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My Work is Wild — Promoting Career Literacy of Conservation and STEM Vocations in Secondary School Students

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My Work is Wild — Promoting Career Literacy of Conservation and STEM Vocations in Secondary School Students

by

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CHAPTER ONE

Introduction

From toilets to biodiversity, bridges, and microbiology— our nation thrives off the knowledge and expertise of science, technology, engineering, and mathematics (or STEM) professionals. To continue our competitive innovation trajectory, policy reports from the President's Council of Advisors on Science and Technology indicate that at least one million more STEM professionals are needed in the workforce than the current rate at which students are choosing these vocations (Kassaee & Rowell, 2016). Nestled in the STEM vocational outfit, is a dedicated cohort of professionals that research and conserve our native wildlife and natural resources. Conservation is a movement that requires an array of talents, people and expertise (Blickley et al., 2013).

Specifically, conservation science is a field dedicated to supporting our planet's natural resources and ecosystems which is widely viewed as a benefit to the humans that inhabit it (Archer et al., 2021). But humans have led our planet into a new era, often referred to as the Anthropocene epoch, that has been steam-rolled into existence by human-caused changes to our environment that are now dependent on human action (Jeanson et al., 2019). Challenges of this emerging epoch present large challenges to people— food shortages, new pathogens, climate change, natural disasters, and deepening environmental injustice will require a litany of professionals in conservation including, but not limited to, policymakers, engineers, scientists, and other creative thinkers to help address these issues (Redman et al., 2021). Adaptive solutions are required to conserve our natural ecosystems and their continued biodiversity which are pivotal to humankind's continued well-being, as well as intertwined with socioeconomics (Jeanson et al., 2019).

A large part of my passion for environmental education is influenced by funneling young adults into these career paths. As such, I seek to answer the question- *what tools and experiences are effective in teaching conservation career literacy to secondary education students in the afterschool setting?* My decision to work with these aspects also germinated from the seeds of my formative years. Experiences and education in my life did not lead me to my current career in a traditional process. Through the creation of an engaging career literacy curriculum, I hope to offer windows of literacy into what and who our conservation heroes truly are. I wish to align students with these professionals' daily tasks and skill sets and instill in them familiarity and ownership. Nurturing the seeds in their minds that these careers are not only integral but approachable and within their capacity to obtain. In this introductory chapter, I elucidate the experiences in my life that led me to this capstone project, the *My Work is Wild* curriculum, including my own career journey, as well as explicate the need for students to join these career forces. I conclude this chapter with initial thoughts on barriers students may perceive as well as the desideratum of diversity in this field— of both affinity and people.

The Path to Here—My History and Experience with Career Literacy

As an avid Girl Scout and adventure enthusiast, I was quite dispirited when I took a career aptitude test in my early post-secondary years and received the result “florist”. As part of the assignment, I researched the intricacies of procuring fanciful arrangements and the training required to fulfill this pathway. I summarily wrote a three-page report on how this could not be the only option for a student with a creative streak and an affinity for the natural world. I purposefully neglected to mention my second-matched career result from the aptitude test- “roof installation technician”.

Following the advice of peers and my physician father, I decided on a collegiate experience focused on Animal Science with the intent to pursue veterinary school. In my introductory years, professors expatiated on the rigor of the coursework and the inevitably large number of us that would not continue on due to lack of stamina, dedication, or simply the exceptionally limited number of seats in veterinary colleges. However, these professors also forewarned us— the only career to work with animals for a living and make any sort of financial living was with the prefix, Dr. Dropouts of the program were encouraged to explore biology or agricultural pathways— but never, ever the inevitable financial destitution of becoming a zookeeper.

Fast forward four years, I officially graduated and accepted an internship as a zookeeper in Omaha. Throughout my undergraduate tenure, I worked at a wildlife rehabilitation clinic that cemented my passion for husbandry and advocacy of wild animals, and my reticence to enter the medical field. It was here that I followed a decidedly more meandering path toward environmental education where I believe I can make the most impact with my skills and knowledge.

It is important I recognize here my privilege as a white female of middle-class status. In my experience in obtaining upper education degrees, I have had access to a multitude of resources that many do not. I approached the research and creation of this project by setting aside my experiences and innate biases and approached diverse cultures and intersectionalities with open curiosity and empathy in an effort to make the most impactful curriculum unit possible. I have also kept in mind how my position as a stakeholder in expanding the conservation job field has affected my research and tried to withhold all opinion for peer-reviewed data and research.

We Need "Wild" Professionals

As we enter the Anthropocene epoch and our planet continues to experience large losses of biodiversity and significantly altered habitats, it is paramount educators recruit more students to enter the fields of ecology and conservation (Jeanson et al., 2013). The world we pass off to our future generations is in crisis, and it is integral that environmental educators prepare students with the tools and agency to support our natural resources. The conservation world often exists in a vacuum. Outreach and education are needed to connect science to the students of today's world— especially at a time when early career aspirations are forming.

During adolescence, students are forming their views of self-concept, perceptions of their identity, and considering career-guiding pathways (Valentine & Koloski, 2021). In my secondary education years, I explored new experiences that I felt corresponded with my identity and who I wanted to be as a person. From Girl Scouts to the dance team, I began to timidly involve myself in newfound interests. The after-school timeframe is a unique opportunity for students to explore new ideas and passions— often ones that align with their innate and chosen identities and represent facets of themselves. Whether in the field or lab, there are a vast amount of professions that contribute to our natural resources that don't necessarily "look" like the standard conservation or wildlife worker. Currently, in my post-secondary science academy program that focuses on career literacy, the need for a diverse understanding of the vocations available for supporting conservation is evident. Most of the students enter the program with two clear ideations of their future— veterinary school or relinquishing their passion for wildlife to join a family business due to a perception that other vocations do not afford them the financial stability they need, require exhaustive education they are not prepared for, or other perceived discourses.

Working with wildlife can look a myriad of ways— at a desk, in a field, or in a classroom. Diverse people with differing aptitudes, backgrounds, and education are all needed in the fight to conserve our natural resources and species.

A Diverse Workforce— Jobs & People

It is clear to me that at the very least, an introductory approach to the critical literacy of what options are available in the conservation career field needs to be addressed and defined for students early on in their career decision-making process. Career literacy is not new to my programming repertoire— I currently run a high school science academy that is situated around introducing local high school students to myriad career options in conservational sciences. While my current post-secondary program connects learners to professionals and elucidates the finer details of vocations— a more refined and interest-focused program would benefit younger students earlier in the development of their future planning. As these students explore and define who they are as individuals, it is important to align them with the knowledge that can make use of their passions and skills from a human perspective— not a computer-generated version of categorical strengths.

Furthermore, we need to empower diverse peoples and cultures who will be disadvantaged in the career-seeking process. Over 40% of college students pursuing a degree in science, technology, engineering, or mathematics (or STEM) career fields will switch degrees or fail to obtain a degree due to perceived barriers and lack of self-efficacy, and the vast majority of these students identify as female or non-white (Kassaee & Rowell, 2016). We need to prepare and empower these students prior to their collegiate experience via culturally sustaining pedagogies and inclusive curriculum. Conservation itself holds a history steeped in discrimination and white privilege.

Conservation was, and in some areas still is, canonically colonialism (Archer et al., 2021). European aristocrats from the 15th century onwards decided what was, and what was not acceptable to do on ‘wild’ land, stripping away important culture, religion, and spiritual elements of green spaces to return to a virgin state (Archer et al., 2021). Non-white conservation heroes and histories have been wiped from the books and forgotten-— creating a very unfamiliar archetype for students of diverse cultures to role model. Still today, researchers and professionals of color are underrepresented in scientific journals and research, reinforcing structural bias as well as the very education that prepares them for these careers (Archer et al., 2021). To be effective, this curriculum creation must have a cornerstone in inclusiveness and diversity and celebrate a holistic approach to conservation and nature that includes culture and respect for all peoples.

