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Sparks, Belonging, and Relationships: High School Teachers' Use of Developmental Context to Engage Students in Career Pathways

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SPARKS, BELONGING, AND RELATIONSHIPS: HIGH SCHOOL TEACHERS' USE OF DEVELOPMENTAL CONTEXT TO ENGAGE STUDENTS IN CAREER PATHWAYS

by

Dave Francis

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ABSTRACT

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by

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The 4-H Thriving Model emphasizes youth development through sparks, belonging, and relationships. This study examined how teachers integrate sparks, belonging, and relationships to create a robust developmental context that positively impacts academic, vocational, and personal outcomes. A mixed-methods approach, using both qualitative and quantitative data collection and analyses, was utilized to understand the practices of high school educators who teach environmental science or natural resources management.

The target audience for both data collection forms was Utah science and career and technical education (CTE) teachers teaching natural resources and related topics. Educators described their role in guiding students to identify sparks, nurturing interests, and connecting them to careers through various teaching techniques, including guest speakers, field trips, contests, and student presentations. Additionally, teachers described fostering belonging in their classrooms and how they developed positive relationships with students.

Lastly, science and CTE teachers differ in teaching emphasis. CTE teachers, for example, have a more specific model that includes three distinct components for each class, yet both described and the evidence demonstrated that they have a positive contribution to students' lives that helps build student career awareness and helps build the classroom developmental context. This can lead to long-term academic success that prepares students to be ready to pursue further education and careers in natural resources management and environmental science.

(199 pages)

PUBLIC ABSTRACT

Sparks, Belonging, and Relationships: High School Teachers' Use of Developmental Context to Engage Students in Career Pathways

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The 4-H Thriving Model outlines how a foundation for youth sparks, belonging, and relationships can lead to short and long-term outcomes. This study explored how high school teachers in Utah integrate the elements of the foundation of the 4-H Thriving Model in environmental science and natural resources management classroom teaching. A mixed method of interviews and surveys was used to understand teaching practices. Teachers described helping students discover their interests (sparks), nurturing these interests, and linking them to careers using methods like guest speakers, field trips, contests, and student presentations. They also worked on creating a sense of belonging in their classrooms and building positive relationships with students. Science and career and technical education teachers had different teaching approaches, with career and technical education teachers using a specific model tailored to teaching models outlined by this discipline. Despite these differences, both types of teachers positively influenced students, fostering career awareness and preparing them for future academic and career success in natural resources management and environmental science.

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CHAPTER I: INTRODUCTION

This dissertation explores the developmental context created by Utah high school teachers of science and career and technical education (CTE). The research uses the 4-H Thriving Model, a change theory in positive youth development. The model identifies sparks, belonging, and relationships as the foundation of positive youth development programs. career and academic success are among the long-term outcomes of programs that use sufficiently high levels of these foundational elements, meaning these programs could play a vital role in linking students to future careers.

A career pipeline in natural resources management and environmental science is essential to address growing environmental sustainability and conservation challenges. This pipeline ensures a continuous supply of trained professionals who can effectively manage and protect natural resources while promoting sustainable development. This pipeline should promote diversity and inclusion by encouraging people from diverse backgrounds to pursue careers in this field.

In recognition of the need for future employee development, this research seeks to answer the question: *How do high school educators who teach environmental science and natural resources management foster an inclusive developmental context supporting academic motivation, career awareness/aspiration, and positive youth development for their students?* Exploring this question requires understanding the current situation of workforce development, factors that impact career choice, and teachers' intentional use of building a developmental context and promoting career pathways.

The 4-H Thriving Youth Model recommends intentionally planning and implementing programs to provide a rich developmental context with activities that

enhance thriving. A developmental context is the setting or environment in which young people can grow and thrive. The model is used by youth development professionals to assist in the planning and implementation of education programs to ensure that the foundational developmental context is in place to increase the reality of realizing the short- and long-term outcomes outlined in the model. Thriving occurs when youth grow from their associations and use all they gain to add value to the world around them. It also relies on youth actively pursuing their sparks a passion for a self- identified interest or skill, or a capacity that metaphorically lights a fire in a young person's life, providing energy, joy, purpose, and direction, supported by their environments (such as a 4-H program) and developmental relationships that encourage this pursuit—associated with achieving the program's developmental outcomes (Arnold & Gagnon, 2019). The 4-H Thriving Youth Model (Arnold & Gagnon, 2019) serves as the theoretical foundation for this study.

Numerous potential factors impact a young person's career interests and future employment. For example, a sample of 2,213 high school seniors from nine schools in Rhode Island were surveyed about their academic and career choices and the perceived influences on those choices. According to Dick & Rallis (1991), parents and teachers were seen to have a greater impact on students' career decisions, particularly in fields such as engineering and science, compared to other career paths. Because the school environment is one of the possible factors that can impact student career interests and future employment, this study will examine the classroom developmental context, which will be measured by looking at three indicators: sparks, belonging, and relationships.

Additionally, the research will seek to identify differences between the science and CTE disciplines as well as educator demographics. Both disciplines teach similar content, but the funding, intended outcomes, and teaching methods differ. Lastly, the research will examine how educators intentionally connect classrooms and careers.

Research Objectives and Expectations

Purpose

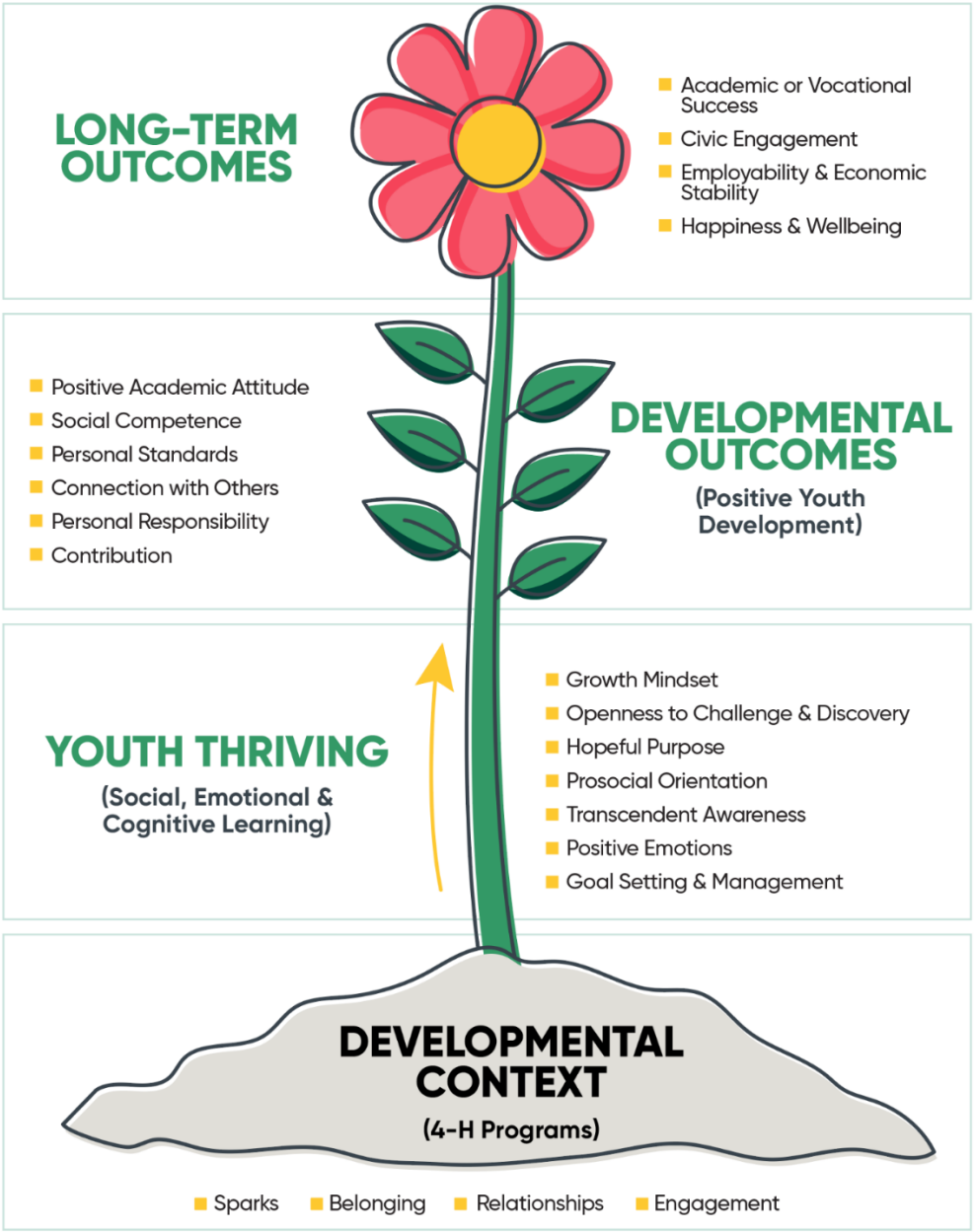
The 4-H Thriving Model (Arnold & Gagnon, 2019) recommends a foundation of a developmental context to realize the outcomes discussed in the model. The context is the setting that the youth engage with. The goal is to create a positive, engaging space with hands-on learning opportunities for youth. The developmental context is built on three foundational pieces:

1. Youth sparks: The environment should provide a place for youth to explore their interests and passion.
2. Belonging: This refers to creating a learning environment where youth feel safe and are secure in knowing their ideas matter. In this space, youth are sometimes challenged, and they are encouraged to persevere when adversity arises. In a space with a good development context, youth will believe in their abilities as they build new skills.
3. Developmental relationships with adults who are caring, challenge their growth, and share power with youth: This is the last element of the developmental context outlined in the 4-H Thriving Model, youth engagement in the program/class moderates the relationship between developmental context and youth thriving (Arnold & Gagnon, 2019).

Figure 1, below presents the 4-H Thriving Model as a flower with the developmental context as the soil that anchors the flower and leads to the thriving behaviors, short- and long-term outcomes.

