests gratitude as the antidote for greed. Matthew

then expresses his aspiration of becoming an educator that is environmentally socially just through adopting this lens into his teaching practice.

In addition to *Braiding Sweetgrass*, Matthew describes the ways in which the book *Teaching Agency for Equity* has influenced his teaching philosophy. Matthew states:

“At the center of my teaching philosophy is the importance of creating an authentic presence in the classroom. As written in *Teaching Agency for Equity*, “authentic presence possesses the transformative power to shift the teaching and learning dynamic, in this space, both the teacher and the students can experience the joy and awe of everyday discoveries”. Being an authentic presence in the classroom is crucial as how are we supposed to inspire and communicate purpose to students without being authentic.”

In these three statements, Priscilla and Matthew express the ways in which participating in this course, and further this teaching experiment, has influenced their emerging teaching identities and further demonstrated developing a teaching identity rooted in *conscientious engagement*. Priscilla expresses developing an orientation towards mindfulness and a desire to implement mindful practices within her classroom. Matthew experiences developing a teaching identity that values environmental social justice and authenticity. Mindful practices which tend to students’ wellness and environmental social justice are aspects of *conscientious engagement* that have the potential to promote equitable opportunities for *all* students.

In addition to participating in course practices and engaging in course materials, preservice teachers identities were also shaped in their teacher preparation program by their field experience and interactions with their host teachers.

Influences by host teachers during field placement. Teaching identities are understood as values that educators uphold within their classrooms. For the purposes of this study, this section discusses the ways in which preservice teachers’ emerging teaching identities are enacted through the process of developing lesson plans. This section will differ from the following

section that answers research question II. This section talks about influences in the process of developing lesson plans, while the next section that answers research question II, discusses the pedagogical practices that are upheld by preservice teachers when developing lesson plans. In this section, Priscilla, Michelle, and Matthew discuss the ways their host teachers have influenced their emerging teaching identities through the development of their lesson plans.

In the process of designing a lesson plan, Priscilla states that she was influenced by the suggestion of her host teacher in her field placement. Priscilla states:

“Putting the mental blueprint into written documentation when creating lesson plans frequently poses a cognitive challenge. Using a new lesson plan template presented an interesting new challenge for me. The selection of the 1920s as the central theme resulted from what my host teacher suggested I do.”

This statement expresses that Priscilla experienced difficulties in developing a lesson plan, and the guidance and support of her host teacher in her field placement proved to be influential.

Michelle experienced similar sentiments towards her host teacher when developing her lesson plans. Michelle says:

“I structured my lesson plans similar to my host teachers. We began the class with a quick review, then went into structured notes, and then went into practice problems. When observing my host teacher, I noticed that she used up every minute of her time wisely, and this meant that she has a set structure for her classroom. I tried to create that in my lesson plans by creating a similar routine each day for the students to follow.”

In this statement, Michelle expresses that her pedagogical practices were modeled after her host teacher based on her observations in her field placement. This statement suggests that Michelle’s emerging teaching identity values structure that was modeled by the pedagogical practices of her host teacher.

Similar to Michelle, Matthew also expressed the influence that his host teacher had on his teaching identity. Matthew further expresses similar sentiments to Priscilla and Michelle.

Matthew expressed that his approach to developing his lesson plans were inspired by his host teacher. Matthew states:

“In developing my lesson plans, I drew inspiration from Mrs. Campbell’s (my observation teacher) teaching style. Very similar to her lessons, I organized my lessons into sections, aligning with the structure previously discussed. Mrs. Johnson's emphasis on group work left an impression on me, influencing my decision to incorporate similar group work into my own lesson plans.”

Matthew further expresses:

“The structure of the lessons, in three sections shows the influence of Mrs. Campbell on my educational perspective. Mrs. Johnson has been an inspirational mentor for shaping my educational philosophy and I'm very grateful to have been given the opportunity to observe her class. My emphasis for group work is drawn from Mrs. Johnson's classroom. I have learned from her the importance of collaboration between students and teachers in the learning process.”

These statements made by Matthew expresses the influence that his host teacher had on his emerging teaching identity, and through his lesson plans aims to uphold values of collaboration.

Within these six statements, preservice teachers Michelle, Priscilla, and Matthew express the ways their experiences in their teacher preparation program has influenced their pedagogical approach, and the types of practices they aim to implement.

Overall, the first research question findings indicate that preservice teachers’ emerging teacher identities were influenced by their personal experiences as students, their experiences with teachers, experiences with their families, and experiences in their teacher preparation program. Preservice teachers Matthew and Priscilla expressed developing teaching identities that reflect aspects of *conscientious engagement*. In supporting preservice teachers as they develop their emerging teacher identities, teacher educators must consider preservice teachers’ past experiences and the ways in which these experiences have influenced their perspectives of

education. Through effective modeling and curriculum materials, teacher preparation programs and teacher educators have the ability to support and shape preservice teachers' emerging teaching identities. Furthermore, preservice teachers' who expressed having a teaching identity that was rooted towards social justice were influenced by their experiences as a student, with their teachers, and by their families.

Research Question II: Pedagogical Practices

- **Research Question II: In what ways does socioscientific issues-based curriculum support adolescent preservice teachers develop pedagogy that are aligned with environmental social justice?**

The second research question that is guiding this study was: In what ways does socioscientific issues-based curriculum support adolescent preservice teachers in developing pedagogy that is rooted in environmental social justice? After the intervention unit, preservice teachers were expected to submit a teaching portfolio in which they created their own learning unit that was composed of multiple lesson plans centered around one focus question. Due to the expectations outlined by the University's teacher preparation program, preservice teachers were not expected to teach their lesson plans, and instead submitted a written assessment that reflected on their process of developing their lesson plans. This second research question was answered by assessing preservice teachers' teaching portfolio.

Preservice teachers' teaching portfolio highlighted the pedagogical practices which they upheld. Pedagogical practices upheld by preservice teachers ranged between being consistent with the teaching identities and values expressed by preservice teachers, and being inconsistent.

This section is divided into two parts: (1) pedagogical practices are consistent with teaching identities, and (2) pedagogical practices are inconsistent with teaching identities.

Pedagogical Practices are Consistent with Teaching Identities

This section describes how preservice teachers Christopher and Matthew uphold pedagogical practices consistent with their emerging teaching identities.

When developing a lesson plan, Christopher expresses having a teaching identity that values respect and social justice. Christopher states:

“Throughout the unit, I tried to implement my teaching values of respect and social justice, because climate change is a social issue.”

This statement highlights the values that Christopher holds within high teaching identity and his desire to express those values when constructing a learning unit. Throughout his lesson plan, Christopher implements learning activities that reference societal issues around climate change and collaborative work that encourages students to explore strategies to address this environmental social injustice. As Christopher prepares a lesson plan, Christopher states:

“For the next 20 minutes read over and discuss a case study about deforestation and fossil fuel usage with the class as a whole. Once complete, have the students get back into the groups that they were in before. Have the students brainstorm strategies for climate change combat.”

Christopher further expresses that encouraging students to explore strategies to combat the climate crisis is a form of student empowerment and supports his value of meliorism.

Christopher states:

“Having the students come up with combat strategies promotes Meliorism, by making them put their ideas together to create a better solution to climate change”

The desire to create a lesson plan that promotes meliorism upholds values of collaboration and student empowerment. Furthermore, Christopher states:

“When creating this lesson, I wanted the students to think about what they could do for the earth. I want to promote the idea of reciprocity when talking with the students. [...]

The earth gives us everything we need but what do we do for the planet? I want the students to appreciate the Earth and maybe put the strategies they created to use.”

In addition to environmental social justice, Christopher also expresses a desire to tend to students’ wellness. Christopher states:

“I think that having the quick write in the beginning of class gives time for students to settle/tune in to what is going on in class. This is also time for students to ask me questions. I also use this time to have a wellness check with students and get a sense of how the class is feeling emotionally. Some of these quick write’s questions don’t always have to be about what we are learning in class. They can be self-reflection questions or questions regarding themselves in the future.”