Conclusion

America needs more STEM professionals. Our nation needs adults who are scientifically literate and use critical thinking to solve complex problems. Our nation needs professionals who will continue to innovate and research how our world works, and how we live in it. These next generations of thinkers are currently sitting in classrooms all across the United States. They are diverse, curious individuals who can only benefit from an education that aims to promote inclusive career literacy based on their individual interests. It has become a primary goal of my own as an educator to foster these endeavors for the purpose of enabling students entry into STEM and conservation-related continuing education and the pursuit of a connected career field. This goal has been shaped by my personal experiences in education and career literacy and my professional experiences. I have identified a key aspect of this new curriculum to

focus on celebrating the diversity of my students and relating that to a culturally sustaining and socially just pedagogy. This will not only address how students identify but their perceived aptitudes and interests as well. I strive to create lesson plans that any student can aspire to and believe is achievable through a culture of shared belonging.

In Chapter 2 of this paper, I analyze what peer-reviewed current literature states and use it to inform the creation of the *My Work is Wild* curriculum. An efficacious program relies on using pedagogy that is scientifically proven to impact secondary school students in the applicable setting. Best practices for informal afterschool programming will have to be obtained and students' motivations and reasonings for career choice analyzed. Through meaningful research of qualitative and quantitative data, the *My Work is Wild* curriculum was born from peer-reviewed data to create a product that is both effective and influential. Chapter 3 will include important logistical details such as the explicit project overview, the development of the project, the setting and intended audience and how the curriculum will be assessed for further improvement. The concluding chapter will analyze lessons learned in the curriculum creation process, identified limitations of the curriculum, and recommendations for future use.

CHAPTER TWO

Literature Review

Introduction

The creation of the *My Work is Wild* curriculum was for a grant-funded after-school program serving public middle schools in the Omaha metro area. Students meet with program providers for one hour, once per week, for five-week sessions occurring over the academic school year. Content is guided by state science standards as well as Next Generation Science Standards (NGSS) which are collaborative, state-led guidelines for science literacy, including cross-cutting concepts, disciplinary core ideas, and science and engineering practices (Next Generation Science Standards, n.d.).

This program binds career literacy of conservation and STEM vocations with the guiding question— *what tools and experiences are effective in teaching conservation career literacy to secondary education students in the afterschool setting?* In the past two decades, afterschool networks nationwide have begun concentrated efforts on the creation and execution of quality STEM programming (Allen et al., 2019). Data has shown there is a negative jump in mindsets on STEM-related education from secondary to post-secondary schooling; however this can be effectively combated with informal learning opportunities, such as those presented in the out-of-school time frame, that supports students persisting in and entering STEM fields in college (Habig et al., 2020).

When STEM topics are approached with a pedagogy that supports youth voice and choice, it helps students build autonomy, create relationships with peers and mentors, and approach real-world social and problem-solving contexts; which in turn leads to identity development (Allen et al., 2019). Allen et al. (2019) also outlined that this engagement on intellectual, academic, social, and emotional levels is a necessity as

STEM employers often seek candidates with teamwork, collaboration, critical thinking, and self-regulatory skills gained from these frameworks of social and emotional learning.

A robust field of STEM professionals is critical in maintaining the innovative productiveness of the world and the competitive technological advances of our country, which is also vital to our nation's socioeconomic status (Holmes et al., 2018). However, despite this new charge in STEM education, the Trends in International Mathematics and Science Assessment (TIMSS) and Program for International Student Assessment (PISA) both reported little to no change in student STEM performance in schools (Redman et al., 2021). This curriculum will combat this with an informal, out-of-school time frame to support students' in-school learning by highlighting conservation as an important scaffolding of STEM, an integration strategy with interdisciplinary techniques highlighted in educational models as supportive of effective learning frameworks (Baran et al., 2019). Through contact with our natural resources such as wildlife, plants, water, and earth, we can support students' social and emotional learning in a holistic model of learning that encompasses their emerging identities and how they perceive themselves as contributing to our world (Jeanson et al., 2019). Although views of nature are dynamic, students who see themselves as environmental stewards have the opportunity to help battle the irrevocable changes humans have elicited on our planet (Jeanson et al., 2019).

In the coming chapter, I provide a detailed exposition of what career literacy is, and what gaps in knowledge it is in response to. Next, proven pedagogies and tools for the teaching of career literacy and the frameworks are introduced that support persistence in STEM career pipelines. After frameworks of teaching, I center on the student—discussing what factors influence students’ choices of careers and potential barriers as

found in the literature, and how educators can use them to support students successfully persisting in STEM. Lastly, I use the current demographics of career professionals and supporting literature to make an argument for explicit inclusivity tools to be used in this curriculum to combat a current gap in diversity in STEM career fields (Haynes, 2015). All these factors tie back to my original goal of creating an effective curriculum based on career literacy with proven tools and education frameworks.

Tools and Frameworks for Teaching Career Literacy

First of all, it is important to approach career literacy with the understanding that it was created because career options are confusing. There is a well-documented gap in knowledge between middle-school-age students and what careers exist in conservation as well as negative stereotypes about related jobs (Habig et al., 2020). Curry et al. (2013) introduced four main factors that lead to misunderstanding and confusion in students' career pathways:

> (a) lack of knowledge of the steps involved in choosing a career, (b) lack of knowledge about oneself related to career (e.g., values, aptitudes, interests), (c) lack of information about career and postsecondary options, and (d) lack of knowledge about how to gain further information to assist in the process of decision making (p. 28).

Their paper, which focused acutely on the introduction of career options in secondary school timeframes, also highlights the importance of critical teaching by in-school educators. While tools such as job fairs may prove useful, other tools such as textbooks often describe STEM careers as heavily laboratory and procedural settings only, which distorts the actual field which is flexible, diverse, and supports a myriad of talents and aptitudes (Curry et al., 2013). Narrow views such as these cause increased

misinformation and confusion surrounding students' career decisions and do not support the realities of the job force (Curry et al., 2013).

To address the ambiguity, many studies support the teaching of career literacy in middle school, instead of waiting for post-secondary school (Aschbacher et al., 2014; Curry et al., 2013; Gibbons & Borders, 2010; Mishkind 2014; Valentine & Kosloski, 2021). Early adolescence is a proven time for the growth and identification of an individual's values, interests, passions, and sense of identity (Curry et al., 2013). The purpose is not yet to have students make decisions but to prepare them with information to further evaluate their interests and explore potential career pathways (Valentine & Kosloski, 2021). Additionally, middle school is a pivotal developmental stage for exploration and planning their post-secondary education pathways to potentially include career interests in their choice of classes and even extracurricular activities (Aschbacher et al., 2014). This is also supported in Jeanson et al. 's (2019) “Twenty Actions for a Good Anthropocene”— one of which was to focus on younger generations. Ideas such as biodiversity, sustainability, and environmental stewardship can make a larger impact on students in earlier stages of development when interests and mental frameworks are fluctuating and evolving (Jeanson et al., 2019).

If middle school begins the pipeline to possible vocations, then the next step of the ladder is high school. High school is often the setting where educators focus on career readiness— however, it is essential to note that career readiness and career literacy are different strategies (Valentine & Kosloski, 2021). Career readiness focuses on preparing students with all the tools to gain an occupation, whereas career literacy introduces students to all the information they require to make personalized decisions for their

chosen career pathway (Valentine & Kosloski, 2021). Career literacy, the focus of this new curriculum, also readies students to take advantage of opportunities in post-secondary school and provides the skills needed to interpret and evaluate decisions for their futures (Valentine & Kosloski, 2021). Career literacy, therefore, is the antecedent to career readiness (Valentine & Kosloski, 2021).