Figure 1

Thriving Model Plant Graphic



The path from adolescence to adulthood has many possible events/actions that can lead a person to choose a particular career. Research shows that one of the potential factors in a career choice is classroom educators. Haynes and Jacobson (2015) found that mentors and influential teachers were the most vital factors influencing students. This finding is consistent with other research showing the importance of mentoring in career motivations (Lent, 2002).

Mentoring is a contextual factor influencing career interests. Concerning environmental education, mentoring can help students transition from student to practitioner to leader (Fortino, 1997). Mentors often serve as role models, inspiring and motivating mentees to pursue careers or activities. Personal connections and shared experiences can instill a passion for furthering education and pursuing a career in environmental science or natural resources management. Mentors can offer valuable career guidance by sharing their own career paths, experiences, and lessons learned. This guidance helps mentees make informed decisions about their educational and professional journeys. Lastly, mentors can contribute to long-term impact and continuation of the mentoring cycle. As mentees progress in their careers, they may become mentors themselves, creating a positive cycle of knowledge transfer and skill development.

This research examines how teachers support academic motivation, positive youth development (PYD), and career awareness in classroom environments. The research explored how educators support a developmental context that promotes a sense of belonging, developmental relationships and fosters student sparks. The long-term outcomes of the 4-H Thriving Model include: connection with others, vocational and

academic success and a sense of happiness and well-being. To see if the potential to realize these long terms outcomes might be in the realized, this research will look at the foundation, the developmental context, do elements for “thriving” exist in the high school classroom. The guiding questions for this work include the following:

1. In what ways are high school teachers using the developmental context of a sense of belonging and fostering positive relationships with caring adults to create a supportive classroom environment and enhance students’ academic achievement?
2. What learning experiences and techniques do teachers use to assist students in finding and fostering their sparks?
3. How does a teacher’s passion for the topic increase student engagement?
4. How do science and CTE teachers and other demographics differ in using the developmental context elements and career awareness/promotion?

CHAPTER II: REVIEW OF LITERATURE

This literature review first focuses on workforce needs and the theoretical framework of the 4-H Thriving Youth Model that is central to the research questions. Other frameworks and concepts around youth development that support and inform my research are also explored.

Workforce Needs

"Developing the Federal Natural Resource Workforce," published in *Bioscience*, highlights a federal government report documenting the need to replenish a scientific, technical, and managerial workforce to address the shortage resulting from the Baby Boomer generation retirement (Gropp, 2004). Following this report, the Department of the Interior and the Department of Agriculture began investigating how to develop a workforce recruitment and development pipeline to meet the labor shortage in the natural resources management profession (Gropp, 2004).

Unger (2007) outlines the need to address the potential shortage of employees in wildlife science as a critical issue as older employees retire. In natural resources management, compounding factors—including the shrinking budget for natural resources, decreasing numbers of students in traditional wildlife management programs, and a shift to more basic research that builds knowledge about living organisms and how they function vs more applied research.

National Academies of Sciences, Engineering, and Medicine. 1991. Science, Medicine, and Animals. Washington, DC: The National Academies Press. https://doi.org/10.17226/10089.—could result in challenges of not having a sufficient workforce (Unger, 2007). When employers attend college career fairs looking for

potential recruits to work for their company, they are not just looking for technical expertise. The potential employee sought has a broad set of skills, including solid technical expertise and soft skills (Doyle, 2011). Technical skills, or challenging skills, are acquired by using and gaining expertise in performing physical or digital tasks (Birt, 2022).

According to Colburn (2018), the two broad categories of soft skills are interpersonal (i.e., skills between the self and others) and intrapersonal (i.e., skills within oneself). Interpersonal soft skills refer to one's core skills that propel an individual's ability to perform and fit into a specific job. These skills include listening, asking questions, working in teams, resolving conflicts, and showing empathy. Intrapersonal skills include self-awareness, proactiveness, goal setting, time management, perseverance, and self-management (Colburn, 2018). These skills are also needed in all lines of employment rather than specific disciplinary or technical skills of a profession (Robinson, 2006).

James Heckman (2000) determined that having soft skills literacy statistically leads to success more than technical skills literacy. He cites evidence demonstrating that soft skills and competencies are essential for success in professional and personal life. Rayner and Papakonstantinou (2016) found that science, technology, engineering, and math (STEM) programs produce qualified graduates (based on discipline knowledge). However, many programs fall short in teaching inter- and intrapersonal skills and career readiness that employers require. This includes skills in understanding corporate and personal ethics, communicating, and respecting a culturally diverse team of peers (Rayner & Papakonstantinou, 2016).

Wallace et al. (2016) identified a need for natural resources employment to meet all human interests and values in considering workforce strategies. The percentage of minorities in environmental and natural resources professions is not congruent with the racial diversity composition in the United States (Haynes et al., 2015; Kern et al., 2015). Diversifying the natural resources management workforce may help ensure that management decisions and policies are inclusive of all people connected to those resources.

High School CTE Programs and Science Education

Career Technical Education (CTE) refers to educational programs that specialize in providing students with the knowledge, skills, and experiences necessary to prepare them for specific careers or fields. These programs often blend academic learning with hands-on training, allowing students to gain practical experience in their chosen field while still in school.

The Association of Career and Technical Education is “an educational strategy for providing young people with the academic, technical, and employability skills and knowledge to pursue postsecondary training or higher education and enter a career field prepared for ongoing learning” (ACTE, "What is CTE?", https://www.acteonline.org/cte).

CTE programs typically offer a wide range of courses and pathways tailored to various industries, such as healthcare, information technology, manufacturing, agriculture, and more. Students enrolled in CTE programs often have opportunities to participate in internships, apprenticeships, or cooperative education experiences, which further enhance their understanding and skills in their chosen field.

CTE programs are designed to align with industry standards and often involve partnerships with local businesses, industry professionals, and community organizations. These partnerships help ensure that CTE curriculum remains relevant and up-to-date with current industry trends and practices.

In American high schools (grades 9–12), natural resources management and environmental science can be taught as part of CTE programs or science classes.

CTE programs allow students to learn and develop skills in specific career fields, including natural resources management. CTE courses in natural resources management may include agriculture, forestry, wildlife management, and conservation biology.

CTE agricultural education programs for natural resources management provide students with hands-on experience and theoretical knowledge necessary to manage natural resources. These programs teach students about sustainable resource management, conservation, and preservation of natural resources, such as water, air, soil, forests, and wildlife.

Students in CTE agricultural education programs for natural resources management have three components to the learning experience: classroom instruction, the FFA student organization, and Supervised Agricultural Experience (SAE) programs. Because of these required components, the full learning experience is different than a typical high school science course. FFA provides leadership education and a club advisor, and SAE programs provide experiential learning.

High school science education covers a wide range of subjects, including biology, chemistry, physics, Earth science and environmental science. The curriculum aims to

provide students with a foundational understanding of scientific principles, promote critical thinking skills, and foster an appreciation for the scientific method.

The National Science Teachers Association (NSTA), a professional organization dedicated to promoting excellence and innovation in science teaching and learning. According to NSTA, high school science education should emphasize inquiry-based learning, hands-on experimentation, and the integration of technology to enhance student understanding and engagement (NSTA, "Position Statement: High School Science Education").

In addition to traditional classroom instruction, high school science education often includes laboratory activities, group projects, and opportunities for students to conduct their own scientific investigations. These hands-on experiences help students develop problem-solving skills, enhance their understanding of scientific concepts, and prepare them for further study or careers in science-related fields.

Environmental science concepts can be found in science classes, such as biology, chemistry, or earth science. These classes typically cover a wide range of topics related to the environment, including ecology, climate change, pollution, and sustainability. Some Utah high schools have the resources to offer more specific science courses, including environmental science and Advanced Placement (AP) environmental science, wildlife science, and zoology (Utah State Board of Education, 2023).

Positive Youth Development

Adolescents spend significant time participating in school and school activities. High schools use specific courses to provide a structured and comprehensive education that prepares students for various academic and practical challenges. The course

offerings, based on educational standards, local requirements, and community needs, aim to provide a well-rounded education that prepares students for success in higher education, careers, and life. This time allows them to participate in activities that can shape their identities and prepare them for their future.

Using positive youth development (PYD) principles, high school teachers can create a nurturing and empowering educational environment that supports their students' holistic development and well-being. This approach can increase student engagement, motivation, and academic success and promote positive personal and social outcomes. Experiences at school influence every aspect of development during adolescence, ranging from the breadth and depth of their academic learning to their psychological well-being and the impact of peer influences on their development. The developmental context in which this happens impacts students' identity and preparedness (Wigfield et al., 2006).

PYD theory asserts that primary psychosocial conditions are significant determinants of youth well-being (Lerner, 2009). PYD is based on the relational developmental systems theory, which suggests that young people possess resources that can be developed, nurtured, and cultivated. A primary PYD resource is the social context in youth lives, such as family, school, and community organizations. Lerner described PYD as a process that promotes the 5Cs: competence, confidence, connection, character, and caring. Additionally, thriving young people are individuals who actively nurture, cultivate, and develop positive qualities (Lerner, 2009).

Lerner et al. suggest that adaptive developmental regulations predict youth development through positive, mutual interactions with their contexts. The phrase "mutually influential relationships between the individual and the context, represented as

individual ← → context relationships" refers to the bidirectional interaction and influence between a person and their environment. The individual and their surroundings impact each other and continuously affect and shape one another.

Suppose these adaptive developmental regulations emerge or are fostered, specifically between a developing young person and various aspects of their environment such as their family, school, peer group, and community. In that case, the chances are higher that the young person will thrive (Lerner, 2009). Thriving here refers to experiencing healthy and positive developmental changes during adolescence. Elements of the developmental context of high-quality youth programs have been considered since the PYD field gained momentum in the 1990s (Eccles et al., 2001).

If youth have a high-quality developmental context learning experience that emphasizes these critical social–emotional skills, there is potential for PYD outcomes. Short-term outcomes include academic motivation and success, social competence, high personal standards, connection with others, personal responsibility, and contribution to others through leadership and civic engagement. Youth who achieve positive developmental outcomes are more likely to achieve long-term outcomes marked by vocational or academic success, civic engagement, employability, economic stability, happiness, and well-being (Arnold, 2018). Because of the potential impact of short- and long-term impacts on youth and the larger community, I chose the 4-H Thriving Model as the theoretical framework for this study.