The statements made by Christopher demonstrate an emerging teaching identity that values environmental social justice, collaboration, student empowerment, and wellness and mindfulness. As Christopher worked to structure his lesson plans, Christopher explained the ways in which his lesson plans reflect his values and the ways in which he plans to use his developing teacher agency as a way to uphold these values. Christopher’s pedagogical approach and teaching practices are consistent with his teaching identity and values. Aspects of *conscientious engagement* are reflected in Christopher’s pedagogical practices, including mindfulness and an orientation towards environment social justice reflects.

Similarly, Matthew expresses that his emerging teaching identity upholds values of diversity, equity and inclusion. As Matthew has developed his lesson plans, he identifies a potential equity gap in an activity. Matthew says:

“While I recognize the potential effectiveness of this activity, I am also aware of the potential challenges it could pose, particularly for students who face mobility difficulties. It’s important to acknowledge and address the needs of students, and I am committed to adapting lessons on the fly to ensure all activities are inclusive.”

Furthermore, as Matthew expresses the values he aims to uphold in his pedagogical practices, he also expresses how his lesson plans reflect these values. Matthew states:

“My teaching philosophy believes that education is a collaborative journey that empowers students and teachers to learn from each other. My lesson plans are designed to reflect this philosophy by incorporating group discussions and opportunities to learn and grow from each other. My emphasis on creating assessments that test how well students understand the material is further proof that education is a collaborative process that allows students and educators to learn from each other.”

In this statement, Matthew expresses that he values reciprocity and collaboration amongst students, and between students and teachers. Within his lesson plan, Matthew expresses implementing pedagogical practices, such as group discussion so that peers can work with one another, demonstrating collaboration. Additionally, Matthew believes that the development of assessments which examines students’ understandings, can be used to provide further insight of his teaching practices, demonstrating values of reciprocity between students and teachers. Both preservice teachers, Christopher and Matthew express the values that are reflected in their emerging teaching identities, and the ways in which their lesson plans are reflective of these values. The following section expresses the ways in which preservice teachers develop lesson plans that are inconsistent with the values that they have expressed within their emerging teaching identities.

Pedagogical Practices are Inconsistent with Teaching Identities

Throughout the course, preservice teachers described the values and aspirations they have as developing educators, however, for preservice teachers Johnathan, Priscilla, and Anthony, their pedagogical practices were irreflective of those values. Inconsistencies between preservice teachers' emerging teacher identities and their pedagogical practices can be attributed to resistance in implementing contemporary teaching methods that promote equity, and typically reflect conventional methods of instruction.

Preservice teachers Johnathan, Priscilla, and Anthony describe aspirations of incorporating equitable methods of instruction that are culturally meaningful, however the methods of instruction implemented within their lesson plans lack equity and cultural relevance.

When creating his lesson plans and reflecting on his methodologies Johnathan's perspective of equity referred to equality and was reinforced by an authoritarian form of teaching. During a class discussion, when asking about take-away ideas, Johnathan says:

“Just don't be a sense of authority. Have humility in the class - maybe adding comical aspects to the lessons, actually talk to the students and create a healthy relationship with them, try to find common interest, actually listen to what the students are saying/asking. Believe in them and show that you care about them.”

Johnathan expresses developing a teaching identity that values humility and establishing healthy relationships with his students. However, when developing a lesson plan, Johnathan utilizes phrases that express being an authority in the classroom, maintaining control of the students. Johnathan states:

“In my classroom, I will have a no cell phone policy. If I catch students on their phone during any part of the lessons besides the times they finish early, I will confiscate it and give it back once class is over”

In this statement, Johnathan refers to the classroom as “*my classroom*”, which places himself as the teacher at the center of the class. Johnathan then further addresses classroom policies that he aims to uphold and the repercussions that students will face if these policies are not followed. This pedagogical style reflects a sense of authority that is upheld by the teacher. As Johnathan continues to describe his lesson plans, Johnathan states:

“A lot of work in school is done on computers now, which makes it easy for students to play games. I understand that these students were easily distracted when doing computer work, so to deter students from using the computers inappropriately I will take away students' privilege of using the computer to do their work. For the group presentation, this would not be applicable, and students will lose credit on their project if they are

caught playing games. Since the project will be graded for the group as a whole, if one student is caught, all the students in the group will suffer”

In this statement, Johnathan once again describes the behavioral policies that he aims to uphold as a teacher, and describes the repercussions students will face when they do not adhere to his classroom policies. Although Johnathan expresses a teaching identity that values humility, and not being a sense of authority, Johnathan’s pedagogical practices reinforce his position as a teacher as a sense of authority in the classroom.

In reference to establishing a teaching identity that values the development of healthy relationships with his students, Johnathan states that he aims to implement trust within his classroom. However, his perspectives of trust are used to further exert control and maintain authority over his students. In Johnathan’s teaching portfolio he states:

“In all my lessons, I envelop the idea of trust. I do so by letting the students work on their computer for much of the work. The trust I am trying to establish is that the students will do the work they need to do on computers and not go to other sites/games. I make it very clear that there will be some sort of punishment if the students break my trust.”

Furthermore, this idea of weaponizing trust to gain control is again mentioned in the following statement. Johnathan says:

“I believe that the students will work in groups they are most comfortable with, and again am instilling trust in them to get their work done even though they are working with their friends. If I catch students using the computers for different work, I will take the student’s computer away, forcing them to look on with the other students in their group.”

Although Johnathan expresses developing a teaching identity that values humility and healthy student-teacher relationships, these two statements however further reinforce Johnathan’s sense of authority in the classroom, and his approach towards establishing trust within the class is utilized to uphold Johnathan’s authority as a teacher.

In another case, when Johnathan was asked about his beliefs towards the purpose of education, Johnathan makes two statements that center the teacher as the sole-owner of knowledge within the classroom. In the beginning of the course, Johnathan initially states:

“[the purpose of education] is to teach knowledge that is unknown to people who have little to no knowledge”.

By the end of the course, Johnathan mentions:

“I cannot wait until I am a teacher and can spread all my knowledge to the youth.”

In these statements made by Johnathan, Johnathan's perspective towards education is teacher-centered, and although Johnathan expresses developing a teaching identity that values humility, there is no change in Johnathan's perspective towards education that exemplifies that.

Additionally, when discussing final take-aways from the course, Johnathan states:

“giving back to the land and respecting it.”

However, Johnathan's lesson plans do not reflect any aspect of environmental sustainability.

Overall, Johnathan expresses a teaching identity that reflects values aligned with *conscientious engagement*, including equity, environmental sustainability, humility as an educator, and developing healthy student-teacher relationships. However, Johnathan's pedagogical practices are inconsistent with values that he expresses through implementing conventional methods of instruction. Johnathan expresses that he hopes to build trust amongst his students but demonstrates challenges in shifting his perspective from the teacher's role in the classroom being a source authority and control and further punishing students when they are non-compliant, to one that has mutual trust and reciprocity with students. Although Johnathan expresses having a teaching identity whose values are aligned with the framework of

conscientious engagement, his pedagogical practices and perspectives are not aligned with the framework of *conscientious engagement*.

In addition to Johnathan, Priscilla's pedagogical practices are also inconsistent with the values expressed within her teaching identity. When discussing varying cultures and beliefs in class, Priscilla acknowledges the lack of diversity and meaningful content that relates to students' lives. Priscilla mentions:

“we didn't learn about indigenous living in schools. We were taught about Christianity, Islams, but not other religions and cultures.”

In this statement, Priscilla acknowledges the lack of cultural diversity within educational curricula. Further, Priscilla expresses her beliefs in the importance of having awareness of current events. Priscilla states:

“I also believe that it is very important that students understand current events and what is going on with society.”

Both of these statements made by Priscilla imply that Priscilla values cultural diversity within the curricula and that students should be made aware of societal issues. However, when given the opportunity to develop her own lesson plan, the content that Priscilla chose further lacked meaningful connections. With the suggestion of her host teacher, Priscilla opted to focus on *the Great Gatsby*, a novel written by F. Scott Fitzgerald which centers the lives of wealthy White Americans during the roaring 20's. Priscilla states:

“Fitzgerald's "The Great Gatsby," which is studied in conjunction with a more comprehensive examination of US history, is one of the core texts in the eleventh-grade ELA curriculum in New York State. I created a thorough unit that integrates the novel's themes with the 1920s historical setting in order to improve students' understanding of the work.”