But what are the specific ideas and experiences that support career pathways? In 2021, Valentine and Kosloski published a Delphi study that interviewed and interpolated key constructs of career literacy from top career education experts in the United States. The three main types of experiences identified by the experts as useful in career education were functional, interactive, and critical types of learning (Valentine & Kosloski, 2021). Functional experiences were described as those activities that provide a basis of knowledge or skills needed to understand a career field (Valentine & Kosloski, 2021). Interactive experiences concentrated on preparing students to interpret information, and often concentrated on drawing real-world comparisons (Valentine & Kosloski, 2021). Critical experiences were lastly interpreted as those lessons that provided the skills and knowledge to students that readied them to evaluate information and make decisions (Valentine & Kosloski, 2021). All of these experiences are integral to effective career literacy education and will be included in the *My Work is Wild* curriculum. Critical education experiences are integral to students' contextual applications of learning and connecting to the outside world (Curry et al., 2013). A qualitative study by Curry (2013) and colleagues of urban at-risk students engaged in a middle-school career literacy course further supported this claim while also showing marked improvements in students' academic motivation, participation, and schoolwork

effectiveness versus students not engaged in a career literacy program. Yet, even with all the literature supporting engagement in career education in middle school, there exists no adopted nationwide guidelines or expectations for implementation of it in traditional schooling (Curry et al., 2013). *The College and Career Readiness* booklet published by the College and Career Readiness and Success Center at the American Institutes for Research provided an extensive overview of state-specific career education programs for twenty-one states facilitated in middle schools (Mishkind, 2014). Important themes highlighted in many states included academic knowledge, incorporation of social-emotional learning, collaboration, critical thinking, perseverance, and community involvement (Mishkind, 2014). Of note, only one state— Hawaii, declared stewardship to the environment, family, and future generations specifically as an important factor in career education (Mishkind, 2014).

In this review of the literature, conservation is often combined with the greater STEM umbrella to help focus on the technology that continues to provide the most effective frameworks for linking current ecological and social gaps (Jeanson et al., 2019). Integrated STEM learning is touted in the literature as a major pedagogical strategy for the promotion of science careers (Baran et al., 2019). However, an overall consensus on possible frameworks for effectiveness and persistence in the field is missing (Baran et al., 2019). Given that career education is essential and firmly defined in the research, the next step is to analyze popular theories proven in the literature.

Firstly, when students envision their future they engage in an idea of their Possible Selves (Markus & Nurius, 1986). The Possible Selves Construct of Identity was first suggested by Markus and Nurius in 1986 as a link between a person's perceptions of

self in the past, as well as in the future. This cognitive link connects an individual's goals, interests, hopes, fears, and perceived threats between the present and how they perceive themselves in the next stage of their lives (Markus & Nurius, 1986). This can be tied to career literacy because the act of positive experiences, especially those linked with perceived success, drives students' perceptions of their self-efficacy (Holmes et al., 2018). Self-efficacy is a singularly important concept in career literacy; self-efficacy is a set of perceived beliefs that influences what individuals get involved with, how much time they spend on topics and creates neural pathways of thinking around certain domains (Haynes, 2015). The confidence gained via these positive (or perceived "successful") experiences serves to frame future behavior and is an acutely individualized phenomenon (Markus & Nurius, 1986). Perceived self-efficacy is imperative in students believing they can be successful in the future— studies even show that it may be the singular most powerful influence on an individual's decision to participate in and persist in a behavior, such as STEM hobbies or education (Aschbacher et al., 2014; Gibbons & Borders, 2010). This, in turn, supports students' cognitive perception of seeing STEM professions as achievable and leads them to persist in these career pipelines (Holmes et al., 2018). Conversely, in the face of challenges and negative experiences, students will struggle to see STEM or science in general as a version of their Possible Selves (Markus & Nurius, 1986). This phenomenon is also domain specific; that is, positive experiences and achievements for example in art will not correlate to perceived self-efficacy in mathematics (Gibbons & Borders, 2010; Holmes et al., 2018). Success transfers to the vision of a Possible Self within the same academic (or skill) domain. Ultimately, this theory guides educators to encourage self-efficacy perceptions in students as well as

positive experiences to help shape future achievements (Gibbons & Borders, 2010; Holmes et al., 2018; Markus & Nurius, 1986).

A startling 57% of students studied in a California middle school reported "science isn't me" in a 2014 study of science and identity (Aschbacher et al., 2014, p. 1). These students were analyzed and proven to have low self-efficacy in science and also reported believing that science is not useful in the real world (Aschbacher et al., 2014). Whereas 22% of students who reported feeling significantly aligned with science and considered "science is me" reported having an interest in science and were more likely to follow a science career pipeline (Aschbacher et al., 2014, p. 1). A strategy that can combat these specific issues or relationships to a topic is the Construct of Identity (Aschbacher et al., 2014; Habig et al., 2020). The Construct of Identity in an individual is salient— it changes with development and is directly tied to experiences, connections to self, and relationships (Habig et al., 2020). When an individual participates in experiences or activities related to a domain, they are directly interacting with their perceived identity (Habig et al., 2020). Allen et al. (2019) supposed that the use of science as an identity (i.e. science people) may possibly be more persuasive than even self-efficacy perceptions. The development of identity in science or STEM is directly formed from STEM interests, hobbies, and engagement (Allen et al., 2019; Aschbacher et al., 2014). Furthermore, educators can analyze and fight the negative stereotypes in STEM that exist of strict, procedural occupations and academic inability by inviting more young generations to use this theory of identity to create a sense of community (Aschbacher et al., 2014; Valentine & Kosloski, 2021).

So if relevancy leads to persistence, how do educators further convince students they align with this community? A strategy linking science identity to personalized relevance is teaching conservation in a way that situates the student as part of a larger living system that starts at home— or also known as, a place-based manner of education (Jeanson et al., 2019; Redman et al., 2021; Wyner & DeSalle, 2010). Focusing on local conservation and topics that occur in the learner's daily lives lends a sense of agency to the student and makes learning more personalized and meaningful (Wyner & DeSalle, 2010). Often students reject conservation careers because they feel too removed from what is important to them (Redman et al., 2021). A paleontology STEM program in Iowa opted to study extant North American mammalian fossils in lieu of ancient extinct creatures from previous eras and found that students reported, "[not knowing] all the unique real-world applications of paleontology", and "[paleontology was] much vaster than [they] had previously believed" (Redman et al., 2021, p. 8). Students who see science as relevant and meaningful to them are much more likely to pursue it as a career (Aschbacher et al., 2014). Because of this, *My Work is Wild* curriculum focuses on Nebraska conservation issues and vocations that are needed in our local ecosystems. Another easy way to apply locality and relevance to conservation topics is to simply change the verbiage used when educating (Jeanson et al., 2019). The use of more approachable terms such as "wildlife instead of taxa", and "nature's contribution to people instead of ecosystem services" fosters a link between learners and the environment, supporting stewardship and creating a more impactful message (Jeanson et al., 2019, p. 105).