Introduced in 2018, the 4-H Thriving Model looks at the elements of a youth development program that contribute to involvement that, in turn, leads to realizing long-term impacts (Arnold, 2018). This model looks into the "black box" of PYD to determine

what was working well and what was lacking or needed improvement. By understanding the developmental context, we can begin to predict the long-term outcomes that include academic and vocational successes. In his book *Black Box Thinking: Why Most People Never Learn From Their Mistakes—But Some Do*, Matthew Syed (2015) argues that aviation is much better than other fields in acknowledging and learning from performance failure. If an airplane crashes, the black box containing essential flight data is recovered, the data are analyzed, and any ensuing lessons are shared rapidly across the industry to improve an engineering practice or pilot behavior and reduce the risk of a repeat event. Likewise, the 4-H Thriving Model uses a similar strategy to realize the short and long-term outcomes outlined by a 4-H logic model (Arnold, 2018).

The 4-H Thriving Model combines several proven successful elements to guide the development of a high-quality youth development program, regardless of subject matter. This includes the facilitation of youth sparks (Benson & Scales, 2009), the presence of developmental relationships (Li & Julian, 2012; Search Institute, 2014), program quality standards, and sufficient youth engagement with the program (Chaput et al., 2004).

At its core, the developmental context of the 4-H Thriving Model includes youth sparks, relationships with caring adults, and belonging.

Sparks

Arnold (2018) defines a youth spark as "a passion for a self-identified interest or skill or a capacity that metaphorically lights a fire in a young person's life, providing energy, joy, purpose, and direction." Youth sparks are essential to a child demonstrating thriving behaviors. These behaviors include openness to challenge and discovery, growth

mindset, hopeful purpose, prosocial orientation, transcendent awareness, positive emotionality, and self-regulation through goal setting and management (Arnold, 2018).

A spark gives a young person a sense of direction and encourages goal setting. Sparks are different from mere leisure activities in that they:

- Create significant actions that contribute to the benefit of the young person and society,
- Provide the intrinsic fuel for a young person's growth in knowledge and skills, and
- Enhance a young person's networks as they encounter others with similar sparks, particularly adults with expertise who can facilitate learning and opportunities for engagement.

In the book *The Path to Purpose: How Young People Find Their Calling in Life*, Damon (2008) discusses how fostering youth sparks contributes to personal development by helping young individuals discover their strengths, interests, and values. This process is crucial for building self-esteem, resilience, and a sense of identity. Fostering sparks also has positive academic outcomes. Engaging in activities related to one's passion has been linked to improved academic performance. When students are motivated and find relevance in what they are learning, they are more likely to excel in their studies (Eccles & Gootman, 2002).

Lastly, Hirschi and Herrmann (2013) found a clear alignment with sparks and career aspirations. When youth are passionate about a particular field, they are more likely to align their career goals with that passion. This alignment can lead to a clearer sense of direction and purpose, enhancing career readiness.

Belonging

The second element of the developmental context found in the 4-H Thriving Model is belonging. A sense of belonging provides an environment where youth feel like they belong, which is critical in designing high-quality programs. This environment should allow each child to grow and develop according to the directions and timing of their interests and abilities.

According to Arnold (2018), the following program characteristics foster belonging:

- Youth are safe and secure in knowing their ideas matter.
- Youth work in an environment they can trust to be positive and supportive.
- Youth are challenged sometimes and encouraged to persevere when adversity arises.
- Youth are reminded to believe in their abilities as they build new skills.
- Learning occurs in an environment where a young person's family, school, and community can all unite.

In a separate study by Rose et al. (2016), students at 10 Tennessee high schools enrolled in at least one agriculture/natural resources course, and FFA members were the study population. Students who participated in the survey overwhelmingly responded that the FFA is a place where their need for belonging is being met. Most (89.6%) of the FFA members surveyed answered that they have a place to call "home" within their school. An even larger group (93.4%) of members also responded that the FFA had enhanced their ability to make friends (Rose et al., 2016).

Self-actualization is described by Maslow (1943) as an individual's desire to exceed one's potential, becoming everything one can achieve. Croom and Flowers (2001) agreed that students become eligible for FFA membership during one of the most challenging stages of life, the teenage years. Both Maslow and Croom and Flowers indicated that individuals long for contact, intimacy, and a sense of belonging. Membership in a student organization like FFA provides these opportunities and the opportunity for self-actualization of participating members (Croom & Flowers, 2001).

A sense of belonging may be especially critical for young people who must traverse significant ethnic, racial, socioeconomic, and sociolinguistic borders to feel fully part of a school where middle-class, majority cultural norms often predominate (Garcia-Reid et al., 2005).

Relationships

The last element of the developmental context of the 4-H Thriving Model is the importance of positive relationships in the development of young people. Positive relationships involve supportive interactions with peers, adults, and family members. Specifically, the 4-H Thriving Model highlights four critical components of positive relationships: positive communication, mutual respect, trust, and shared experiences (National 4-H Council, 2018).

Positive communication involves clear, respectful communication that helps young people feel heard and valued. Mutual respect involves treating others with kindness and understanding, even in disagreement or conflict. Trust involves building relationships based on honesty, reliability, and consistency. Finally, shared experiences

involve engaging in activities and experiences together that foster positive connections and meaningful relationships (National 4-H Council, 2018).

Haynes and Jacobson (2015) found that mentors and influential teachers were the strongest factors influencing students. This finding is consistent with other research showing the importance of mentoring in career motivations (Lent, 2002). Mentoring is a contextual factor influencing career interests. Concerning environmental education, mentoring can help students transition from student to practitioner to leader (Fortino, 1997). The need for a relationship with a caring adult who builds and supports youth sparks is the foundation of the developmental context for the 4-H Thriving Model (Arnold, 2018). If we want to increase the number of potential employees on a natural resources pathway, we must start with the developmental foundation of fostering youth sparks and building environments that allow youth to connect with caring adults.

Various studies have shown that the quality of teacher–student relationships (TSRs) and students' feelings of classroom belonging predict changes in students' academic motivation, engagement and learning, and social–emotional well-being in school (Burchinal et al., 2008; Deci et al., 2009; Roeser et al., 2000; Wentzel & Wigfield, 2007). Krane et al. (2017) explored students' experiences of TSRs in upper secondary school. Qualities of TSRs concerning students' mental health and dropout likelihood have also been explored. Positive relationships between adolescents and adults are perhaps the single most important ingredient in the promotion of PYD.

Teacher support is often categorized into two categories of student support: instrumental support and emotional support and care. Instrumental support is the practical assistance and subject-related guidance that teachers provide for individual students.

Emotional support is related to students' perceptions of the extent to which teachers value, accept, and respect them as people (Hoy & Weinstein, 2006; Studsrød & Bru, 2011).

However, these concepts are intertwined and interact in numerous ways (Suldo, Riley, & Shaffer, 2006). Negative TSRs are characterized by high levels of conflict and negative emotions (Drugli, 2013). In negative TSRs, students frequently believe that teachers do not care about them and are not interested in their success or willing to help them with problems (Davis & Dupper, 2004). Krane et al. (2017) found the potential of TSRs and importance of small actions perceived as recognition and kindness in everyday life. When teachers promote a friendly, caring, helpful atmosphere, it is likely that students will develop positive TSRs and thrive at school.

Beyond TSR, student classmates' relationships impacted how well they liked the class. The ability for a teacher to utilize effective classroom management is essential for students to feel comfortable in the classroom. Students were uncomfortable if their peers engaged in disruptive behavior and inappropriately challenged the teacher because teachers were ineffective in fostering relationships and constructing an engaging learning environment (Keller et al., 2016). By looking at teacher use of the developmental context element of relationships with a caring adult, we may further understand how teachers do or do not form positive relationships with students as it contributes to the short- and long-term outcomes found in the 4-H Thriving Model.

Keys (2019) examined the essential classroom factors for promoting classroom belonging and engagement by interviewing 31 diverse students in tenth grade, reflecting on their ninth-grade year. The students shared that teacher who utilized established

instructional practices to help students, had the perception of an increased sense of classroom belonging and engagement. Because high school students rotate through several teachers and classes during the instruction week, Keys was able to ask what were their most and least favorite classes.

Findings from this study revealed two teacher actions that built students' classroom belonging and behavioral engagement: (a) fostering relationships with and between students and (b) employing teaching practices that encouraged students to participate in the work for the class. These actions were accomplished when teachers worked to build teacher–student trust through honest feedback and listening to students, provided engaging and relevant lessons and activities, instilled classroom management practices that went beyond just dealing with disruptive behavior, created a seating arrangement to facilitate pair and group work, and supported students socially and academically (Keys, 2019).

Keys also found that some students described liking aspects of their least favorite class, such as liking the course subject because they were "good at it" or personally liking the teacher because he or she related well to kids, even if he or she was not a good instructor; or liking their classmates. This research shows that students' sparks/interest or abilities in the course material can be present in a class they identify as least favorite because of the teacher.

Keys's findings also suggested that teachers play a vital role if students feel they have not succeeded in the subject matter. While generally, students were less likely to feel a sense of belonging and engagement in a class if they felt they had failed in their classes on the subject in the past, some distinguished teachers reversed this. A teacher

who effectively built relationships and constructed an engaging learning environment made students feel supported, thus boosting their belonging and engagement.

A teacher may be able to reverse the negative impact of failing a class and allow a student to resume a potential coursework path. This is especially critical with core subjects like math, which serves as a foundation for physics, chemistry, and engineering (Cuoco, A., Goldenberg, E. P., & Mark, J., 1996). Success and failure in math courses can open or close doors of future education and careers for students. A teacher may be able to reverse the negative impact of failing a class and allow a student to resume a potential coursework path. Additionally, positive TSRs are associated with lower dropout rates. Students who feel connected to their teachers are more likely to stay in school, attend classes regularly, and persist in the face of challenges (Jimerson, S. R., Campos, E., & Greif, J. L., 2003). The high school TSR can be important to students' academic and socioemotional development. Positive relationships contribute to motivation, engagement, academic achievement, emotional well-being, and a positive classroom climate, fostering an environment conducive to effective learning.