Priscilla's lesson plan was intended to be implemented in an ELA course for ESL students. Priscilla's first two statements stress the importance of cultural inclusion and current

events in a classroom setting. However, when developing a lesson plan, Maria's lesson plan is based on a fictional novel that centers the lives of wealthy White American class and does not reflect the various cultural identities of the students within her observation class nor does it include culturally meaningful content. It is important to note that Priscilla expresses that her lesson plans were made from the suggestions of her host teacher.

Like Priscilla, Anthony expresses aspirations of developing lesson plans in which the mathematical content that students are learning is culturally relevant and meaningful to the personal lives of his students. Anthony states:

"I do not want to be the typical math teacher where students come in, complain about math they will never use, and just leave without learning anything."

Although in this statement, Anthony expresses desires of developing pedagogy that is relevant to the lives of students, when given the opportunity to develop a lesson plan, Anthony chose the topic of conversions and utilized soda cans as the relevant topic. Anthony states:

"Units and their conversions are a topic that students can see in their everyday lives more often than other topics that are in Algebra I."

Anthony then continues to say:

"For the first standard, the students would determine that they need to round to 100 cans of soda, and by the second standard, students would have to find how many cases they would need to buy given the number of cans in one case."

Although Anthony expresses the desire of developing classroom content that students will find relatable to their lives, the content he chose has a shallow level of relatability, and does not portray deep meaningful relevance to the lives of the students. His method of instruction incorporates repetitive practices that are often utilized in mathematics and is void of meaningful content. Although he aspires to implement contemporary pedagogical practices that incorporate cultural relevancy, Anthony expresses that that is not possible in a mathematics class. Anthony states:

“When a class like English discusses a topic students find interest in, the students “[are] all genuinely engaged and interested in what [they are] reading,” (Delpit, 2021, p.210). While it is easier to incorporate engaging content into an English class because you can diversify the authors of the literature and course content, it is not unmanageable to be completed in a math class.”

Within these scenarios, the teaching identities expressed by Johnathan, Priscilla, and Anthony, are inconsistent with their pedagogical practices. The lesson plans developed by Johnathan, Priscilla, and Anthony reflect pedagogical practices reflecting conventional methods of instruction.

Overall, preservice teachers express teaching identities that align with values including equity, inclusion, environmental social justice, humility, and cultural relevance. However, preservice teachers were more likely to implement pedagogical methods that were reflective of conventional methods of instruction and did not align with their teaching identities. Two preservice teachers whose content specialty was science expressed having a teaching identity that valued environmental social justice, and further developed lesson plans that were aligned with those values.

The next section, Growth as a Preservice Teacher, highlights findings that extend beyond the research questions identified in this research study.

Growth as a Preservice Teacher: Additional Findings

Over the duration of the course, preservice teachers exhibited growth within their teaching identities and pedagogical practices. Themes of growth conveyed in this section include (1) shifts in perspectives, (2) aspirations as an educator, and (3) an orientation towards environmental sustainability.

Shifts in Perspectives

Over the duration of this course, preservice teacher Johnathan expressed a shift in his perspective regarding cultural sensitivity. In the beginning of the course, Johnathan made three comments that were culturally insensitive.

The first comment made by Johnathan was in reference to the character Eva Benitez from the movie *Freedom Writers*. In *Freedom Writers*, when the teacher, Ms. Gruwell, incorrectly pronounced Eva's name, Eva corrected her teacher and said "It's Eva, with an A". Later in the movie, when a school administrator incorrectly pronounced Eva's name, Ms. Gruwell corrected him, demonstrating that she listened to her students and respected her students' cultural identities. During class discussion, Johnathan refers to a scene with Eva and says:

"Eva, Eva or whatever".

Johnathan was not considerate of the correct pronunciation of a Latina name, and therefore dismissed it, although this was a key component in the movie. In a later class, when talking about industrialization in Syracuse City and the ways in which the development of a city negatively impacted indigenous community of Syracuse and the environment, Johnathan followed up with the statement:

"but we can't all live in tipis".

This statement made by Johnathan demonstrates a disregard to the knowledge and cultural practices upheld by the indigenous community that occupied Syracuse City prior to colonization, and further minimizes their ways of living

The third statement Johnathan made referred to his experience in his field placement. In his field placement he observed a classroom that had international students who were English Language Learners. When sharing his experience, Johnathan states:

"they spoke Swahili, I don't even know what country they speak Swahili in."

In following up with that statement, Johnathan expressed that he did not take the initiative to do further research on the students' country of origin, because he did not have the time and eventually forgot. This statement made by Johnathan exemplifies a lack of cultural awareness and further demonstrates that it was not a priority of Johnathan to learn about the lives of culturally and linguistically diverse students.

Although the three statements made by Johnathan were culturally insensitive, by the end of the teaching experiment, Johnathan made 3 statements that exemplified a shift in his perspective towards a lens that is more culturally sensitive. When discussing his field placement, Johnathan expressed that he heard two students speaking, and asked them what language they were speaking. Johnathan says:

“Is it okay to ask someone what language they are speaking? Because I heard two students speaking and when I asked them, they gave me a look.”

In this statement, Johnathan expresses interest in gaining more knowledge about culturally and linguistically diverse students but is unsure of how to appropriately engage.

The next two comments that exemplify a shift in Johnathan's perspective is in regards to the book *Braiding Sweetgrass* by Robin Wall Kimmerer. When discussing the book in class, Johnathan describes the practices of the Potawatomi Nation regarding the Cedar tree. Johnathan states:

“Cedars, they considered it a gift, although it was just a tree, it's bad to say just a tree because it's taking away from the fact that this tree provided them with food, shelter, and clothes.”

When talking about the cultural practices of the Potawatomi Nation regarding the cedar tree, Johnathan catches the moment where he minimizes the practices of the Potawatomi Nation, and then expresses the reasons why Cedar tree was highly respected and valued. Correcting

himself when describing the cultural practices and values of the Potawatomi Nation demonstrates respect, and further exemplifies a shift towards cultural sensitivity.

In addition to demonstrating respect to the cultural practices and values upheld by the Potawatomi Nation, Johnathan made a third comment that reflects a shift in his cultural sensitivity. When discussing the book *Braiding Sweetgrass* with his peers, he has trouble pronouncing the name *Haudenosaunee*. Instead of disregarding the name he asks:

“How do you pronounce-, *Hau-de-no-sau-nee*? Haudenosaunee.”

In contrast to disregarding the pronunciation of one’s cultural name, this comment reflects a shift in Johnathan’s perspective of respect and how he demonstrates respect by asking for the correct pronunciation of a cultural name, and then correctly saying that name.

This shift in perspective demonstrates that in the beginning of the course, respecting cultural differences may not have been of high value in Johnathan’s teaching identity, however of this teaching experiment, Johnathan has recognized that demonstrating respect for cultural differences is valuable when aiming to achieve equity within the classroom. It is important to note that the trajectory of Johnathan’s shift in perspective towards cultural sensitivity did not happen directly after the intervention, but instead was gradual over time. In addition to demonstrating a shift in perspectives, adolescent preservice teachers also expressed their aspirations as a teacher.

Aspirations as a Teacher

As Michelle developed her teaching portfolio she expresses the desire to incorporate teaching methods that are reflective of students’ lives and and further incorporate societal issues.

Michelle states:

“I want my students to have respect for one another, treat each other with kindness, be able to express their freedoms and talk about pressing matters when it is appropriate to do

so. I do not want my classroom to be curriculum 24/7 with no time for real world conversations. My students are not robots walking into my classroom to do math for 40 minutes straight, they are real people and so am I.”

Michelle expresses the desire to create a classroom culture that is founded on respect and incorporates culturally meaningful content reflective of societal issues. However, based on this statement, Michelle suggests that there is no connection between the curriculum and the real-world, and does not recognize that she could teach mathematics in a socially and culturally relevant way by utilizing and implementing contemporary methods of instruction. When developing her teaching portfolio, Michelle’s lesson plans were reflective of conventional methods of mathematics instruction that focused on incorporating drill practices that promoted memorization. Michelle states:

“I will teach the students using a powerpoint presentation for the first 15 minutes of class, and then the students will work in small groups to complete a set of worksheets that I hand out to practice what we just learned. By the end of the period the students should be able to identify and name angles and be able to recognize the different triangles on their own.”