Linking self-efficacy perceptions with the relevance of topics is another possible framework for effectively teaching career literacy, which is outlined in Achievement Motivation Theory (Aschbacher et al., 2014). Simply put, students who achieve success in a topic and find it meaningful to their lives are more apt to pursue it further— which could be argued also contributes to the means-ends pattern of behavior of the Possible Selves Theory (Aschbacher et al., 2014; Markus & Nurius, 1986). In Achievement Motivation Theory, the importance and perception of achievement in a topic are decided upon by a number of categorized values (Aschbacher et al., 2014). For example, *utility value* is the student's ability to link lessons with real-world use, whereas *intrinsic value* is derived from personal pleasure or relevancy to the topic (Aschbacher et al., 2014, p. 736). Using these values as well as others outlined in this theory can aid educators in whether students believe they can or have an interest in learning science (Aschbacher et al., 2014). An afterschool STEM program in Turkey studied by education students at Iowa State University used this theory to create their curriculum and their data supported it as a successful pedagogical tool (Baran et al., 2019). The study— which also followed NGSS guidelines for science learning— found that the program benefited their constituents in academic achievements such as exams, homework, and the completion of science projects, as well as their "handcrafting, cognitive, collaboration, and teamwork skills" (Baran et al., 2019, p. 229). They also found that students who completed the program placed more value on science careers and possessed altogether a more positive outlook on them than their peers who did not participate in the program (Baran et al., 2019).

Another tool of merit in terms of teaching career literacy that this curriculum will draw roots from, is Constructivist Theoretical Frameworks (Baran et al., 2019; Redman

et al., 2021; Stevenson et al., 2022; Wyner & DeSalle, 2010). In this framework, it is believed that educators teach more effectively with hands-on activities and projects which stimulate learners to actively create knowledge themselves, rather than passively absorb knowledge by reading or attending a lecture (Redman et al., 2021; Stevenson et al., 2022). In the past, STEM learning has consisted of largely passive learning from a lecturer or source, whereas inquiry-based concepts of learning actually are proven to boost STEM academics and students' attitudes toward subsequent careers (Redman et al., 2021). This type of inquiry-based learning closely follows Constructivist Theory and is more effective as it allows learners to practice scientific theory in real time; students make observations and build hypotheses off them, as well as practice using real-world databases and data collection from actual specimens (Redman et al., 2021). Students are then prompted to create their own experiments and think critically about the results (Redman et al., 2021). Another guiding principle using this theory in the literature comes from my colleagues and partner program Nebraska Stem4U— their published findings also expressed the importance of mentorship and adult partners in this pedagogy (Stevenson et al., 2022). In fact, Stevenson et al. (2022) found that middle schoolers in their program who met with scientists or professionals had an increased understanding of STEM careers and could picture themselves as scientists. Constructivist Theory, when wielded effectively, puts the students in charge of learning— but this cannot be done effectively without the confidence and guidance that educators need to equip them with (Stevenson et al., 2022).

The last model examined for this literature review is project-based learning by way of an Ecology-Disrupted Framework (Wyner & DeSalle, 2010). Ecology-Disrupted

Framework is heavily focused on the importance of biodiversity and the effects humans cause when we interfere with it (Wyner & DeSalle, 2010). There has been a call for more understanding and literacy about what conservationists do and how they mitigate these disasters, and Ecology-Disrupted Frameworks are a direct answer to this call (Martinich et al., 2006; Wyner & DeSalle, 2010). Martinich et al. (2006) elucidated several projects suitable for the classroom that follow an Ecology-Disrupted Framework and may offer direct literacy of conservation field jobs such as water or soil testing, environmental data collection (such as weather, or live specimen), and invasive plant management. My project will use activities such as this to provide literacy to conservationists' daily work and also provide functional experiences from the career field. These hands-on activities offer a window into the conservation career world and can provide critical thinking opportunities that situate the impending crisis of our depauperate ecosystem (Martinich et al., 2006).

Summarily, this section has analyzed tools and frameworks proven to correlate with persistence in STEM pathways. The successful Lang program at the American Museum of Natural History funneled much of this into four simple and effective tools (Habig et al., 2020). First, “affording multiple opportunities to become practitioners of science”— students persist when they identify with STEM and consider themselves to be part of a community (Aschbacher et al., 2014; Habig et al., 2020, p. 1; Wyner & DeSalle, 2010). Second, “providing exposure to and repeated experiences with STEM professionals such as scientists, educators, and graduate students to build social networks” (Habig et al., 2020, p. 1). As discussed, effective mentors and educators can facilitate the pathway of a student becoming a science practitioner, and eventually a

leader and mentor themselves (Haynes, 2015). Thirdly, the Lang Program identified that "furnishing opportunities for participants to develop shared science identities with like-minded individuals" additionally lead to persistence (Habig et al., 2020, p. 1). A common use of tools, verbiage, skill sets, and techniques can bind students together with a sense of community and aid in them identifying with a domain or topic (Habig et al., 2020; Wyner & DeSalle, 2010). "Offering exposure to and preparation for a variety of STEM majors and STEM careers so that youth can engage in discovering possible selves" is the last wisdom offered in the four pillars of persistence framework identified by Habig et al. and the Lang Program (2020, p. 1). The Theory of Possible Selves and Science as Identity work hand-in-hand with students' perceptions of self-efficacy and what they deem a potential career pathway (Aschbacher et al., 2014; Habig et al., 2020; Markus & Nurius, 1986).

Analysis of External and Internal Factors in Student Career Choice

When teaching career literacy, educators must understand the supporting factors and barriers presented to students when deciding on career pathways that affect career literacy education. It is important to understand that the development of a student's career path has deep roots in many spheres of influence such as their family, school groups, and peers (Curry et al., 2013). Haynes (2015) laid out many spheres of influences (or barriers) in career-making decisions, but this review focuses on four— personal, social, familial, and structural.

Personal factors are made of an individual's life experiences and predispositions (Haynes, 2015). A study of undergraduates studying conservation reported access to nature early in life and outdoor recreation as a support to them entering conservation career fields (Morales & Jacobson, 2020). Conversely, in another study, lack of exposure

to nature was reported as the most prominent barrier to students entering conservation career fields (Haynes, 2015). Additionally in another study, having pets at an early age supported students relating to the topics of biology and conservation (Nattrass, 2020).

Social factors focus on the individual and how they interrelate with other groups of people in a student's life such as peers, media, and mentors— and have proven to be most influential in high school-age students (Haynes, 2015). Many of these spheres of influence also correlate with Bourdieu's (1986) psychological lens of capital. Social capital is gained by becoming a member of a group— it is also represented in the resources gained from being associated with networks (Bourdieu, 1986; Habig et al., 2020). This also correlates with socially linked groups of peers as being a strong influence with persisting in and joining STEM career pathways (Aschbacher et al., 2014; Habig et al., 2020). For social factor barriers to entry into conservation career fields, Haynes (2015) listed a lack of conservation and biological mentors for students in the field as the primary barrier for students.

Haynes' (2015) third identified sphere of influence is familial factors. A large push for persistence in STEM can come from having a family member in a STEM career or possessing STEM qualifications— Holmes et al. (2018) identified this as familial "science capital" and their corresponding study supports this being a proven positive factor in students joining STEM pathways. The students of families that value STEM ideologies and hold bachelor's degrees or higher had a strong correlation with the student's perceived self-efficacy and motivations (Holmes et al., 2018). Contrarily, Haynes' 2015 study of students from historically marginalized communities in the conservation field identified a general lack of support from family, as well as a lack of

education in the family, such as a GED, as a barrier to students persisting in their undergraduate year. Additionally, perceptions of future family values play a part in students' career decisions (Morales & Jacobson, 2020). Females especially are proven to strive for careers that offer work-family balance and pursue careers that offer comfort and strong family values over their male counterparts (Morales & Jacobson, 2020).