In addition to the 4-H Thriving Model, Bronfenbrenner's ecological systems model emphasizes the interconnectedness between an individual's development and the multiple environmental systems in which they are embedded. These systems include the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner, 1979).

In the context of a high school classroom, Bronfenbrenner's ecological systems theory suggests that students' development is influenced by various factors and interactions within and beyond the classroom.

1. Microsystem: The microsystem represents the immediate environment where students directly interact, such as their peers, teachers, and classroom. It focuses on students' direct relationships and experiences within the classroom, including the TSR, classroom climate, and peer interactions.
2. Mesosystem; This system refers to the connections and interactions between different microsystems. The high school classroom context includes the linkages between the classroom and other settings, such as the student's home environment, extracurricular activities, and community. The quality of communication and collaboration between these systems can impact students' development.
3. Exosystem: The exosystem encompasses external settings that indirectly influence students' development but are not directly experienced. In the high school classroom, examples of the exosystem include the school administration, educational policies, and the broader community. These factors can shape the resources, opportunities, and support available to students.
4. Macrosystem: This system refers to the cultural values, beliefs, and ideologies influencing the high school classroom and education. It includes broader societal norms, economic conditions, and historical contexts that shape educational practices, curricula, and student expectations.
5. Chronosystem: The chronosystem recognizes that development occurs over time and involves historical changes. It includes the influence of significant events, transitions, and societal changes on students' educational experiences and

outcomes. This can encompass changes in technology, social trends, or educational reforms.

Bronfenbrenner's ecological systems theory provides a comprehensive framework for understanding how various interconnected systems influence the developmental context in a high school classroom. It highlights the importance of considering the interactions between students, teachers, families, communities, and broader societal factors to promote students' optimal development.

Bronfenbrenner's model can be seen as a precursor to the 4-H Thriving Model, which examines the critical role of developmental context in fostering PYD. This model identifies how youth need to be part of a group that fosters a sense of belonging, builds relationships between youth and adults, and engages in projects that fuel their sparks. These three elements are the foundation of a developmental context that builds thriving behaviors in youth. Academic and vocational success is a long-term outcome of building a developmental context that includes the three elements (Arnold, 2018).

The Child Development Institute at Sarah Lawrence College highlights in their publication ""The Positive Classroom: Creating a Positive Classroom Climate" PYD strategies for creating a positive classroom environment that supports students' social-emotional development and overall well-being, This research will examine how high school educators build this developmental context in the classroom to potentially lead students to future careers in environmental science and natural resources management.

FFA and Supervised Agricultural Experience

CTE and science education represent distinct educational domains, each with its own focus and goals. In the area of environmental science and natural resources

management content for coursework, there is considerable overlap. The primary difference is that CTE uses two unique program elements not found in science education: the FFA organization and a required integrated project for each student and class called the Supervised Agriculture Experience (SAE) (FFA.org, 2024)

FFA is a career and technical student organization (CTSO) that promotes career success for students in the Agriculture, Food, and Natural Resources Career Cluster®. It is part of a three-component agriculture education program: classroom instruction, FFA, and the SAE. In 2021 national SAE project enrollment was estimated at 767,749 student projects and 945,988 FFA members in 9,163 chapters in all 50 states, Puerto Rico, and the U.S. Virgin Islands (FFA.org, 2024). FFA was founded in 1928 as the Future Farmers of America and has undergone several changes. In 1988, the organization changed its name to the National FFA Organization to reflect that its mission had expanded beyond agriculture and farming to include a broader range of career opportunities in STEM fields (FFA.org, 2023).

An SAE program is designed to provide hands-on learning opportunities to students in agriculture education programs outside classroom instruction. An SAE can take various forms, depending on the student's interests and goals. It can involve working on a farm, ranch, or other agricultural business. Other forms of SAEs may involve research, exploring agricultural/natural resources-related careers, or participating in community service projects related to agriculture. An SAE aims to provide students with practical experience and help them develop the skills, knowledge, and work ethic necessary to succeed in their future careers (FFA.org, 2023).

Diversity, Equity, and Inclusion in Student Organizations

Jones et al. (2021) interviewed 22 African American teachers about their perceptions of the merger 1965 merger of the New Farmers of America (NFA) and the Future Farmers of America (FFA). Until 1965 segregation laws had two youth agriculture organizations NFA to serve African American students and FFA to serve white students. These two organizations merged in 1965. Their study utilized interviews, to examine perceptions of the impact of the merger. Teachers perceived that the merger was not a merger "takeover" that led to a critical absence of participation and leadership development among African American youths. The merger had a drastic, negative impact on the number of African American agriculture teachers produced and the number of individuals in the pipeline for agriculture-related careers.

Previous studies demonstrate that teachers can use FFA and SAEs as practical tools to realize PYD impact. However, some youth continue to perceive FFA membership as a barrier to participating in the program. A nationwide survey of 540 FFA members revealed that a barrier to involvement in FFA was the perception of how others perceive FFA, including that it wasn't for urban students and it lacked diverse mentors (Hoover & Scanlon, 1991). A case study of 10 schools with more than 300 FFA members and nonmembers revealed that nonmembers often referred to FFA members as "hicks," "hillbillies," and "farmers" (Phelps et al., 2012). Nonmembers also displayed apathy toward participating in FFA activities.

These perceptions of FFA and its members from outsiders and non-FFA members can create challenges for recruiting diverse students. Students who cannot identify with an organization or its members will not be inclined to join or participate (Larson, 1994).

Thus, the organizational culture of FFA may negatively alter how urban students think about the organization.

Martin and Kitchel (2014) used a qualitative approach to understanding the perception of FFA and urban youth. They studied members of the "Belmont High" FFA chapter (pseudonym) and those who attended the National FFA Convention. They selected the FFA chapter at this high school for two reasons. First, the school was part of a large urban school district, and second, the students had few ties to production, agriculture, and rural life.

Belmont is a magnet school serving students from every corner of the city. The student body is racially and ethnically diverse. During the Martin and Kitchell study, the Belmont student population was 60% African American, 20% Caucasian, and 20% Asian and Hispanic. The school had two agriculture teachers, each with a curriculum pathway: veterinary science and horticulture. Both teachers were Caucasian and female. They both came from predominantly rural and traditional FFA programs in high school.

The student population of the agriculture program was generally representative of the school; however, this study focused only on the FFA members attending the National FFA Convention. The 15 FFA members included 14 females and one male: 10 Caucasians, three African Americans, one Hispanic, and one biracial member. The racial breakdown of the members attending the National FFA Convention did not closely align with the demographics of the Belmont agriculture program (Martin & Kitchel, 2014).

Observation and interviews resulted in four data collection events over two months. The data collection happened before, during, and after the National FFA Convention. Data collected before the convention asked students about their membership

and connections to the group. Students new to the program expressed that they joined as a class requirement or to meet new friends. Returning students connected with the program through a love for working with animals or leadership development (Martin & Kitchel, 2014).

At the convention, the students' sense of cultural awareness was heightened. In addition to recognizing that students from all over the United States attended, they also noticed that they were not the typical demographic at the event. However, they did not disparage or have negative attitudes toward other FFA members. Members generally had a positive experience at the convention. They cited meeting new people and having opportunities to develop leadership as highlights.

Reflecting on their convention experience, some Belmont students noticed the many rural agricultural images compared to the sparser urban agricultural images of agriculture. This resulted in some members increasing their understanding of rural agriculture, making connections between large animals and rural-urban agriculture. In contrast, others wanted to highlight more urban agriculture. Most students returned to their school chapter with a desire to stay involved and do more (Martin and Kithell, 2014).

The FFA component of the more extensive agricultural education can foster a sense of belonging by providing opportunities for students to connect with other club members/adult club advisors, promoting diversity, equity, and inclusion, and creating a positive and welcoming environment.

On the other hand, if the learning environment is one in which students do not feel like they belong, they may feel isolated and that the program/class is not for them. This

can negatively impact their academic performance and lead to lower engagement in school activities. As this is a unique program element to CTE classrooms, it provides one area of potential exploration of the differences in the developmental context element of belonging fostered in CTE versus science classrooms.

An interview with Professor Charlie Nilon, an African American faculty member of fisheries and wildlife, highlights the potential barriers for Black, Indigenous, and people of color (BIPOC) youth interested in a possible career (Weathersbee, 2021). "There was a program in southeast Missouri designed to introduce Black kids to careers in natural resources. However, even in this program designed to recruit them, they did not see anyone doing anything outside who looked like them" (Weathersbee, 2021). Not seeing people of similar ethnicities and economic statuses in a career is a significant barrier.

The 4-H Thriving Model outlines that belonging is essential to the developmental context, leading to academic and vocational success and overall happiness. When students feel a sense of belonging in their school community, they are more likely to feel comfortable, engaged, and supported. This, in turn, can lead to better academic performance, higher self-esteem, and improved mental health.

Science Classroom Experiences and The Developmental Context

Because agricultural education has integrated the FFA organization as part of its teaching, connecting those FFA program elements with some standardization level to the 4-H Thriving Model is easier. While high school science teaching does not have a uniform program that includes strategies for career pathways, national Career and Technical Student Organizations (CTSO) like FFA include elements of PYD as part of

their teaching methods. I sought to identify high school science program elements that can provide similar engagement experiences. Looking at possible connections for programs that focus on environmental science and natural resources within the science education effort, I identified two sources, science competition and service learning, that include community/citizen science.

Science Competitions

Science fairs are one of the oldest and largest science competitions. Grinnell, Dalley, and Reisch (2020) researched the impact of science fairs. In their study, which involved high school science students from various states who competed in a local or national science fair, approximately 60% said they were interested in a career in the sciences or engineering, 15% said they were not, and the remainder were unsure. Also, about 60% of the students expressed that science fair participation increased their interest in the sciences or engineering. This indicates that science fairs can be the source of either initiating or feeding a youth's sparks of science and engineering (Grinnell et al., 2020).