This statement addresses the methods of instruction that Michelle aims to include in her pedagogical practice. However, Michelle expresses being aware of the disconnect between her emerging teaching identity and values and the pedagogical practices included in her teaching portfolio. Michelle attributes the challenges that she has faced in developing lessons plans to her lack of experience. Michelle says:

“The main challenge I faced when developing my lesson plans was lack of experience. Before this assignment, I had only written two lesson plans, so I do not have much experience or knowledge in the field.”

Although Michelle expressed having difficulty in developing lesson plans, Michelle then expresses her future plans as an educator, saying:

“Students being able to express their freedoms and talk about pressing matters is a little challenging to build into a lesson plan, but I still plan to include them in my classroom.”

In the sequence of statements made by Michelle, Michelle expresses having a teaching identity that values respect and social justice. However, due to a lack of experience, Michelle's pedagogical practices were not consistent with her emerging teaching identity, and did not see mathematics as culturally relevant. Ultimately, Michelle's lesson plans did not include instruction that were reflective of the lives of students. Michelle was able to recognize the inconsistency between her teaching values and pedagogical methods, in turn, Michelle was intentional about expressing the ways in which she aims to grow as an educator, through the desire to implement methods of instruction that were social just and incorporated societal issues. Michelle can benefit from having more opportunities to learn about culturally relevant methods of mathematics instruction.

Environmental sustainability

While Johnathan's growth reflected a shift in his perspective towards one that was culturally sensitive, and Michelle's growth reflected her aspirations as an educator, Matthew's growth reflects the ways in which he developed a lens towards environmental sustainability. When engaging in the socioscientific based learning unit, Matthew questioned the value of environmentally sustainable practices. On day 3 of the socioscientific learning unit, preservice teachers completed a worksheet in which they utilized data collected from a local initiative, explored the impact of this initiative within the community, and ended with a class discussion. During this discussion Matthew questions:

“It works, but is it worth the maintenance?”

This statement made by Matthew questions the perceived value of implementing environmentally sustainable practices and wonders whether it is worth the monetary investment.

However, by the end of the course, Matthew expresses that he aims to instill gratitude within his pedagogical practices as a way to address issues of environmental social justice. Matthew states:

“In my journey as an educator, I aspire to teach this theme to my students, that gratitude serves as an antidote to the destructive forces embodied by *Windigo*.”

Although Matthew initially questioned the value of environmental sustainability,

Matthew’s perception of environmental sustainability shifted in such a way that he believed it was important to adopt within his teaching identity. Matthew further elaborates:

“You gotta be mindful about the planet, the consequences on the land and for the people who use that land, and how eventually it affects everyone.”

Not only did Matthew express developing a teaching identity that values environmental sustainability, in this statement, Matthew identifies that environmental injustices are also a social injustice. This statement suggests that Matthew has an awareness of environmental social justice and the ways in which recognizing one’s relationship to their environment is a form of respect for one’s culture and recognizing the larger implications of environmental social justices.

Over the duration of this teaching experiment, Matthew has grown to value environmental social justice, and aims to implement teaching a teaching lens that aligns with environmental sustainability. Overall, Matthew’s perspective on teaching for environmental social justice widen, as first he questioned the value of the construction and maintenance of an environmental social justice initiative, to then expressing the need to respect the land and those who inhabit it. The widening in Matthew’s perspective is thus reflected in his teaching identity as he discusses the desire to implement a teaching framework that centers gratitude. Furthermore, Matthew’s his pedagogical practices were consistent with his teaching identity and reflected this shift in his perspective towards one that values environmental social justice through the development of a learning unit that centers climate change, natural disasters, and human impact.

Chapter Summary

In this chapter, I highlighted the findings of the two research questions that guided this teaching experiment. During this process, it was revealed that preservice teachers' emerging teaching identities are influenced by their experiences within the academic journey, including personal experiences as a student, experiences with teachers, experiences within their family influences, as well experiences within their teacher preparation program. Although preservice teachers' emergent teaching identities are influenced by their past experiences, teaching identities are flexible and teacher preparation programs have the opportunity to support preservice teacher in developing teaching identities that are rooted towards environmental social justice. However, for preservice teachers require guidance and additional support in developing pedagogical practices that do not uphold the status quo through conventional methods of instruction, and instead promote environmental social justice. Overall, participants in this study who had a disciplinary background in science were more likely to develop teaching identities and pedagogical practices that aligned with environmental sustainability.

In Chapter 5, I overview the findings presented in this teaching experiment, and further discuss the implications that are presented by the findings in this study as well as potential limitations.

Chapter V: Conclusion

Chapter Overview

This dissertation study is a teaching experiment that explores the ways secondary preservice teachers of various disciplines developed teaching identities and pedagogical practices after engaging in a teacher preparation course that was oriented towards environmental social justice. The course in which this study was carried out was designed and taught by myself. I utilized the frameworks of *conscientious engagement* to support my own teaching identity throughout the course, and using the frameworks of *socioscientific issues-based curricula* I designed an intervention learning activity that participants engaged with. The intervention learning unit was administered half-way through the semester. As part of the teaching experiment, I explored preservice teachers' emergent teaching identities over the duration of the course, and then explored their pedagogical practices as the end of the course. Understanding the development process of preservice teachers' emerging teaching identities and pedagogical practices is important for emerging and practicing teachers, teacher educators, and teacher preparation programs, in ensuring that the goals of K-12 education, teacher preparation programs, and teacher educator are effectively achieved. The information revealed in this study can be used with subsequent courses in teacher preparation, such as teaching methods, and further explored by teacher preparation programs.

Research Question I: Findings

In analyzing the processes in which preservice teachers developed their teaching identities and pedagogical practices, this teaching experiment answered two research questions. The first research question explored the ways preservice teachers developed their teaching identities, including the values and aspirations that they upheld as emerging educators and

influences and experiences that shaped these values and aspirations. As I developed this teaching experiment, I was initially curious in exploring ways to support adolescence preservice teachers develop teaching identities that were oriented towards environmental social justice, but first I had to explore the ways teaching identities were formed and their influences to therefore provide experiences that support and reinforce this emerging identity.

Overall, adolescent preservice teachers' teaching identities were greatly influenced by their experiences with their families, experiences in school, and experiences within their teaching programs. Adolescent preservice teachers are more inclined to repeat and perpetuate ideologies that they've gained about education from their own personal experiences. Participants in this teaching experiment had little experience with socioscientific issues-based curricula, and the values that participants expressed as part of their teaching identities in the beginning of this teaching experiment did not align with environmental social justice.

This teaching experiment then focused on the teaching values that participants expressed by the end of the course. Preservice teachers Matthew, Johnathan, and Christopher did develop teaching identities rooted in environmental social justice; however, they were also preservice science teachers. I believe incorporating a socioscientific issues-based learning unit within this teaching experiment reinforced preconceived ideas about science teaching that were held by Matthew, Johnathan, and Christopher. Additionally, this socioscientific based learning unit provided Matthew, Johnathan, and Christopher with ways to make science learning culturally relevant, engaging, accessible and equitable by exemplifying ways to science content with societal implications.

Not all participants developed teachings identities aligned with environmental social justice. Priscilla, Michelle, and Anthony all expressed having a teaching identity that aligns with

social justice and aims to promote equity. One potential reason that these participants did not develop a teaching identity that aligns with environmental social justice is because there was not explicit instruction or connection between the ways in which environmental social justice can be instilled in various disciplines to promote equitable opportunities in education.

My initial conjecture was that adolescent preservice teachers have not have many experiences engaging in learning material SSI based learning units, or teaching identities that aligned with environmental social justice. Additionally, I expected that if there were any participants who did have an orientation for environmental social justice, it would be preservice adolescent teacher whose teaching discipline was in the science. Additionally, I expected that if preservice adolescent teachers had a teaching identity that closely aligned with environmental social justice, they would identify as a member of a historically marginalized group.