Lastly, structural factors are those that comprise the institutional, financial, educational, racial, and others that create organizational influence on career decisions (Haynes, 2015). Families that can financially support their students and enroll them in areas with well-resourced education structures generally correlate with higher aspirations in students (Valentine & Kosloski, 2021). However, poor structural factors such as racial discrimination, limited exposure to career education, limited science academic structures, and low economic resources tend to lead to low self-efficacy and create barriers to the STEM and conservation pipeline (Haynes, 2015). Racial structures create specific barriers— some studies state African American and Hispanic students are more likely to not enter a career field due to the perception they will experience discrimination and Mexican-American students struggle more with poor academics and educational institutes (Haynes, 2015; Morales & Jacobson, 2020). Financial capital also creates a significant barrier in the career pipeline— especially in science (Aschbacher et al., 2014). Returning to the 2014 Aschbacher et al. study of diverse students in Southern California public schools on science and identity, a significant factor influencing STEM behavior was socioeconomic status. Students of low socioeconomic status were significantly more likely to have fewer opportunities to engage in STEM, whether in-school or in the out-of-school time frame (Aschbacher et al., 2014). This possibly led to this population

also reflecting that science did not seem relevant to their lives or important to them (Aschbacher et al., 2014). This population also reported perceiving that even if they pursued a science or STEM career, they did not have the financial resources they perceived needed for training in this career— other studies found that middle-school students believe at least some college is required to be successful in the STEM field (Aschbacher et al., 2014; Gibbons & Borders, 2010). Along the socioeconomic line, is considerations of perceptions on future earnings and job market growth (Haynes, 2015). Haynes' interviews with liberal arts undergraduate students reported that they believed careers in the conservation field to be low-paying and generally more of a hobby than a realistic career path, however in actuality STEM careers generally have a high rate of job growth, lower rates of unemployment and higher salaries than non-STEM vocations (Habig et al., 2020; Haynes, 2015). Seven of the ten highest salaries in the United States require a STEM degree, yet conservation undergraduate students report switching degrees due to a higher financial burden of education and perceived lower future earnings (Habig et al., 2020; Haynes, 2015). Educators can bridge this perception of conservation as not being included in these data points with Outcome Mindset Theory— or, the understanding that students pursue jobs to gain feelings of stability and success (Haynes, 2015). Curriculum in conservation careers must present real-life opportunities that students see as achievable, valuable, and will satisfy them financially (Haynes, 2015).

Linking these four spheres together along with students' self-efficacy and future goals is the Social Cognitive Career Theory (Habig et al., 2020; Haynes, 2015; Mishkind, 2014; Valentine & Kosloski, 2021). As previously stated, students' career goals develop in time with feelings of perceptions of self and identity, as well as self-efficacy (Curry et

al., 2013). According to Valentine and Koloski (2021), there are three pillars that makeup Social Cognitive Career Theory; self-efficacy, outcome expectation, and goals for the future which should all be explicitly included in all career education. Utilizing this future-focused theory, educators must also encourage students to hold a growth mindset over a fixed entity view of their own intelligence (Holmes et al., 2018). Students who believe they can grow and change will be better suited to face challenges and perceived threats (Holmes et al., 2018; Markus & Nurius, 1986). However, Social Cognitive Career Theory possesses a broader scope and neglects to incorporate more personal factors, such as family and peers, that were discussed previously (Haynes, 2015).

Understanding these barriers is crucial to approach the conversation with students about their perceived obstacles barring them from entering conservation or STEM fields. This information makes a valuable toolkit for conservation career literacy educators when mentoring students in this program. With a better understanding of factors and barriers to students, the concluding section of the literature review will focus on the need for and practice of welcoming diverse people into STEM career literacy education.

Including Diverse Humans in the Fight for Biodiversity

Even though the field of conservation's purpose is to promote and preserve biodiversity, the field often fails at welcoming diverse people and cultures to the table (Archer et al., 2021). Population trends in the United States reflect that the majority of Americans are people of color, however, the field of conservation does not reflect this demographic (Haynes, 2015). Increasing these voices in important conservation decisions and promoting their entry into the field adds new experiences and expertise to the strategies being utilized to fight the climate crisis (Haynes, 2015).

First, it is imperative to touch on conservation's history of colonization and alienation of people of color and diverse cultures (Archer et al., 2021; Jeanson et al., 2019). The birth of conservation is often attributed to the wealthy upper-class aristocrats of 11th-century Europe (Archer et al., 2021). These nobles sought to sustain predominantly species that were targeted in hunting by restricting access to public land from “rural peasants” to allow for research and recreation by the wealthier ruling classes and creating harmful structures of white privilege (Archer et al., 2021, p. 613). Tactics also often excluded humans altogether from natural spaces, attempting to split them from human influence and negating important cultural, spiritual, or religious significance of the area (Jeanson et al., 2019). Undervaluing these intangible values undercuts the understanding we now know today of conservation as “socially connected systems” (Jeanson et al., 2019, p. 100). In the United States, these goals of untainted people-free safeguards displaced and removed thousands of indigenous communities and inhibited them from many practices they depended on for their livelihoods such as hunting and harvesting food (Archer et al., 2021). Financial incentives proposed in the 21st century furthered conservation toward market-based practices and began inequities that still exist today (Jeanson et al., 2019). Analysis of global funding and spending for conservation purposes in 2019 revealed over 90% occurs in the world's wealthier countries, countries that continue to fail in their commitments to underserved and less-resourced places (Jeanson et al., 2019).

Although the 21st century heralded more evidence-based practices that viewed nature holistically with people and nature in the same sphere, there still exists a divide on who is included in that circle— the predominant demographic being White males

(Jeanson et al., 2019). Although numbers of female-identifying people who hold science STEM degrees has doubled since 2008, analysis reveals they only make up 11-12% of the highest salaried STEM population (Habig et al., 2020). The same data set also reflects a negative correlation between current STEM professionals and ethnicity (Habig et al., 2020). For instance, in 2018 African Americans made up 11.7% of the population in the United States, but only 4.8% of STEM professionals (Habig et al., 2020).

Support of ethnic pride is a proven way to empower students in career literacy and readiness education (Sookyoung Lee et al., 2022). In studies, the use of empowerment of cultural capital and influences were proven to boost academic achievement, social-emotional learning and well-being, and overall cognitive function (Sookyoung Lee et al., 2022). *Cultural capital* is a Bourdieusian sociological term that refers to tools, knowledge, and resources acquired via a student's specific traditions, cultures or religions that also provides a cognitive lens on how they interact in the world (Bourdieu, 1986). The use of this tool is time-sensitive— ethnic pride must be instilled early in a student's life to combat experiences of disparity and prejudice (Sookyoung Lee et al., 2022). This tool additionally arms students for the future as a toolkit to combat oppressive systems and discrimination by improving self-efficacy, confidence, and achievement (Sookyoung Lee et al., 2022).

Another culturally sustaining pedagogy provided in the literature is the use of Cultural–Historical Activity theoretical frameworks (Archer et al., 2021; Habig et al., 2020; van Eijck & Roth 2009). This theory takes a step further from how people relate to other conspecifics, to how they additionally interact with other intangible systems such as goals, divisions of labor, social rules, and how that infers their actions and decisions (van

Eijck & Roth 2009). Further, this theory posits cultures and traditions as a socially mediated process that provides a lens for cognitive function and helps inform life decisions (van Eijck & Roth 2009). This is applicable to conservation as often conservation issues are social issues rather than ecology-related (Archer et al., 2021). Students and educators need to consider how culture provides a framework for wildlife and natural resources— for example, epistemological commitments may limit or contrast with biological concepts (van Eijck & Roth 2009). Conservation and science often exist in the narrow scope of a chemical bench or a computer and neglects to incorporate communities (Archer et al., 2021). The teaching of science can often serve to indoctrinate Western ideas of science and exclude indigenous perspectives or cultural concepts about the world (van Eijck & Roth 2009). Cultural–Historical Activity theoretical framework fills the gaps and breaks these barriers by linking cultural concepts and the health of the community as societal influences to consider and understand conservational vocations (van Eijck & Roth 2009). The inclusion of vocations in career literacy education that support our community and conservation (such as farming, environmental scientists, and water quality technicians) is an easy way to utilize this theory (van Eijck & Roth 2009).