One additional finding of the Grinnell et al. (2020) study connecting to the 4-H Thriving Model looks at youth thriving behavior by supporting openness to challenge and discovery and a growth mindset. Youth who desire to explore and try new things and challenges demonstrate thriving behaviors. Similarly, youth with a growth mindset supporting learning over innate ability will exhibit this thriving behavior. The study authors found significant evidence that students think science fairs should not be required. Two negative impacts of requiring student involvement included the percentage of students who expressed that they did not want to pursue a career in science or engineering when linked to an opinion about requiring (10%) and the increased level of

cheating at the science fair because participation was required (Grinnell et al. 2020). Involvement in this kind of contests and competitions may increase students' self efficacy.

Self-efficacy refers to an individual's belief in their ability to accomplish tasks and achieve desired outcomes successfully. It is a concept rooted in a social cognitive theory introduced by psychologist Albert Bandura (1977). In the 4-H Thriving Model context, self-efficacy is crucial in promoting positive development among youth.

Within the model, self-efficacy is an essential factor influencing how young people approach challenges, set goals, and persist in facing obstacles. When youth have a strong sense of self-efficacy, they are more likely to believe in their abilities, have confidence in their skills, and exhibit resilience in pursuing their goals. Free choice involvement allows youth to develop self-efficacy (Grinnell et al., 2020).

The Institute of Competition Sciences curates a list of over 500 science competitions. A review of this list presents evidence that science competitions vary significantly in subject matter, participation level, and resources/time required to compete (Neubert, 2016). The National Conservation Foundation-Envirothon is the largest high school environmental education competition in North America. The Envirothon is an environmental education program and competition that engages high school students in learning about natural resources and environmental issues. It typically involves teams of students participating in hands-on activities, field studies, and written tests to demonstrate their knowledge of various environmental topics. The program aims to promote environmental awareness, knowledge, and stewardship among students (National Conservation Foundation, 2023).

In 2001, Weiser provided evidence that the Envirothon program does make a statistically significant difference between the environmental literacy of high school students who have participated in the Envirothon program and those who have not, specifically in the cognitive component of environmental literacy. However, no significant difference was found in environmental literacy's affective and behavioral components. It is important to note that the population was small, studying high school students from 17 out of 43 states with Envirothon programs. Only 148 students completed the Wisconsin Environmental Literacy Assessment instrument as part of this study (Weiser, 2001).

Even though it is a small dataset, this information does illuminate an area in which educators who serve as coaches for the Envirothon might better apply the elements of PYD to affective and behavioral components. Educators have done an excellent job teaching their students natural resources and environmental science content, as demonstrated by the significant difference in the cognitive domain. To make a difference in the affective domain and behavior domain, perhaps elements of PYD could be included in the overall program.

Based on Weiser's research and my knowledge of the 4-H Thriving Model, educators could implement two thriving behaviors in the Envirothon competition: hopeful purpose and prosocial orientation. Hopeful purpose happens when youth have a sense of hope and purpose and see themselves on the way to a happy and prosperous future. Prosocial orientation happens when youth see helping others as a personal responsibility and live up to the values of respect, responsibility, honesty, kindness, and generosity. In a prosocial orientation, youth care about and give back to their communities (Arnold,

2018). Competitions like the Envirothon can include all three elements of the thriving developmental context: sparks, relationships, and belonging. When educators are intentional about the use of these elements, the impact will increase.

Service Learning and Citizen Science

Science teachers often incorporate service learning and citizen science into their teaching strategies to engage students in real-world experiences and enhance their understanding of scientific concepts. The National Service-Learning Clearinghouse defines service learning, as "a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities" (National Service-Learning Clearinghouse, "What is Service-Learning?"). Service learning can include teachers involving their students in projects related to environmental conservation, like tree planting or habitat restoration (Eyler & Giles, 1999).

Citizen science engages members of the public, including students, in scientific research projects or data collection efforts. The Cornell Lab of Ornithology defines as citizen science, "public participation in scientific research" (Source: Cornell Lab of Ornithology, "What is Citizen Science?"). Citizen science projects can cover a wide range of scientific disciplines, including astronomy, ecology, biology, environmental science, and more. Teachers involve their students in citizen science through activities like monitoring water quality in local rivers or lakes, contributing valuable data to scientific research (Silvertown, 2009). Service learning and citizen science can be combined in a holistic approach to enhance students' scientific understanding and community engagement (Jordan et al., 2011).

Career Connections

Cohen et al. (2013) conducted interviews and focus groups with over 70 high school science teachers and other science and career education experts to understand how high school students become aware of STEM career options. Understanding how educators can help students translate awareness into the pursuit of STEM careers and provide students with the support and skills they need to succeed are crucial elements in ensuring the future of our STEM workforce. They identified that high school students need knowledgeable adults to make explicit connections between their interests, classroom lessons, and applications in the work world.

For some students, this may happen through participation in after-school clubs or interactions with career counselors, who can provide invaluable guidance as students seek to define and pursue their goals. Unfortunately, many high school students never meet with their career counselors or cannot be involved in an after-school club. However, all high school students interact with at least one science teacher. Science teachers may be best positioned to understand and keep abreast of STEM-related occupations, but some teachers may be as removed from career knowledge as their students. (Cohen et al., 2013) found that participants reported deficits in their awareness of science-related career options. One teacher said, “If I do not understand how fields of STEM merge together, I am reticent to encourage kids in careers” (Cohen et al., 2013 p. 13).

Teachers also reported a lack of pedagogical strategies and resource materials that would allow them to infuse career awareness into their lessons. Still others did not perceive making connections between science content and career applications as part of their science teacher role. (Cohen et al., 2013 p. 13) did provide evidence that teachers’

reflections on their inclinations and abilities to make connections between science lessons and potential careers revealed an increasingly important role for science teachers in fostering student motivation to enter STEM careers.

Demographics

Teacher demographics can impact student performance in several ways, and various factors can influence these effects. The impact of teacher demographics on student learning is a complex and multifaceted issue, influenced by a variety of factors including cultural competence, representation, role modeling, and instructional practices. Conchas and Villegas (2016) examined how the racial and ethnic diversity of teachers can affect the academic achievement and engagement of minority students. Conchas and Villegas argue that minority students often benefit from having teachers who share their racial or ethnic background, as these teachers may possess a deeper understanding of students' cultural backgrounds, experiences, and challenges, leading to more culturally responsive teaching practices and greater academic support (Conchas, G.Q., & Villegas, A.M. 2016). It is important to note that the relationship between teacher demographics and student performance is complex and may not always be the primary influencer that impacts student performance. For each of the demographics collected in the quantitative instrument, I have identified evidence of why this may impact the developmental context in the classroom.

Teacher Experience and Education Level

Teachers' experience and qualifications, such as their level of education and years of teaching experience, can influence student performance. More experienced and highly

qualified teachers tend to positively impact student outcomes (Hanushek & Rivkin, 2006).

The impact of a high school teacher's education level on student performance is a complex and multifaceted issue, and research findings can vary depending on various factors. However, some evidence can be found that suggests that teacher education level can have some influence on student outcomes. Two specific examples look at teacher education level in a subject matter content area; for example, science, and another example providing evidence of the impact of pedagogical training. Teachers may have degrees in a specific discipline (for example, science) or may choose to continue their education in educational leadership or teaching.

Teachers with higher levels of education can possess a deeper understanding of the subject matter they teach. This can positively impact their ability to convey complex concepts and inspire student interest. Research has shown that teachers with strong content knowledge can have a positive impact on student achievement (Hanushek & Rivkin, 2007). Of note, the authors found that just having a master's degree has no systematic relationship to teacher quality as measured by student outcomes. However, Ingersoll (2007) found that teachers with advanced degrees, such as a master's in education, have typically received additional training in educational theory and instructional strategies. This training can help teachers employ more effective teaching methods in the classroom.

Gender

Teacher gender has also been found impactful in related research, especially in subjects where gender stereotypes may come into play. Research has shown that female

students may perform better in math and science when taught by female teachers (Beilock et al., 2010).

Ethnicity

The quality of teacher student relationships can be influenced by shared racial or ethnic backgrounds, potentially leading to improved student engagement and performance (Ewing & Taylor, 2009). Also, teachers who share the same racial or ethnic background as their students can be positive role models and provide cultural relevance in the classroom, which may lead to increased student engagement and motivation (Gershenson et al., 2016).

Type of Community Taught (Urban, Rural, Suburban)

School location can significantly impact student performance in urban, rural, or suburban settings. The effects of school location on student performance can be attributed to various factors, including resource allocation, teacher quality, school facilities, and socioeconomic conditions.

Rural schools face resource challenges, particularly in attracting and retaining qualified teachers, due to geographic isolation and lower salary scales. However, the same researchers found that schools in urban areas may also struggle to attract and retain high-quality teachers, resulting in higher teacher turnover rates and potentially impacting student achievement (Ingersoll & Strong, 2011).

Some urban schools may face overcrowded classrooms, inadequate facilities, and a lack of necessary educational materials (Biddle & Berliner, 2002). Having fewer students can lead to rural schools struggling with limited access to advanced courses, extracurricular activities, and technology due to budget constraints (Hedges et al., 2018).

Passion

Additional questions regarding the teacher's passion for the topic and teaching natural resources or environmental science are included in this study. This is based on evidence of teacher passion for a topic found in the literature review and a response to information found in the qualitative interviews. Many teachers expressed being responsible for a wide array of subjects to teach besides natural resources management or environmental science. Teachers demonstrating passion for a topic can have a positive impact by increasing student engagement, providing positive role models, and building positive teacher–student relations.

When teachers are passionate about a subject they teach, it can translate into more engaging and dynamic lessons. This can capture students' attention and make them more enthusiastic about the subject (Harackiewicz, Barron, Tauer, & Elliot, 2002). Passionate teachers can serve as role models for students. Their enthusiasm for the subject matter can inspire students to develop a deeper interest in the topic and pursue it further (Linnenbrink-Garcia & Patall, 2016). Further, students experiencing a passionate teacher can have a lasting impact on their lives which may influence their career choices and lifelong interests (Ladson-Billings, 1992). Lastly, a teacher's passion can foster a positive teacher student relationship, as students tend to respond more positively to teachers who show genuine enthusiasm for what they are teaching (Kunter et al., 2008). In addition to relationships, a teacher's passion for the subject taught can impact student performance. Keller et al. (2016) found that enthusiastic teaching motivates, inspires, and excites learners, improving learning and learners' achievement. Passionate teachers can inspire and motivate students to reach their full potential.