Findings from research question I support my initial conjecture. I expected that the participants teaching identities and subsequent values would reflect their personal lives and experiences. Participants who held values aligned with environmental social justice had backgrounds in science disciplines. Participants who did not develop a teaching identity in environmental social justice had academic backgrounds in ELA and mathematic disciplines.

Research Question II: Findings

The second research question focused on preservice teachers' pedagogical practices and the ways in which their teaching identities are reflected in their methods of instruction, or not. Pedagogical practices can be perceived as an enactment of one's teaching identity (Hui Lin Lee, 2022). In the development of this teaching experiment, my initial conjecture was that preservice

teachers would implement pedagogical practices that reflected their teaching identities and aspects of instruction that were modeled throughout this course.

Reflected in the findings of research question I, three of the research participants, Matthew Christopher, and Johnathan, who were all adolescent preservice science teachers developed a teaching identity whose values aligned with environmental social justice. Of these three preservice teachers, Matthew and Christopher further implemented pedagogical practices that were oriented towards environmental social justice, while Johnathan opted for more conventional methods of instructions that did not align with environmental social justice.

In their teaching portfolios, Matthew and Christopher developed lesson plans to teach science in ways that centered around societal issues. Centering societal issues in the context of science aligns with frameworks of socioscientific issues-based curricula, and thus demonstrates an orientation towards environmental social justice. Johnathan's teaching portfolio implemented pedagogical practices that aligned with conventional methods of science instruction, and classroom management practices that limit access to equitable learning opportunities. Though Johnathan expressed a teaching identity that aligned with environmental social justice, his pedagogical practices were inconsistent with those values of environmental social justice. One potential reason that Johnathan's pedagogical practice did not reflect aspects of environmental social justice is because the course was not designed to teach methods of instruction, therefore Johnathan never received explicit guidance as to how to develop lesson plans in ways that do align with environmental social justice. Also, Johnathan resisted implementing contemporary instruction methods that aligned with some of his teaching values. One potential reason for this resistance can be due to the likelihood of repeating what he has seen teachers do in their teaching practices.

In addition to Johnathan, participants Michelle, Anthony, and Priscilla also implemented pedagogical practices that were not aligned to environmental social justice and utilized conventional methods of instruction. Priscilla and Anthony incorporated lesson plans that were not culturally relevant and did not provide equitable opportunities to learn. Although Michelle's lesson plan was also not culturally relevant, Michelle expressed having the desire to develop lesson plans that did incorporate societal issues. One potential reason that Michelle, Anthony, and Priscilla did not implement a lesson plan that was culturally relevant and lacked contemporary methods of instruction is because this course did not explicitly teach methods of instruction. Therefore, preservice teachers implemented pedagogical practices that they were familiar with. Additionally, Michelle and Anthony are preservice mathematic teachers and Priscilla is a preservice ELA teacher. Another potential reason that these three participants did not implement pedagogical practices that aligned with environmental social justice or implement contemporary methods of instruction is the intervention, the SSI based learning unit, did not reflect ways to explicitly connect their disciplinary content with societal issues and cultural relevancy.

In addition to developing teaching identities and pedagogical practices that aligned with environmental social justice, Christopher and Priscilla expressed developing a teaching identity that aligned with *conscientious engagement*. Christopher and Priscilla expressed valuing mindful practices that I implemented throughout the course, and desired implementing their own mindful practice within their classrooms. Furthermore, in Christopher's teaching portfolio, his lesson plans include time to check-in with his students, exemplifying the mindful practices that he aspires to implement in his pedagogical practices. Christopher and Priscilla demonstrate ways in which preservice teachers adopt, adapt, and implement teaching identities and pedagogical

practices that they resonate with. Although the teaching experiment did not intentionally promote *conscientious engagement*, it was through my pedagogical practices and their engagement with the course that Christopher and Priscilla developed an orientation towards *conscientious engagement*. This further exemplifies the ways in which teacher preparation course can foster unique experiences that further supports preservice teachers in developing their teaching identities and pedagogical practices.

Overall, the goal of this study was to explore the ways preservice teachers develop teaching identities and implement pedagogical practices to further understand how to design curricula align with contemporary methods of teaching for the 21st century. Historically and consistently, the intention of American education has been to promote civic engagement. However, the meanings and expectations of civic engagement has shifted in the twenty-first century, and therefore educational methods of teaching must shift as well. Teaching identities and pedagogical practices, however, are commonly a reenactment of the teaching identities and pedagogical practices of practicing teachers that preservice teachers have observed throughout their educational journey. In order to shift the status quo and effectively prepare students of the twenty-first century for civic engagement, preservice teachers must first be equipped with the skills and resources needed to teach for the twenty-first century.

Limitations

Differing limitations impede the generalizability of this teaching experiment. The first limitation of this teaching experiment is reflected in a small sample size of the study which then limits diversity. This teaching experiment was conducted in a teacher preparation course at a medium-sized public university in Central New York. 12 preservice teachers completed the course, and of the 12 preservice teachers, 6 preservice teachers agreed to participate in this

teaching experiment. Of the 6 participating preservice teachers, 4 of them were males and 2 of them were females. Furthermore, of the 6 participating preservice teachers, 5 of them identified as White American, while 1 identified as a person of Color, being of Brazilian descent. This presents a lack of gender diversity, as well as cultural and linguistic diversity within this study.

The second limitation of this study is reflected in the possibility that many students complete work in a way that caters to the teachers' expectations. In this study, preservice teachers were aware of my passion towards environmental social justice and may have oriented some of their answers to reflect my expectations as opposed to providing their authentic answers.

Additional limitations to this teaching experiment are reflected in the implementation of the intervention unit. The socioscientific issues-based learning unit was the intervention that was implemented in this teaching experiment. When this learning unit was first designed, it was intended to be taught in a high school science course for one week. This creates three limitations. The first limitation created by the implementation of the learning unit is that the learning content leaned more towards science content, potentially posing a bias that favored participants whose disciplinary backgrounds are rooted in science. The second limitation that this implementation of this intervention study has to do with the delivery of this learning unit. This learning unit was intended to be delivered across 5 consecutive days, however because of the scheduling of this course, this learning unit was instead delivered across 4 lessons, once a week for four consecutive weeks. Preservice teachers expressed feeling as if the intervention unit was too long and experienced fatigue. This may have caused participants to become disengaged with the intervention study. Lastly, participants in this teaching experiment were college-level preservice teachers, but the learning content was designed for secondary students. This presents a potential

limitation because some participants may have advanced knowledge within the content and therefore not fully engage with the intervention unit from the perspective of a learner.

Overall, although limitations within this study hinder the generalizability of this study, emergent findings present opportunities for teacher educators to develop curricula that caters towards educational goals for the twenty-first century.

Implications

Findings of this study provide further insight for various stakeholders within the field of education, including areas for potential for future research and implications for teacher educators.

Implications for Future Research

This study explored ways in which preservice teachers developed teaching identities and pedagogical practices without guidance on ways in which instructional methods should be enacted within a classroom setting. This study revealed ways in which preservice teachers tend to perpetuate conventional methods of instruction that were observed during their own educational journey, even if they do not align with their teaching identities. Participants in this study did not receive direction on ways to develop contemporary methods of instruction and implement them within their pedagogical practices. Potential areas for future studies include the implementation of a variation of this study within a methods course to explore how preservice teachers of various disciplines develop pedagogical practices that are contemporary and transformative in practice and tend to issues of the twenty-first century. This study revealed that preservice science teachers were more likely to implement pedagogical practices that tended to issues of the twenty-first century via environmental social justice. However, this poses the

question as to whether preservice teachers of other disciplines would incorporate contemporary instruction that tends to issues of the twenty-first century when explicitly exposed to contemporary methods of instruction.

Additional areas for future research include longitudinal studies that track preservice teachers across their teacher preparation experience through their initial years as practicing teachers. A longitudinal study has the potential to reveal the practices that were most influential in preservice teachers' teacher preparation programs and factors that either perpetuate or dissuade novice teachers from implementing contemporary methods of instruction that were introduced during their teacher preparation experience. This study revealed that without explicit instruction, preservice teachers are more likely to repeat instructional methods that they have observed even when they do not align with their teaching identities. However, it would be useful to explore preservice teachers' pedagogical practices that are enacted once they become professional educators.