Lastly, the literature supplies many guidelines and tools specifically for teaching conservation that promote inclusion and diversity to help bridge the current diversity gap in the conservation field. By and large, most of these tools address how to educate about conservation holistically— understanding that humans and culture are also a part of nature (Archer et al., 2021; Blickley et al., 2013; Jeanson et al., 2019; Sookyoung Lee et al., 2022). Encouraging learning as a reciprocal process is one of the most successful tools we have to combat structural bias and dynamics of oppression (Archer et al., 2021).

Westernized views of nature position it on the opposite side of a dichotomy from humans, whereas many cultures view humans as part of ecosystems (Jeanson et al., 2019). Educators must incorporate cultural knowledge and indigenous ways of knowing along with textbook science and seek to develop a deep cultural competency (Jeanson et al., 2019). Archer et al.'s (2021) "Twenty Actions for a Good Anthropocene" advised to "listen deeply to others, and be more open to seeking interpretation and opinion from different fields to better ensure social, political and ethical dimensions are adequately considered" (p. 262). Listen especially to local voices and those with insight into the education of conservation in students' personal communities (Archer et al., 2021). Research has shown that students actually prefer curricula that support diverse, often conflicting narratives and the opportunity to think critically about their personal experiences and lives (Sookyoung Lee et al., 2022). However, educators need to be prepared to connect conservation and culture so that they support one another (Nattrass, 2020). For example, a 2020 study of South African students revealed a large portion of black students (as opposed to other ethnicities) were not interested in careers in biology or science and also reported believing that the human race did not evolve from primates (Nattrass). This indicates gaps in education between basic science principles and the strong background of religion in black South African students (Nattrass, 2020).

Just as the diversity of species adds richness to nature, a diverse conservation workforce can grow and enrich the current goals of the field (Archer et al., 2021; Haynes, 2015; Jeanson et al., 2019). To welcome these communities, educators must acknowledge and pay heed to the colonialist origins of conservation, approach science, and conservation topics holistically, and consider prominent pedagogical tools in the literature

such as Cultural–Historical Activity Theory (Allen et al., 2019; Archer et al., 2021; Habig et al., 2020; Jeanson et al., 2019; Nattrass, 2020; Sookyoung Lee et al., 2022). The inclusion of diverse peoples is everyone's responsibility and a cornerstone of this new career literacy curriculum.

Conclusion

Education and policy leaders around the globe have begun the conversation of how to effectively engage students in STEM at a greater level for entrance to STEM-related pipelines (Aschbacher et al., 2014; Wyner & DeSalle, 2010). STEM professionals serve our communities in a myriad of ways such as developing technological advances, conserving our natural resources, creating infrastructure, boosting food security, combating the climate crisis, and helping nations sustain economic competitiveness and advancement (Aschbacher et al., 2014; Holmes et al., 2018; Nattrass, 2020; Redman et al., 2021). In the face of the Anthropocene epoch, students who enter STEM career pathways must be adaptable, collaborative, and culturally competent (Archer et al., 2021; Blickley et al., 2013; Jeanson et al., 2019). Career literacy education is imperative to support STEM career forces and bridge gaps in knowledge between students and what vocations make up the conservation field and prepare students to interpret career-related information (Curry et al., 2013; Martinich et al., 2006; Mishkind, 2014; Valentine & Kosloski, 2021). A range of studies support career literacy education in the afterschool timeframe and especially for middle-school-age students (Allen et al., 2019; Curry et al., 2013; Valentine & Kosloski, 2021).

In an effort to support the national dialogue of boosting state afterschool networks and increasing effective STEM education, the information compiled in Chapter 2 will be

utilized to engage students academically, socially, collaboratively, and in evolving ways (Allen et al., 2019; Stevenson et al., 2022). Additionally, this information sets the stage for the project rationale of the *My Work is Wild* curriculum, coordination of details, intended audience, and further evidence used and presented in Chapter 3.

CHAPTER THREE

Project Description

Introduction

Literature supports career literacy education starting as early as middle school so students may assess and understand career-related information and prepare to make personalized decisions when they matriculate into high school (Aschbacher et al. 2014; Curry et al., 2013; Gibbons & Borders, 2010; Mishkind 2014; Valentine & Kosloski, 2021). Research also shows after-school timeframes are effective in teaching STEM topics in ways that also boost social-emotional learning, self-efficacy, and academic knowledge (Allen et al., 2019; Baran et al., 2019). Because of this, the *My Work is Wild* curriculum was created to focus on secondary school students in the afterschool timeframe. My research sought to answer the question: *what tools and experiences are effective in teaching conservation career literacy to secondary education students in the afterschool setting?*

In this chapter, I identify and discuss the project's development, setting, and intended audience. The project overview will include the rationale for the curriculum, the supporting evidence for contributing pedagogy, and the timeline of the project. The setting includes the people, places, and schedule related to the teaching of the curriculum, and the audience describes the intended student body this curriculum is geared toward.

Project Overview And Development

This curriculum is a five-lesson unit for middle-school students in the afterschool setting that focuses on career literacy of conservation careers, while also engaging students in relevant STEM skills and how professionals use these skills to be successful in their careers. The development also centered around two of Collective For Youth's

after-school programming outcome goals, “reinforcing academic competency” and “foster curiosity/future focus" (Collective for Youth, n.d.b, [Infographic]). The practice of career literacy fits well within these goals and lessons are designed to be inquiry-based and link in Nebraska state science standards for middle schools to support students' academic efficacy. The beginning of the curriculum lists a breakdown of specific Nebraska state science standards that are addressed. Each lesson lasts approximately sixty minutes and is given once per week over the course of a five-week period. The lessons focus on linking how these vocations are necessary to students' communities and make a difference in our world, as studies show students are more apt to join career pathways that are relevant to their everyday lives (Allen et al., 2019; Aschbacher et al., 2014; Habig et al., 2020; Wyner & DeSalle, 2010).

Each lesson focuses on one conservation based career that is not commonly taught in traditional education. Lessons provide important context into these professionals' daily work and their impact on our natural world and communities. The selected profession domains include wildlife rehabilitation, entomology, ornithology, aquatic ecology, and soil conservation. The lessons focus on one or two engaging activities that model the required skills of each profession such as water or soil testing, assessment of wildlife, and documenting data. These small-scale STEM experiments were created to include tools such as careful observation, role modeling, or projects to actively engage students in the learning process.

To deliver the most impactful message in support of these career pathways, the curriculum employs useful tools such as science as identity, Achievement Motivation Theory, Constructivist Theoretical Frameworks, Project and Inquiry-Based Learning, and

Cultural-Historical Frameworks— tools that are proven effective for career literacy, especially in the STEM field and welcome diverse cultures and students (Aschbacher et al., 2014; Habig et al., 2020; Haynes, 2015; Martinich et al., 2006; Redman et al., 2021; Stevenson et al., 2022; Wyner & DeSalle, 2010). All activities are highly interactive and inquiry-based— prompting students to test hypotheses and create their own forms of knowledge as aligns with the Constructivist Theoretical Framework (Stevenson et al., 2022). For example, in the lesson on water ecology, students will use scientific tools to test a community water source in the classroom for various data points (brought to the classroom by the educator). In pairs and small groups, students will follow explicit instructions mimicking real protocols of testing done by professionals in the water ecology career field. Successfully completing these small tasks will lend to students' self-efficacy, which Achievement Motivation Theory suggests guides students to see these career fields as tangible pathways for their future (Aschbacher et al., 2014). Details that also focus on local community natural resources (like using community water sources) also link the relevancy of these jobs to students' lives using a place-based framework of education centered around locality (Martinich et al., 2006; Wyner & DeSalle, 2010).