CTE Versus Science Teachers

CTE educators who teach the topics of agriculture and natural resources and science teachers are both responsible for courses that focus on topics related to the natural world and the environment. They may cover plant and animal sciences, ecology, environmental conservation, and sustainability. Both types of teachers often incorporate hands-on, experiential learning activities into their instruction. They may conduct field trips, lab experiments, and outdoor projects or engage students in practical applications of agriculture, natural resources, and science concepts.

CTE agriculture and natural resources teachers typically have a more applied focus, emphasizing practical skills and knowledge related to agricultural production, farming, horticulture, animal husbandry, forestry, or natural resources management. The National Council for Agricultural Education outlines the standards that provide a framework for agricultural education programs at the secondary level. These standards define the essential knowledge and skills that students should acquire in agricultural education to be prepared for further education, careers, and lifelong learning in agriculture-related fields. They often follow industry-aligned curricula, including technical skills training, and may cover agricultural business, equipment operation, or sustainable land use. Demonstrating a career pathway that includes various education levels and jobs is an essential planning tool for CTE teachers. (The National Council for Agricultural Education 2024).

Conversely, science teachers focus more on scientific principles, theories, and research methodologies. They cover a more comprehensive range of scientific disciplines, such as biology, chemistry, physics, or environmental science, emphasizing

scientific inquiry and critical thinking. The National Science Teachers Association (NSTA) was actively involved in the development and review of national science education standards. The NSTA participated in the development of the Next Generation Science Standards (NGSS), which provide a framework for K-12 science education in the United States (NSTA, 2024).

Environmental science and natural resources management are taught in two departments in Utah high school classrooms. Mostly, teachers are responsible for coursework in one of the two departments. While the topics taught are similar, the departments, teaching philosophies, and strategies differ: CTE teachers in agricultural education use a three-circle instruction model, while science education teachers focus on the Next Generation Science Standards. CTE teachers and science teachers also have distinct roles and responsibilities, reflecting the different educational techniques of their respective fields.

CTE teachers may be more likely to provide students with career development experiences, industry guest lecturers, FFA, and SAEs (Stone, J. R., III, 2013). CTE teachers have a primary focus on preparing students for the workforce. They aim to equip students with the skills and knowledge necessary for successful entry into specific careers immediately after graduation (Anderberg & Hyslop-Margison, 2012).

Science teachers often prepare students for further education in science-related fields. The emphasis is not only on immediate career readiness but also on providing a foundation for those who may pursue higher education and careers in scientific research (National Research Council, 2007). Israel et al. (2012) compared 11th-grade science achievement test scores of students enrolled in various CTE course clusters, including the

agricultural and natural resources cluster, with those enrolled in STEM and health clusters and the education and training cluster. The analysis revealed that performance on the standardized science test tended to improve as a student's coursework in a CTE program increased as they experienced more coursework that takes them further into a specific career pathway.

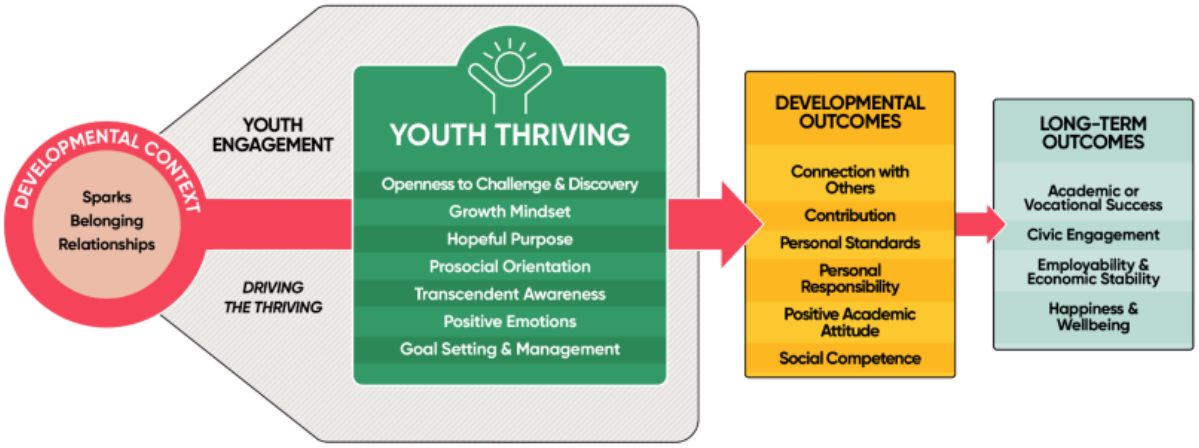
Their results also showed that students in agriculture programs scored slightly lower on the science test than those in health programs and somewhat lower than those in STEM programs, but higher than students in education programs. CTE students with at least two or more credits in the same agriculture programs scored on par with those in health programs and slightly lower than those in STEM programs after controlling for student and school factors.

This literature review examined existing research on the role of high school teachers in creating a supportive classroom environment and enhancing student achievement through fostering a sense of belonging and positive relationships. It examines various strategies employed by teachers to leverage developmental contexts and caring adult relationships to promote academic success. Additionally, the review delves into the techniques utilized by teachers to help students discover and cultivate their passions, known as "sparks," It explored the impact of teacher passion for a subject on student engagement. Finally, the review compares the instructional approaches of science and Career and Technical Education (CTE) teachers in utilizing developmental context elements and promoting career awareness, providing insights into disciplinary differences and their implications for student learning outcomes. Referring to the Thriving Model in Figure 2 below, we see how the three elements that make up the

developmental context: spark, belonging and relationships are drive thriving through engagement (https://helping-youth-thrive.extension.org, 2024)

Figure 2

4-H Thriving Model



CHAPTER III: METHODOLOGY

I utilized a mixed-methods approach to answer the four research questions using both qualitative and quantitative data analyses methods. This methodology provided me with an opportunity to begin to understand the practices of high school educators that teach either environmental science or natural resources management.

For both data collection methods, the target audience was Utah science and CTE teachers who teach in some aspect of environmental science or natural resources management. The research questions included:

1. In what ways are high school teachers using the developmental context of a sense of belonging and fostering positive relationships with caring adults to create a supportive classroom environment and enhance students' academic achievement?
2. What learning experiences and techniques do teachers use to assist students in finding and fostering their sparks?
3. How does a teacher's passion for the topic increase student engagement?
4. How do science and CTE teachers and other demographics differ in using the developmental context elements and career awareness/promotion?

Qualitative Research

Qualitative data was collected through semi structured interviews with teachers of high school science classes and CTE classes focused on environmental science and natural resources management. The complete interview guide can be found in Appendix A. These interviews were conducted to understand how teachers create a developmental context that fosters a sense of belonging in students, encourages sparks development, and helps them build positive relationships with caring adults in their classroom instruction.

The study design, semi-structured interview guide, informed consent, and participant contacts were all vetted by a panel of experts and approved through the Utah State University Institutional Review Board (IRB). The interviews were conducted at a location preferred by the participants (mostly all in their classrooms) and lasted 45 minutes to an hour. The interviewer followed Hatch's recommendations (2002) for conducting successful qualitative interviews during the interviewing process, including establishing respect, paying attention, and encouraging participants. To add rigor to the study, the qualitative data was triangulated using peer debriefing, participant validation/member checking, and reflexivity presented by Morse et al. (2002).

Peer debriefing established reliability and validity. Participant validation or member checking was realized by sharing the research findings with all 10 of the participants of the study. I sought their feedback, corrections, or additional insights. This process helped ensure that my interpretations aligned with the participants' perspectives and experiences. Lastly, as a researcher, I reflected on my role, biases, and potential impact on the study. This reflective process contributed to the transparency of the research. (See a reflexibility statement in Appendix E.)

The sample was selected using a collaborative process with the State of Utah Board of Education. Discipline specialists in science and agricultural CTE were asked to provide potential teachers to interview. These initial names, provided by the specialists, didn't result in sufficient teachers accepting the invitation to be interviewed. To increase the number of educators in the survey, I then invited teachers who represent different geographic regions of the state to be interviewed. Utah's population is mainly concentrated in four counties in the greater Salt Lake area. To ensure that the interviews

represented the entire state, I chose locations in parts of the state with lower populations that provide a diverse set of teachers who may have differences in resources and the number of classes they teach. The qualitative portion of the research is based on a literature review of the following:

- Factors impacting involvement in natural resources, career choice, and attitudes
- Development of career pathway preparation programs
- Potential challenges for diversity in the natural resources management field
- PYD theories

This portion of the data collection was primarily through one-on-one interviews with educators conducted over Zoom with teachers joining the Zoom meeting while in their classrooms.

A phenomenology research framework guides the qualitative methodology. Phenomenology is widely used in qualitative research as a framework for exploring and understanding the subjective experiences of individuals. It provides a systematic and rigorous approach to studying the lived experiences, perceptions, and meanings attributed to phenomena from the perspective of those who have experienced them (Giorgi, A., 1997).

A standard set of semi-structured interview questions guided each discussion. These questions were open-ended to prompt descriptions and narratives of the experiences that the educators have. In addition to the interview transcripts, the

interviewer took notes to record observations and insights collected during the audio-recorded interviews.

Reflexivity and Role of the Researcher

For the qualitative portion of this study, I have checked my biases, assumptions, and beliefs about this topic through a subjectivity statement. Going into this research, I have identified the following biases and beliefs:

- I am a product of a CTE natural resources class, which I took in my senior year of high school. This enjoyable course increased my bias toward CTE as a potent vehicle for natural resources management in high school versus a biology course.
- Professionally, I work with many teachers who bring high school teams to the annual Utah Envirothon competition event. Because of this, I am more familiar with the courses and teaching styles than a typical investigator.
- My belief about the strength of CTE programs' proactive approach to building pathways is strengthened by my work on the Granite School District Agriculture and Natural Resources Advisory Board.