Further implications for research include collaborative opportunities for teacher educators of various disciplinary backgrounds. This intervention study was initially designed for by science educators for science learners, however this may pose a bias for science content. Collaborating with teacher educators of different disciplinary background provides the opportunity to remove biases and explore the ways in which socioscientific curricula can be implemented to promote environmental social justice within teacher preparation courses.

Implications for Teacher Educators

In the field of teacher education, teacher educators tend to create curricula reflective of their personal teaching goals and practices. This study revealed that although teacher educators

have a desired outcome for their preservice teachers, preservice teachers tend to reenact methods of instruction that they have encountered throughout their own educational journey. If teacher educators are to incorporate methods of instruction that go beyond conventional methods and address issues of the twenty-first century via contemporary methods of instruction, then teacher educators must then be conscientious of the prior experiences and perspectives about education that preservice teachers enter the classroom with. With this understanding, teacher educators can develop curricula that assist preservice teachers in identifying limiting biases and beliefs within their pedagogical practices, and further support them in developing instructional methods that cater towards the needs of twenty-first century education.

Chapter Summary

In this study, I implemented a teaching experiment that sought to explore the development of preservice teachers' teaching identities and their pedagogical practices. This teaching experiment incorporated a learning unit that was oriented towards environmental social justice and modeled a contemporary method of instruction. This study revealed that preservice teachers had teaching identities that included values such as equity, respect, and social justice which were influenced by various experiences throughout their personal and academic lives. However, preservice teachers' pedagogical practices were not always reflective their teaching identities and values. These findings then pose questions including 1. what kinds of experiences must preservice teachers have to develop pedagogical practices that are aligned with their emerging teaching identities and subsequent values?, 2. How can teacher preparation programs support preservice teachers of all disciplines to implement contemporary methods of instruction that tends to the needs of the twenty-first century education? 3. In what ways can teacher educators develop curricula that provide preservice teachers with learning opportunities that

support the implementation of contemporary methods of instruction? And 4. How can teacher education be positioned with field experiences to support the development of preservice teachers' teaching identities and pedagogical practices? These questions have implications for the trajectory of teacher education programs and the curricula developed and implemented by teacher educators. In all, the field of education expresses aspirations to achieve learning outcomes designed to address the needs of the twenty-first century. However, to achieve learning outcomes aligned with the needs of the twenty-first century, pedagogical practices and methods of instruction must shift to match those intentions. Contemporary methods of instruction that address societal needs of the twenty-first century are not intuitive for preservice educators, and therefore require intentionality and support of teacher educators as well as teacher education programs.

Appendix A

Green Roofs Unit: Socioscientific Issues-based learning unit

The implementation of this learning unit is part of a pilot study conducted by Dr. Cliff Ian Davidson in connection with the Save-the-Rain Program in Onondaga County. The pilot study included the development and administration of a learning unit that educates learners about the construction of a local green roof. Since the initial development of this learning unit, there have been five iterations of the lesson plan. The following sections walk through the different iterations of this learning unit, the changes made to the learning unit, and the current iteration of the learning unit.

Iterations of the Learning Unit

Since beginning this pilot study, there have been 2 iterations of the learning unit with 2 phases each iteration, the lesson planning phase, and the enactment phase. The first version of this unit was developed by Dr. Cliff Ian Davidson and Elizabeth Cultra. When I joined the team, I modified the lesson plan using the framework of socioscientific issues-based curriculum (Zeidler, et al, 2005), with the intention of implementing contemporary forms of instruction that were culturally relevant through explicit correlations between the learning content and the societal implications. This was the first phase of the first iteration.

Iteration One. The design of the first iteration focuses on the ways industrialization has led to flooding and sewage pollution within the local community. The design of the first iteration is intended to help students foster a deeper understanding of the water cycle, its connection to the green roof, and the importance of environmentally sustainable technology. The first final version

of the lesson plan was edited and negotiated between Dr. Davidson, Elizabeth and me, and then enacted in a social studies course at a local urban secondary school.

Changes within this lesson plan included a reduction in amount of scientific content that students were responsible for learning, and the amount of learning activities that students were responsible for completing. A reduction in the amount of science concepts that students were expected to know was designed to help deepen students' knowledge, rather than promoting a shallow understanding of many science concepts. Further changes incorporated into the second iteration of the learning unit included the completion of three interrelated learning activities that were to be completed during the execution of this unit, as opposed to 5 separate activities. Three learning activities that produced student work included (1) the development of a scientific model of the water cycle, (2) a data analysis worksheet activity, and (3) a written assessment.

The enactment of the lesson plan with secondary social studies students served as the second phase of the first iteration of this pilot study. During this iteration of the pilot study, students were able to demonstrate a conceptual understanding of how green roofs work in relation to the water cycle. However, the primary mode of data collection was in the form of minute notes gathered by observers who were watching the lesson.

Iteration Two. The second iteration of this pilot study was carried out in a college level course with preservice science teachers. The second iteration of this lesson plan was modified for learners' schedules, and the content in which they were responsible for learning.

The second iteration served to act as a model for ways socioscientific issues-based curricula can be implemented within a science classroom to promote equitable and contemporary

methods of instruction that align environmental social justice and teaching for the twenty-first century.

Iteration two of this pilot study revealed the ways in which preservice science teachers are willing to adopt and implement contemporary methods of instruction, however, require more practice and experience to ensure that their methods of instruction align with newly implement Next Generation Science Standards and New York State K-12 Science Learning Standards.

Current Iteration of Learning Unit. The current iteration of this learning unit refers to the version of this unit that is intended to be implemented during this teaching experiment. This current iteration aims to provide adolescent preservice teachers of various disciplines with the opportunity to engage in a socioscientific issues-based learning unit and explore ways to support the development of their teaching identity and pedagogical practices in ways that are aligned with environmental social justice.

The current iteration is a teaching experiment and will open with a pre-unit questionnaire that is intended to capture adolescent preservice teachers' initial thoughts, feelings, and understanding of education and their role as educators, as well as the standards that are implemented within their discipline. This questionnaire will be administered and discussed prior to beginning the interdisciplinary SSI learning unit.

The learning unit is implemented in class during weeks 5, 6, 7, and 8. Within the learning unit, there are four different learning activities that are based the framework of socioscientific issues-based learning (Zeidler et al., 2005). Learning activities embedded in this socioscientific learning unit include: (1) reading media that addresses a local societal issue that is scientific in nature, (2) development a conceptual scientific model that demonstrates their understanding of a scientific phenomenon, (3) a data analysis activity, and (4) a written assessment (or a group

presentation). It is important to note that for purposes of this teaching experiment, I am not assessing adolescent preservice teachers' content knowledge or performance of the activities, but rather, I am exploring the influence that engaging in this socioscientific learning has on the development of adolescent preservice teachers' teaching identities and perspective on pedagogy.

Since this is a teaching experiment that aims to study the influences of adolescent preservice teachers' teaching identities and their pedagogical practices, the data that is to be collected for this teaching experiment, do not reflect the activities within the unit, but rather over the duration of the semester, including: (1) a pre-unit questionnaire, (2) mid-term assignment, (3) final assessment, (4) final discussion questionnaire, and (5) researcher field notes, and (5) ethnographic notes.

Appendix B: Course Syllabus
State University of New York at Cortland
AED 391/- Introduction to Adolescent Education

Fall 2023, Bowers Hall, Rm 1119

Wednesday, 4:20 - 6:50 PM

Lecture Instructor Information:

Instructor Tiffany Hamm, M.S. Ed

Department of Geology

Office: Bowers 1013

Email: Tiffany.Hamm@cortland.edu

Office hours: Tues 1:00 PM - 3:00 PM or by appointment

Course Website: Announcements and course materials will be posted to **BrightSpace**.

Catalog description: Students will develop a coherent and comprehensive personal educational philosophy; analyze the role of education and teachers in society; demonstrate an understanding of teacher certification standards and requirements; evaluate teaching, lesson planning and implementation and cooperative skills; and develop a portfolio. The course includes 25 hours of field observation/teaching experience. (3 cr. hr.)