It is also imperative that this curriculum is created using inclusive and culturally sustaining pedagogy to reflect the trending demographic of public school students, and combat the diversity gap in the current conservation job field (Aschbacher et al., 2014; Habig et al., 2020; Haynes, 2015; Martinich et al., 2006; Redman et al., 2021). The curriculum also features in each lesson a corresponding (often local) conservationist with differing intersectionalities providing important information such as their educational

background, why they joined the conservation field, and how they make a difference to provide students with tangible role models. This leads to students understanding science as a form of identity and seeing themselves through it respectively as a lens (Aschbacher et al., 2014). The collection of data from local professionals was curated through a digital questionnaire. Cultural-Historical Frameworks suggest turning this into valuable discussions on the use of identity and mindset and how that transforms into actions and how people interact with the world (Allen et al., 2019). Several topics, such as water ecology and conservation specifically, offer gateways to introducing several topics important to culturally sustaining pedagogy such as water policy, water sovereignty, and the history of injustice surrounding BIPOC peoples and the environment. These incremental steps towards larger-picture issues are important for all students to understand the complexity and conflicts that still persist around people of color and the environment. However, several of the people featured in the *My Work is Wild* profiles are actively fighting these injustices. It is the hope that learning their stories galvanizes our future leaders to combat these injustices and to consider their future role in these conflicts.

Creation of the *My Work is Wild* curriculum occurred from February-July of 2023. Curation included completion of written lesson plans, creation of supporting materials, identification of supplemental materials for purchase, and identification of an appropriate assessment process.

Setting & Audience

The setting this program will be utilized in is for on-site, in-person, after-school educational programming. Attendance in afterschool programming is salient, so lessons will be created for 2-15 students under the guidance of two educators. Lessons will be

created to build a more complete scope of conservation vocations and their importance, but can also be attended as a stand-alone program if a student only attends one lesson.

When possible, lessons are also conducted outdoors to model fieldwork conducted by conservation professionals. Working with the elements such as heat or wind provides useful skills to students and models common work conditions of many of these vocations (Wyner & DeSalle, 2010). Outdoor lessons do depend on the school having an appropriate and safe outdoor space to do so — when not possible, all lessons can be conducted inside as well to provide an alternative for inclement weather.

Students undergoing the *My Work is Wild* curriculum are public school 5th, 6th, 7th, and 8th-grade students who opt into programming as opposed to sports, other extracurriculars, or going home after the traditional school day. Currently, paired schools are in the Omaha metro area but the curriculum is applicable to the greater state of Nebraska. Pairing with specific schools is handled by a non-profit grant organization, Collective for Youth, which also provides funding for programming, staff professional development, and program assessment. Annually, the afterschool network serves 7,400 students, 86% of which identify as a minority and 21% are English language learners (Collective for Youth, n.d.a). The diverse make-up of the afterschool network only furthers the importance of including culturally sustaining pedagogy into all afterschool curricula.

Assessment

After the curriculum is designed and implemented, I plan to utilize the Weikert Programs *Youth Program Quality Assessment Tool* (YPQA, also referred to as the YPQI, or Youth Program Quality Intervention Tool) to match how assessment is undergone in other sessions of the afterschool program and compare goals with other partner programs

who also utilize this tool. The YPQA tool was created by experts in the afterschool education field, working to engage students effectively while also offering a safe and supportive learning environment (The Forum for Youth Investment, n.d.). What began as a country-wide research project, has produced an effective workbook for assessing program quality based on specific values (such as Youth Voice, Supporting Environment, and Session Flow) and then breaks down explicit examples of those values when used in the classroom (The Forum for Youth Investment, n.d.). Specifically, an assessment will be enacted by video-taping randomized lessons in the unit and having a third party watch the footage and score the program with the YPQA tool. External parties review sessions and provide scoring based on the presence of the YPQA values, and then score the strength of how it was used in the classroom with either a 1, 3, or 5 (The Forum for Youth Investment, n.d.). The data and observations will then be utilized to capitulate a planning stage for improving the program for future use.

Additionally, the *Next Generation Science Standards* (NGSS) are utilized to assess appropriate STEM core ideas and practices for student development and to set them up for further academic achievement in school (Next Generation Science Standards n.d.). *Next Generation Science Standards* also offer conceptual guidance on creating connections across different science domains (Next Generation Science Standards n.d.).

Conclusion

To summarize, this career literacy curriculum will be utilized in elective after-school programs in middle schools in a five-week, once-weekly session with differing vocations presented each week. The curriculum is created with the use of proven career literacy principles with effective pedagogical theories for STEM and conservation based education. This curriculum will be delivered in person by education

staff from my organization at public schools and development of the curriculum extended from February-July 2023. Assessment of the program will be with the YPQA tool used by a third party. In Chapter 4, I assess my personal growth from this project, possible limitations of the curriculum, and how specifically this curriculum will benefit my existing afterschool programming as well as recommendations for use.

CHAPTER FOUR

Introduction

Career pathways for students are a deeply personal and dynamic experience. Career options are overwhelming, confusing, and often misrepresented or poorly understood in traditional classroom curricula (Curry et al., 2013). In an effort to clear the uncertainty, and guide students towards engaging career opportunities in conservation and STEM, this project sought to answer the question— *what tools and experiences are effective in teaching conservation career literacy to secondary education students in the afterschool setting?* Through the research of proven effective pedagogy, barriers, and influences to students in engaging in career pathways, and best practices for inclusion and diversity, the *My Work is Wild* curriculum for afterschool secondary school students was born.

In this concluding chapter, I will revisit the major themes that aided this project and provided the foundation for its planning and creation. From what affects students' career pathway decisions, to how they learn best about STEM topics, many theorems and studies provided insightful knowledge about best practices and how the project was ultimately approached. Limitations are identified and discussed, and finally, suggestions for future use and recommendations for further career literacy and adjacent studies.

Pathways and Connections from Literature to Project

At the onset of the project, I believed the themes of career literacy to be straightforward. However, upon research, I found that career literacy is a variable and subjective term, that is often misrepresented in education. Curry et al. (2013) and Valentine & Kosloski (2021) proved to be very useful sources for understanding the current state of career literacy in K-12 traditional schooling and identifying the major

gaps in knowledge and challenges. Their critical overview of the topic included many helpful suggestions for teaching it to secondary school students that influenced *My Work is Wild*, including the separation of career literacy and career readiness, and best practices for education that stimulated students to consider their futures.

There is also a wealth of academic literature supporting effective pedagogies for teaching STEM topics. Careers in conservation use a veritable host of skills and trades parallel to STEM that have been proven useful to practice in the classroom in preparation for entrance into the conservation career pipeline (Baran et al., 2019; Blickley et al., 2013). A paper from 1986 by Markus & Nurius laid a foundation for my understanding of students' "self-efficacy" and how greatly it influences students' confidence in school, life, and eventually their careers. Aschbacher et al. (2024), Holmes et al. (2018), and Gibbons & Borders (2010) also championed the use of self-efficacy as a tool, especially as it relates to teaching STEM. Habig et al. (2020) and Martinich et al. (2006) who specifically studied after-school programs focused on STEM with a conservation focus, aided in the skeleton structure of the lesson plans and themes to focus on.

Many factors and barriers exist between students and joining certain career pathways. From personal, social, familial, or structural— students' choices are influenced in a myriad of ways. I found the works by Habig et al. (2020) and Haynes (2015) especially helpful when pinpointing these barriers and other sociological factors and concepts students engage with when considering their future.