Recognizing that I have the potential for bias, I opted to employ a neutral interviewer to conduct the interviews and assist with the initial coding. This study's reflexivity statement can be found in Appendix E.

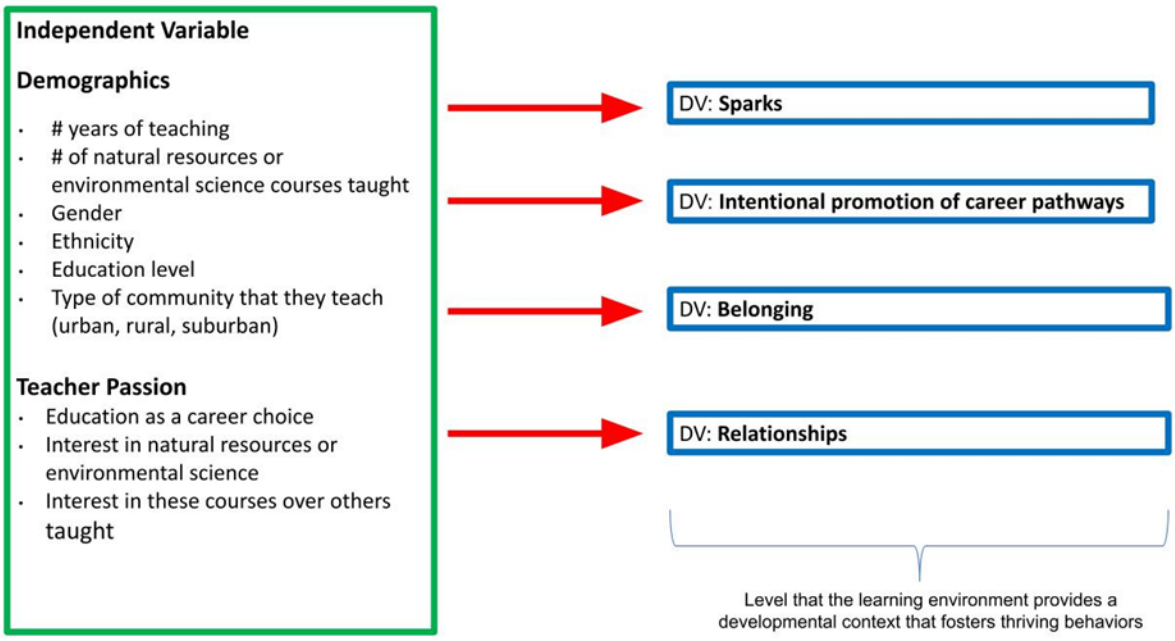
Quantitative Research

The second portion of the research involved a quantitative study with public school teachers in Utah who teach high school (grades 9–12) natural resources or agricultural CTE or high school science courses, including biology, earth science,

environmental science, advanced placement (AP) environmental science, concurrent enrollment environmental science, chemistry, wildlife biology, or zoology. The following conceptual framework, Figure 3 outlines the model that guided the research.

Figure 3

Conceptual Framework Research Model



This target population is appropriate to understand the level at which Utah teachers use elements in the 4-H Thriving Model to build a developmental context. The instrument reached the entire population of educators teaching natural resources–related and science topics in public schools in Utah. A total of 85 participants completed the survey, which had an initial population of 625 teachers. Of the 142 teachers who started the survey, 104 finished; and of those, only 85 were quality responses (answered all questions to the level deemed quality per Qualtrics guidelines, i.e., speed of replies). This represented a 23% response rate and a 73% completion rate. A couple of teachers did reach out saying that they had recently left teaching or had retired, which is why they did

not complete the survey. Response rates to agricultural education surveys have fallen by approximately 30% in the last 20 years (Doss et al., 2021). Declining response rates in agricultural education research aligns with results of survey efforts outside of the discipline (Dillman et al., 2014). When a portion of the population fails to respond to a survey by not completing the survey, it can result in a biased sample (Bordens & Abbott, 2018). According to Ary et al. (2014), nonrespondents can differ from respondents in characteristics such as education, intelligence, motivation, and interest in the survey topic. Results of a sample that is not representative of the population to be generalized to can be a threat to the external validity of the study (Fraenkel et al., 2019). Ary et al. (2014)

Quantitative data was collected through online surveys that were modified by the researcher and administered to teachers of these classes, asking them to rate their use of the developmental context to create a sense of belonging, foster sparks, foster positive relations, and raise awareness and opportunities for future career aspirations. See Appendix B for additional questions were asked about the passion that teachers have for teaching environmental science or natural resources management.

Data analysis involved comparing the qualitative data collected from interviews with the quantitative data collected from surveys to identify any patterns or trends in the data. The differences in the developmental context created in science classes versus CTE classes were also analyzed using qualitative and quantitative data to identify significant differences. The survey was administered through Qualtrics; in recent years, Qualtrics software has become ubiquitous (Rogers, 2017). Qualtrics Core XM also allows

customized end-of-survey messages. This feature sends customized thank-you messages to teachers who participate in the survey.

The Contact List feature is an essential element of the system due to its usefulness in improving the efficiency of data collection. By importing a .csv file of participants' names from a contact list, individualized survey links were emailed to all educators. Furthermore, the messages used the Piped Text feature, embedding a teacher's name in the greeting line. This feature helps improve response rates and get broader participation in data collection efforts (Tourangeau & Plewes, 2013).

Similarly, using the Contact List feature, the Qualtrics Core XM system can automatically generate reminder emails to only those individuals who have not yet completed the survey. To increase response rates, reminders can be personalized and set with a customized frequency or set for a specific date (Monroe & Adams, 2012). Additionally, a small incentive (a $5 Tango gift card) was offered to complete the survey. This was automated at the end of the Qualtrics survey, taking participants to a website to redeem their reward.

The survey is based on quantitative questions in the 4-H Thriving Model youth assessment. The reliability of the original question bank was measured with a Cronbach's alpha. The questions remain the same, but verbiage was changed to focus on adult teachers instead of youth participants. Additionally, the questions were informed by the qualitative interviews. Definitions for sparks, for example, were added because the qualitative interviews revealed that teachers do not understand the term.

In the interviews, it became apparent that resources and time that teachers had to support course work were varied. Because of this, one of the questions added to the

quantitative survey was the number and type of courses that the educators are responsible for teaching each year. Many teachers expressed that they were teaching a wide array of CTE or science courses. As teachers discussed their course-teaching load in the interviews, evidence that teachers may have varied levels of interest in specific courses, along with commitment to the content and resources that can be used in and out of the classroom, was identified. This information helped inform questions around teacher passion.

The questions are divided into the following categories:

- Student Sparks
- Student Belonging
- Developmental Relationships
    - Caring Adults
    - Challenging Growth
    - Youth–Adult Partnership
- Demographics
- Teacher Passion

I first sent the survey to a panel of five experts in natural resources education and agricultural education. Following their review, the survey was sent to a list of 75 CTE teachers in Southeast Idaho to test the instrument to establish validity and reliability. Twenty-four usable responses were received. The responses were analyzed to determine if there were any misleading or confusing questions, and a reliability test was conducted. With the exception of sparks with a Cronbach's alpha score of .641, each of the other

question blocks had a Cronbach's alpha score above .70, as shown in **Error! Reference source not found.**.

The survey was then sent to Utah science and CTE teachers. To generate an email list to send the survey instrument, I asked the Utah State Board of Education specialists for potential lists and recommendations. The CTE specialist provided a complete list of CTE teachers and the Science specialist provided recommendations for courses to include in a teacher list for science teachers. With this information, I assembled my list of potential teachers by researching high school websites for those teaching high school courses in these subject matter areas. Teachers were invited to participate using the Tailored Design Method of Surveying (Dillman, 2007).

A personalized pre-notice email was sent to the instructors, informing them they had been selected to participate in a research study. The email was sent from a USU email address, and the instrument was designed through a USU template in Qualtrics. The introduction in the email included the USU IRB protocol number, a description of the study, and a statement that answers would be kept confidential. One week later, the survey was sent to the teachers. Three reminder emails were sent after five days, the second after 10 days, and the final email three weeks after the initial one. A small incentive ($5) was offered through the Tango gift card platform for complete responses. The incentive process was managed through the Qualtrics platform to increase response rates.

The developmental context portion of the instrument measures teachers' use of the three components that make a high-quality developmental context: sparks facilitation, belonging, and developmental relationships. The original developmental context

instrument was designed to measure youth experience of the same three components of a high-quality developmental context in youth programs. Mean scores and an overall developmental context score were calculated for each component. Once this was determined, the data was examined to determine if any statistical significance existed between the CTE and science teachers. While these two groups of educators teach similar content areas, their methods and the type of students they teach are different. The CTE teachers focus on three fundamental areas: formal instruction, supervised agricultural experiences, and FFA, the science teachers only have formal instruction as their primary teaching design.

The evaluation questions in this study were derived from the 4-H Thriving Model Program Evaluation Instruments Information and Scoring Guide (Arnold & Gagon, 2018). Instruments in this guide were piloted and confirmed the measurement and structure of the 4-H Thriving Model of youth development. The model predicts that the relationship between a high-quality 4-H program (developmental context) and developmental outcomes is mediated by youth thriving. Furthermore, the relationship between developmental context and youth thriving is moderated by the level of youth engagement in the program.

For this study and the target audience of high school teachers, the questions used were found in "Evaluating the Developmental Context" (Arnold & Gagon, 2018), the youth evaluation instrument for the 4-H Thriving Model. The questions were modified to focus on the level of action adults take to foster the developmental context.

For this study, the scale was reduced from seven to five items. This was based on a recommendation from a committee member. A five-point Likert-type scale was used to

increase response rate and response quality, along with reducing respondents' "frustration level" (Babakus & Mangold, 1992).

1—Very untrue

2—Probably untrue

3—Neither true nor untrue

4—Probably true

5—Very true

Student Sparks Questions

The first set of questions asks teachers how they foster student sparks in the natural resources/environmental science classroom. The original instrument that uses these questions as a base has a Cronbach's alpha of .88. These questions are found in the 4-H Thriving Model Program Evaluation Instruments Information and Scoring Guide (Arnold et al., 2018). The Mean Sparks Calculation is the sum of the four items using a range of 1 to 5. This generates a sparks score.