Course Goals

Preservice teachers will develop teaching identities and pedagogy that is oriented towards providing opportunities for adolescent students across *all* sociocultural backgrounds to learn through equity, inclusion, and social justice.

Student Learning Outcomes: Upon successful completion of this course, students will be able to:

- 1) Develop a teaching philosophy that reflects preservice teachers personal and professional values that they aim to bring into the classroom.
- 2) Create, develop and modify curriculum in ways that promote equitable learning outcomes for students across *all* sociocultural backgrounds.

Purpose of the AED 391

This course has been designed specifically for adolescence education majors. This course will explore theme of education, values, and social justice in efforts to promote education equitable, transformative, and culturally relevant.

This course requires that you attend lecture, participate in classroom discourse, and submit assignments in a timely manner.

AED 391 Lab:

Additionally, AED 442/642 requires that students complete **twenty-five hours** of fieldwork.

The Field Studies Office will make a placement in an area secondary school based on information you provided in your application and criteria established by New York State Education Department (NYSED). You are expected to arrange the day and time with the host teacher. **During these 25 hours, you will submit a weekly evaluation form completed by your host teacher which will assess your potential as a science teacher.**

- Hours must be completed over 8 consecutive weeks.
- 25 hours minimum
- 5 of those hours should include individual teaching lessons that are designed by you. You are to upload the lesson plans for the classes you are teaching on BrightSpace.
- Weekly evaluation form completed by your host teacher.
- Journal reflection for each observation

Successful completion of AED 391 requires both satisfactory completion of class assignments and twenty-five hours of fieldwork. Failure to complete course or fieldwork will result in having to repeat both components of AED 391.

Required Textbook:

Delpit, Lisa. (2021) Teaching when the world is on fire: Authentic classroom advice, from climate justice to Black lives matter. *The New Press*. ISBN 9781620976654.

Rios, Raquel. (2017) Teacher agency for equity: A framework for conscientious engagement. Routledge. ISBN 9781138302624.

Wall Kimmerer, Robin (2015) *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*. Milkweed editions. Minneapolis MN. ISBN 9781571313560.

Evaluation of student performance:

Lecture	70%	Observation	30%
Midterm	20%	Journals	20%
Teaching Portfolio	30%	Lesson plans	5%
Attendance & Participation	20%	Host Teacher Evaluations Forms	5%

Grading: Both parts (Methods I & Observations) will make up one grade for the semester and you must complete both in good standing to receive credit. The lecture will compose of 70% of your final grade and observations will compose 30% of your final grade.

Journals entries are due on BrightSpace by Monday 8:00 AM of every week. There should be one entry for each observation.

Weekly evaluation forms are to be completed by your hosted teacher and submitted via brightspace as well.

There are also 2 options for an extra credit assignment to be discussed in class. Each assignment will count as an extra 5 points towards your final grade.

Letter grades will be assigned as follows:

0-59 = E; 60-62 = D-; 63-66 = D; 67-69 = D+; 70-72 = C-; 73-76 = C; 77-79 = C+;
80-82 = B-; 83-86 = B; 87-89 = B+; 90-92 = A-; 93-100 = A

Academic integrity: You are expected to abide by the SUNY Cortland standards of academic integrity (Chapter 340 of the College Handbook). Cheating and plagiarism will not be tolerated.

Please see the College Handbook webpage for a definition of plagiarism and the penalties:
http://www.cortland.edu/handbook/hb08_10/part3.html#Anchor-340.02-34192 .

Please note this important detail: Plagiarism can be intentional or unintentional. All incidents will be reported to the Academic Grievance Tribunal.

Attendance Policy: You are expected to attend lecture and complete fieldwork. Valid absences are those due to approved College activities (see the College Handbook regarding this policy) or due to illness (email ASAP). It is always best to talk to me about an expected absence before it occurs, when possible, so that we can work out a make-up time.

- If students are unable to attend class because of documented quarantine or isolation for COVID-19, they should notify the associate dean of the school in which they are majoring. Students should also follow this procedure, outlined in the SUNY Cortland Handbook, for emergencies such as surgery, accidents involving lengthy absences from classes or other extenuating medical or personal circumstances. The associate dean will request documentation regarding the situation. Upon receipt of sufficient documentation, the associate dean will notify instructors about the reason for the absence. The instructor has the final determination in how such absences will be considered.
- If students are unable to attend class due to short-term illness, they should inform their instructors directly and follow the procedures outlined by the course instructor for making up work. The CDC recommends that instructors not require notes to excuse ill students from class. Making students come to a health facility or other office for a note just exposes them (and others) to more infectious diseases. Requiring a written excuse also makes students more likely to go to class when they are sick and should stay home. This then becomes a public health issue. For this reason, neither Student Health Service nor the associate deans will provide medical excuses for short-term illness. Instructors should follow their established class attendance policy and/or use their professional judgement in working with students in these situations.
- Students are responsible for all work missed. Instructors should establish procedures to allow students who have been absent for valid reasons to make up missed class work. If students anticipate having to miss class, it is their responsibility to inform the instructor ahead of time. (SUNY Cortland Handbook Chapter 410.11). Students should be proactive in communicating with faculty regarding absences and making up missed class work.

Communication: Announcements will be made in class, by **campus email**, and on **BrightSpace**. Please check your @cortland.edu email at least once a day.

Readings:

The pages listed in the Lecture Schedule below refer to the chapters in your textbook that cover and discuss the topic listed. Read the assigned section prior to coming to class.

Adolescent Education 391

Date	Topic	Reading
August 30, 2023	Teaching Identities	
September 6, 2023	Teaching Identities	Rios (2018) Chapter 1: Introduction Chapter 2: Perspective

		Wall Kimmerer: pg 3-32
September 13, 2023	Teaching Identities	Rios (2018) Chapter 3: Poverty Consciousness Chapter 4: Racism Wall Kimmerer pg 32-59
September 20, 2023	Teaching Identities	Rios (2018) Chapter 5: Conscientious Engagement Chapter 6: Spirit Consciousness Wall Kimmerer pg 61-97
September 27, 2023 SSI-learning unit	Teaching Identities	Rios (2018) Chapter 7: Authentic Presence Chapter 8: Entanglement Wall Kimmerer p 98 - 117
October 4, 2023 SSI-Learning unit	Teaching Identities	Rios (2018) Chapter 9: Freedom Chapter 10: Meliorism Wall Kimmerer pg 119 -140
October 11, 2023 SSI-learning unit	Teaching Identities	Rios (2018) Chapter 11: Emergence Chapter 12: Conclusion Wall Kimmerer p 141 - 166
October 18, 2023 SSI-learning unit	Equity in Adolescent Education: Race and Culture	Delpit, Laura pg 133-142 Delpit, Pitts Pg 81-85 Delpit, Richard Milner IV 33-37 Wall Kimmerer p 167 – 201
October 25, 2023 Mid-term Assignment Due	Equity in Adolescent Education: Race and Culture	Delpit, Cho, pg 208-213 Delpit, Ishmael & Tunstall, pg 108-118 Wall Kimmerer p 203 - 222
November 1, 2023	Equity in Adolescent Education: Students with Disabilities	Readings posted on BrightSpace. Wall Kimmerer p 223-240
November 8, 2023	Equity in Adolescent Education: Sex and Gender	Delpit, Weiss, pg 155-165 Delpit, Edwards & Lindberg, pg 166-170 Wall Kimmerer p 241 - 267
November 15, 2023	Equity in Adolescent Education: Sex and Gender	Delpit Torres & Goitia, pg 145-154 Case Study Wall Kimmerer p 268 - 300
November 22, 2023 No Class –	Thanksgiving Break	

November 29, 2023	Equity in Adolescent Education: Climate Change	Delpit, Harmon, pg 173-179 Delpit, Bigelow, pg 180-197 Delpit, Collier, pg 51-53 Wall Kimmerer p 301 - 340
December 6, 2023 Last Class	Equity in Adolescent Education: Social Justice	Delpit, Shalaby, pg 57-60 Delpit, Hawkes, pg 61-77 Wall Kimmerer p 341 - 379
December 13, 2023	Final Assignment Due	