Lastly, and most exhaustively, I pooled many sources on how to make *My Work is Wild* inclusive of students with diverse and varying intersectionalities. It is clear from the literature that certain races, cultures, and sexes have been left out or faced discrimination

from the conservation field— so a main tenet of this program had to be recruiting students who identify with these backgrounds to the cause (Archer et al., 2021; Haynes, 2015; Holmes et al., 2018; Jeanson et al., 2019). Archer et al.'s *Towards fairer conservation: perspectives and ideas from early-career researchers* provided a solid background for the history of discrimination and equity issues in the field of conservation. *Twenty actions for a good Anthropocene—perspectives from early-career conservation professionals*, by Jeanson et al. (2019) outlined flagstones to adhere to in lesson creation. Important themes included embracing flexibility and change, collaboration, and considering nature as a socially connected system (Jeanson et al., 2019). From here, Nattrass (2020), Sookyoung Lee et al. (2022), and van Eijck & Roth (2009) elucidated in their works effective tools for the creation of inclusive lesson plans including the use of ethnic pride, two-way learning or collaborative education, and the use of *Cultural–Historical Activity* theoretical frameworks.

Limitations

Limitations to this curriculum mainly occur at a level of organization that is beyond the educators' ability to change. The afterschool sphere is ever-changing, hinging upon the lessons and educators to be adaptable, and often sacrifice goals. Often, individual students' attendance is sporadic, at the behest of a guardian's schedule, sick sibling, or other limiting factor. While the curriculum is set up to allow individual lessons to be somewhat insular— when attempting to paint a thorough picture of one career pathway, attendance to all the lessons is much preferred. Participating in the entire arc of the curriculum and developing relationships with the educators and fellow students supports their self-efficacy and eventually career aspirations (Aschbacher et al., 2014; Curry et al., 2013). Timing is often another issue. It is not uncommon for schools to have

their programming run late, get done early, or cancel entirely due to a variety of reasons. This affects the lesson plans, consistency in time spent with students, and the environment educators have to platform the product.

Another limitation at the production end is how to appropriately and thoughtfully include varying types of intersectionality other than race or culture. One question not answered in this project is, how does sexual orientation affect one's job outlook and aspirations? Or, how does sexual orientation affect professionals already engaged in the conservation world? And, how do you appropriately then incorporate that into an informal after-school lesson? Neuro-divergency, religious views, previous trauma, and physical disabilities are other aspects of human life that affect future goals and are not incorporated into this curriculum— how could those be included (Kassaee & Rowell, 2016; Nattrass, 2020)? Each sect of a person's identity shapes who they are in unique and faceted ways, each requiring a different educated approach. This project addresses but a slim piece of the whole that students may consider when learning about and approaching career pathways.

Project Use, Recommendations, and Future Focus

The focus of this project has always been to introduce more students to conservation career pathways and embrace the inclusivity of diverse cultures and identities. Organizations that focus on conservation, not only mine but across the country, will benefit from stronger cohorts of young, impassioned professionals entering the conservation field (Jeanson et al., 2019). While women in STEM have doubled over the past decade, other historically marginalized communities such as African-Americans and Hispanics still do not represent in STEM the overall American constituency (Habig et al., 2020). Increasing diversity in career fields garners not only a more equitable work field

but diverse voices, views, skills, and solutions (Haynes, 2015). With the looming Anthropocene epoch and the myriad of issues related to the climate crisis facing these new professionals, new and innovative ideas are imperative (Jeanson et al., 2019) Firstly, my recommendation for future iterations of *My Work is Wild* is continued focus on bridging inequality gaps with further researched tools past what has been focused on in its initial launch.

Additionally, considerations should be made of how to bridge this program for middle-school students in the afterschool timeframe to my organization's current high school science academy program. Retaining these students and adding to their career literacy knowledge would further their placement on the conservation career pathway. However, continuation between these two programs will not be easy. Students in the current *My Work is Wild* programming may be in as early as 5th grade, and generally, the high school program is a better fit academically for students of sophomore standing or higher. Additionally, the high school program requires an application process and additional teacher referrals. While preference can be given to students who have completed *My Work is Wild*, the process of any application or student-led initiation to a program will present a barrier for some individuals.

An early stage plan for this includes a take-home handout for students who complete the programming as eighth graders (who are about to enter high school) with information about the program and assurance that their coordinating educator from our organization will count as their teacher referral to help expedite their application process. Take-home leaflets and pamphlets are not the most salient way to remind interested students to apply however due to their disposable nature, so continued focus on education

on the program and call for applications will continue on social media and to high school teachers in the district. This adds another valuable connection from students who have completed *My Work is Wild* in middle school to continue their literacy of conservation careers in their high school education. In this project and all career pathway recruitment curriculums— considerations for retention will ensure a more effective outcome.

Conclusion

Ensuring curriculum is culturally sustaining is a cyclical, not a finite, process. It is easy to get bogged down as an educator trying to address every injustice and or discriminatory piece of history. And attempting to do so, often results in frustration or apathy in students (Archer et al., 2021). Relationships change, the future becomes the past, and humans evolve. Keeping up with the sociological implications of the curriculum we offer must involve a continued process of reflection, continued education, and adaptability on the educator's part. When I approached this project, I felt a strong need to learn as much knowledge on the gap in diversity in conservation jobs as I could and "solve" the problem. What I have found is there are many solutions— and each offers a tangible tool in my diversity and inclusion toolbox, but will never cure racial injustice. Trust is needed to employ these tools and to believe that I am enacting lasting change, even if I cannot presently see it. Tempering expectations is a challenging lesson for the impassioned. This is perhaps, a common educator's plight— to "fix" or "solve", and simply, this is not the role of an educator. I reflect now that my responsibility in this project is to arm students with applicable tools, skills, and knowledge to feel confident in their choices and capacity to move forward, but in the limitations of the time I have with them. I cannot inexplicably dispel all their fears of the future in a five-lesson unit, but I can ensure the time spent is thoughtful, purposeful, and engaging.

Another lesson was not what I had to glean from academic literature, but that which I learned from my colleagues and peers. Reaching out to young conservationists around the U.S. for diverse professional profiles was perhaps the most insightful facet of this project. While I had dozens of people not respond, understandably, in this busy world— the individuals I did connect with were vehement champions of their beliefs. Many not only filled out my questionnaire with thoughtful, sagacious advice but also shared videos, books, or presentations to help my efforts. While it is not the person of color's responsibility to teach me, the privileged white educator, about inequality and the efforts to influence change— many were eager to offer help. It opened my mind to all sorts of other pedagogical tools, activities, and experiences for future use. My only regret is I stumbled upon them so late in my project journey.

Career literacy is a growing field of interest and the literature had much to offer in the creation of *My Work is Wild*. While implications were certainly indicated for further study, there was sound research to build the foundation of the lesson plans and infer best practices throughout the process. I used these resources to shape a five-lesson unit that is approachable and engaging. The curriculum heightens marginalized voices and leaves room for self-identity and the complexities of environmental injustice. Pedagogical theories that focus on achievement and confidence underpin lesson coordination to pave the road to student self-efficacy. Limitations exist but are stimulating food for thought. While some constraints, such as student attendance, educators do not have much control over, some just require further research and investigation. Bridging the gap between programming from middle- to high school is certainly an aspect that could use future consideration. The steam gathered in *My Work is Wild* in the after-school timeframe must

live to bridge the gap into higher education to be successful. Looking to the future of this program, I also envision an evolving centrality around environmental justice and the purposeful inclusion of diverse peoples. Alas, we come full circle— a lesson is never finished, it exists to be continually adapted. It is my utmost expectation to return to this project again and again, as I strive to put forth a product that is continually greater than the last.

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