Appendix C – Student Assignments Used in Data Collection

1. Pre-unit Questionnaire	
Name: _____	AED 391 – Introduction to Adolescent Education
Date: _____	Instructor Tiffany Hamm
Teaching Identities and Pedagogy Pre-unit questionnaire:	
This questionnaire to gather information about your identities as preservice teachers and your pedagogical style. This questionnaire will serve as a baseline. Answer all questions as honestly as possible, this assignment is graded for completion.	
1. In your own words, what do you believe is the purpose of education?	
_____ _____ _____ _____	
2. Describe the values that you aim to incorporate and instill in your teaching practices.	
_____ _____ _____ _____	
3. Do you believe your personal teaching values align with the purposes of education? Why or why not?	
_____ _____ _____ _____	
4. Describe your biggest influence in your decision to pursue a career as an educator.	
_____ _____ _____ _____	
5. Describe the type of teacher you aspire to be.	
_____ _____ _____ _____	
6. Describe the teaching methods that you aim to implement in your teaching practice.	
_____ _____ _____ _____	

2. Mid-term Assessment - Teaching Philosophy Statement

Name: _____ AED 391 – Introduction to Adolescent Education
Date: _____ Instructor Tiffany Hamm

Mid-term Assignment: Teaching Philosophy Statement

Write your personal teaching philosophy statement. This teaching philosophy should be a personal statement that describes your core values and beliefs in education and ways that you plan on upholding these values as an educator. Following are guiding questions that can be used to develop your teaching philosophy statement:

Who are you? - Introduce yourself

What is your positionality?

How does your positionality and experiences influence your teaching perspective and practices?

What type of teacher do you aspire to be?

What are your teaching beliefs and values?

How might your positionality and experiences influence your teaching values and beliefs.

What are the implications of these beliefs and values?

How you do plan on implementing these beliefs and values in your teaching practices?

What kind of impact do you want to make as a teacher?

What is your overall philosophy as a teacher?

This paper should be 3 pages minimum-5 pages maximum. Double space. Times New Roman, 12 point font with 1 in margins.

Include a title page and incorporate at least 5 citations from readings class readings and course material.

Rubric

Content	Points Possible
Introduction pieces contains a full description of who you are, your positionality, and ways that influences your perspectives and approaches to teaching.	/30
Teaching statement includes a full description of personal beliefs and values that preservice teacher aims to incorporate within their teaching practices.	/30
Teaching philosophy statement incorporates a plan in which preservice teacher aims to uphold personal beliefs and values within their teaching practices and the potential implications of upholding those beliefs and values.	/30
Assignment includes at least 5 citations from class reading and materials. Writing is cohesive, and objectives and thoughts are clearly expressed. Paper meets all writing requirements and is free of grammatical errors.	/10
Total	/100

3. Final Assessment- Teaching Portfolio

Name: _____

AED 391 – Introduction to Adolescent Education

Date: _____

Instructor Tiffany Hamm

Teaching Portfolio – Final Assignment

Create a teaching portfolio with a learning unit plan (a unit is composed of multiple daily lesson plans that are cohesive and attend to one distinct topic), and a reflection section. Choose one class from your placement and utilize this class as guide to base your lesson plan on. Choose at least 1 standard from the options below that reflect the topic you have chosen, and develop a unit plan that is approximately 2.5 – 3 hours long.

Learning Standards:

ELA/Literacy

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS3-1)

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS3-2)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1)

Mathematics

MP.2 Reason abstractly and quantitatively. (HS-ESS3-1)

MP.4 Model with mathematics. (HS-ESS3-3)

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1)

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS3-1)

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1)

Science

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*

HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

Reflection section:

1. Describe the classroom context in which this lesson is to be taught. Your description should include, but not be limited too, the location in which this lesson is to be taught, the content, grade, and discipline of the class, and the various demographics of learners within the class.
2. In full detail, describe the lesson plan(s), including, but not limited to, context, content knowledge, the goals that you would like the students to achieve, the objectives, the ways in which your lesson plan aims to meet the learning standards, and the ways you will assess students' learning.
3. Describe the process of creating the lesson plans, including but not limited to, ideas, influence, and inspiration for your lesson plan, as well as challenges to developing your lesson plan.
4. Describe the ways in which your lesson plan reflects your values as a teacher.

Rubric:

Your portfolio should include a cover page, table of contents, lesson plans and a reflection section, a bibliography, and an appendix with supplemental materials. The reflection section should be 5-7 pages, double space, size 12 font, Times New Roman, with 1 inch margins.

Portfolio Rubric	Score
Lesson plans are detailed, cohesive, meets the time requirement of 2.5-3 hours, and clearly aligns with the standards that you have identified.	/40
Reflection is 5-7 pages in length and answers all prompts in thoughtful manner.	/50
Assignment includes at least 5 citations from class reading and materials. Writing is cohesive, and objectives and thoughts are clearly expressed. Paper meets all writing requirements and is free of grammatical errors.	/10
Total	/100

4. Final Discussion Questionnaire

AED 391: Introduction to Adolescent Education

Name: _____

Fall 2023

Date: _____

Final Class Discussion

It's been a pleasant semester with you all. We have touched on a variety of topics and had some interesting discussions. Complete the questionnaire in complete and well thought out sentences. Be prepared to share out.

1. What were some topics that stood out to you the most? Why?

2. What were some key take-aways from this course?

3. In what ways did this course influence your developing teaching identities?

4. What are some tips, strategies, and/or pedagogical approaches that you've learned from this course (either directly or indirectly) that you aim to implement in your own teaching practice.

5. Any final comments, notes, or questions.

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Curriculum Vitae

Tiffany Q. Hamm

Education

Syracuse University	2024
Doctor of Philosophy, Science Education	
Long Island University: Brooklyn Campus	2018
Master of Science in Education, Urban Adolescence Education	
Stony Brook University	2014
Bachelor of Science, Marine Sciences	
CUNY Borough of Manhattan Community College	2011
Associate of Science, Science	

Professional Experience

SUNY PRODiG Fellowship	2022-2024
<i>Visiting Instructor</i> , SUNY Cortland	
Courses:	
• Integrated Earth Science and Biology Science	
• Methods I: Teaching Science for Middle & Secondary Schools	
• Introduction to Adolescent Education	
<i>Instructor</i> , Syracuse University	2018-2022
Courses:	
• Elementary Science Methods & Curriculum	
• Secondary Science Methods & Curriculum	
• Curriculum Problems in Science	
• Preservice Teacher field supervision	
<i>Secondary Science Teacher</i> ,	2015-2018
New Visions Charter High School for the Humanities, Bronx New York	
Classes:	
• Earth Science	
• Earth Science Regents Prep	
• Biology	
• Marine Biology	

Regional Conference Presentations

Hamm, T., McCurdy, R., & Cunningham, A. (2023) Science sistering: Becoming science teachers through our science her-stories. STEMNoire: Third Annual Conference. San Juan, Puerto Rico. June 23. [peer reviewed]

Hamm, T. (2022) The “Green Roofs” Unit: A Science Unit Using Transformative Science Methods. Sixth Annual Dissertation Funding Competition Presented by the American Association of Colleges for Teacher Education. New Orleans, LA. March 4.

Hamm, T. (2020) The Time Capsule 3020: A Study of the Impacts of Informal Science Institutions on Urban Science Education. 2020 Holmes Preconference Research Session, Atlanta, GA: February 27.

Webinar

Hamm, T. (2021) Science Education for Multicultural Classrooms. Future Professoriate Program Annual Conference. Syracuse University, Syracuse, N.Y. May 26

Service

Science and Technology Entry Program, <i>Syracuse University</i>	2020
<ul style="list-style-type: none"> • Lead enrichment science activities for secondary school students. • Provided science content assistance to secondary school students 	

Honors and Awards

<i>Holmes Scholar of the Month</i> , American Association of Colleges for Teacher Education	2020
<i>Dean’s List</i> , Borough of Manhattan Community College	2011

Professional Licenses and Certificates

Certificate in University Teaching	2021
New York State Classroom Teacher: Earth Science 7 – 12	2020

Professional Memberships

SUNY PRODiG Fellow
Honor Society
American Association of Colleges for Teacher Education Holmes Program