The second set of questions asks teachers how they foster student's belonging in the natural resources/environmental science classroom. These questions have a Cronbach's alpha of .89. These questions are found in the 4-H Thriving Model Program Evaluation Instruments Information and Scoring Guide. The Mean Belonging Score Calculation is the sum of the four belonging questions from 1 to 5. This generates a belonging score.

Developmental Relationships

The third set of questions asks teachers how they foster positive relationships with their students in the natural resources/environmental science classroom. Confirmatory

factor analysis in the pilot studies revealed three sub-factors of the developmental relationship construct: (a) caring adults, (b) challenging growth, and (c) youth–adult partnerships. Each sub-factor has a series of four questions.

1. Caring Adults

The questions in the original instrument used as a base have a Cronbach's alpha of 91. These questions are found in the 4-H Thriving Model Program Evaluation Instruments Information and Scoring Guide. This generates a caring adult score.

2. Challenging Growth

The questions' original instrument used as a base has a Cronbach's alpha score of .87. These questions are found in the 4-H Thriving Model Program Evaluation Instruments Information and Scoring Guide. The Mean Challenging Growth Score Calculation is the sum of the four challenging growth questions ranging from 1 to 5. This generates a challenging growth score.

3. Youth–Adult Partnership

The original instrument questions have a Cronbach's alpha score of .95. The Mean Challenging Growth Score Calculation is the sum of the four youth–adult partnership questions ranging from 1 to 5. This generates a youth–adult partnership score.

4. Teacher Passion

Questions regarding teacher passion for the subject matter taught were collected to better understand the teachers responding to the survey instrument. It is important to note that the relationship between teacher passion and student performance is complex and may not always be the primary influencer that impacts student performance.

Teacher Demographics

Questions regarding teacher characteristics and the type of courses taught were collected to understand better the demographics of the teachers responding to the survey instrument.

Teacher demographics can impact student performance in several ways, and various factors can influence these effects. Additionally, the relationship between teacher demographics and student performance is complex and may not always be the primary influencer that impacts student performance.

Career Connections

To better understand teachers' work connecting future careers in natural resources management and environmental science to classroom activities, teachers were asked how important this concept is and the techniques they use to connect careers and the classroom. Techniques included in the question bank stem from the literature review and techniques teachers indicated using in their qualitative interviews.

The quantitative data summarized the questions and takes the average mean and standard deviation. A regression compared independent variables against each quantitative dependent variable. This assisted in determining what variance exists between teacher demographics and the level of engagement with elements of the 4-H Thriving Model.

Teacher Type Comparison

The two types of teachers' (CTE and science) responses were compared. To conduct this investigation, I used data from the qualitative interviews and quantitative surveys to compare the two teacher groups. In addition to collecting demographics, the

data includes information on classroom techniques, such as whether students take field trips or participate in science fairs or CTE competitions. Findings from this comparison assist teachers in understanding classroom elements that can be included to realize the long-term outcomes found in the 4-H Thriving Youth Model.

CHAPTER IV: RESULTS

I used a mixed-methods research strategy consisting of qualitative and quantitative data collection techniques. Both methods helped in understanding how high school educators incorporate elements of belonging and relationships from the 4-H Thriving Youth Model into their classroom teaching to support a developmental context that includes belonging and relationships.

Qualitative Interview Demographic Data

A neutral interviewer conducted in-depth, semi-structured interviews with participants. Interviews were conducted with teachers using the following criteria: educators in Utah public high schools who teach a science course related to environmental science/wildlife science or natural resources management in a CTE program. Teachers were sampled through purposive and snowball sampling (Tongo, 2007) until data saturation was reached. The final participants (six women and four men) represented a range of geographic areas across Utah and nine of 42 school districts, with two of the 10 schools being charter schools. One charter school emphasizes STEM education and the other focuses on agriculture. One school selected was an alternative high school managed by the local school district.

The semi-structured interview process allowed for unplanned topics to emerge and for the interviewee to lead the conversation whenever possible, fostering mutual respect and engagement (Hatch, 2002). Each interview lasted approximately 50 minutes. The interviews were conducted virtually over Zoom or took place at the interviewees' place of work. The interviewer followed a predetermined question guide, ensuring that all questions were asked in each interview and that the questions were relevant to fostering a

sense of belonging and a relationship with a caring adult (See Appendix A for the question guide). Following consent, each interview was audio recorded, and the qualitative interviews were coded using NVivo.

Data Analysis

Interview transcriptions were copied verbatim using the Zoom transcript feature. The Zoom transcription feature, while helpful, frequently inserts time stamps and transcription errors. To make the transcripts usable in the software, the transcripts had to have the time stamps deleted and transcription errors corrected by referencing the interview video. The interviews were then coded using NVivo to enhance the efficiency of processing and sorting text. The qualitative coding process employed a combination of both closed and open codes. Major themes noted during the interview and transcription process informed the initial coding scheme, and subsequent themes were added throughout (Saldana, 2016). An external coder performed the coding process by working with the researcher to examine and reassess thematic concepts and code definitions (Nowell et al., 2017).

Clarifications in the coding approach were resolved by updating and clarifying the codebook, leading to a consensus on significant themes and convergences of the data (Basit, 2003). This analysis is based on a theoretical frame made evident through the study and recurring patterns in the interview data (Merriam, 1998). I examined the data to determine how educators conceptualize the ideas in the foundational developmental context of the 4-H Thriving Youth Model. This includes specific actions to increase a sense of belonging, develop relationships, foster student sparks, and increase engagement in learning activities. I also examined how educators intentionally showcase careers,

present student options for career exploration, and use field experiences/hands-on labs and other techniques that foster school-to-career awareness connections.

Quantitative Responses and Demographics

A total of 85 participants completed the survey, which had an initial population of 625 teachers. Of the 142 teachers who started the survey, 104 finished; and of those, only 85 were quality responses (answered all questions to the level deemed quality per Qualtrics guidelines, i.e., speed of replies). This represented a 23% response rate and a 73% completion rate. A couple of teachers did reach out saying that they had recently left teaching or had retired, which is why they did not complete the survey.

The demographics of the survey respondents were as follows: 41.2 % (n = 35) were male, 56.5% (n = 48) were female, and 2.4% (n = 2) preferred to not disclose their gender. The majority were Caucasian at 94.1% (n = 80), while 2.4% (n = 2) identified with two or more races or did not want to disclose their race/ethnicity, and 1.2% (n = 1) were Hispanic or Latino. 27.1% (n = 23) had a bachelor's degree, and 72.9% (n = 62) had a graduate degree.

When asked the type of community they taught in, 20% (n = 17) reported a rural community, while 52.9% (n = 45) were suburban and 27.1% (n = 23) urban. The teachers had a mean of 11.97 (SD = 9.34) years of experience ranging from one to 37 years. They taught a mean of 1.13 (SD = 1.27) semesters or trimesters per year of natural resources management and/or environmental science courses. 35% identified as primarily CTE teachers and 65% as science teachers.

Quantitative Findings for Elements of the Developmental Context

Sparks, student belonging, and developmental relationships are the three components of the 4-H Thriving Model, and all three constructs demonstrate good to excellent internal consistency, as evidenced by Cronbach's alpha scores above 0.7. The high internal consistency implies that the questions within each construct are measuring a cohesive and reliable aspect of the targeted constructs. The specific breakdown of responses for each question within the constructs provides additional insights into the participants' perceptions regarding aspects of teaching and learning. These reliability scores suggest that the survey instrument used to collect these responses is a robust and consistent measure of the targeted constructs, reinforcing the credibility of the study's findings.

Table 1

Study Construct Summary

	Very untrue n (%)	Probably untrue n (%)	Neither true/ untrue n (%)	Probably true n (%)	Very true n (%)	Cron-bach's alpha
Sparks Construct						0.771
I allow my students to explore topics they care about.	0 (0.0)	10 (11.8)	20 (23.5)	36 (42.4)	19 (22.4)	
My students are passionate about the learning experiences provided in this class.	0 (0.0)	9 (10.6)	40 (47.1)	33 (38.8)	3 (3.5)	
My students want to learn all they can about the topic of this program.	1 (1.2)	23 (27.1)	35 (41.2)	25 (29.4)	1 (1.2)	
This topic/class is integral to who my students think they are.	3 (3.5)	27 (31.8)	30 (35.3)	21 (24.7)	4 (4.7)	
Student Belonging Construct						0.847

	Very untrue n (%)	Probably untrue n (%)	Neither true/ untrue n (%)	Probably true n (%)	Very true n (%)	Cron-bach's alpha
My students feel safe in this class.	0 (0.0)	0 (0.0)	1 (1.2)	37 (43.5)	47 (55.3)	
My students feel supported by other students in this class.	0 (0.0)	2 (2.4)	9 (10.6)	62 (72.9)	12 (14.1)	
My students feel like they matter in this class.	0 (0.0)	0 (0.0)	8 (9.4)	42 (49.4)	35 (41.2)	
My students feel welcome in this class.	0 (0.0)	0 (0.0)	3 (3.5)	34 (40.0)	48 (56.5)	
Developmental Relationships Construct						0.895
I pay attention to my students.	0 (0.0)	0 (0.0)	0 (0.0)	29 (34.1)	56 (65.9)	
I like my students.	0 (0.0)	0 (0.0)	2 (2.4)	28 (32.9)	55 (64.7)	
I invest time in my students.	0 (0.0)	0 (0.0)	1 (1.2)	20 (23.5)	64 (75.3)	
I show an interest in my students.	0 (0.0)	0 (0.0)	1 (1.2)	27 (31.8)	57 (67.1)	
I help my students see future possibilities for themselves.	0 (0.0)	0 (0.0)	6 (7.1)	41 (48.2)	38 (44.7)	
I expect students to do something positive with their future.	0 (0.0)	0 (0.0)	3 (3.5)	27 (31.8)	55 (64.7)	
I stretch my students and push them in new ways.	0 (0.0)	1 (1.2)	6 (7.1)	48 (56.5)	30 (35.3)	
I hold my students accountable.	0 (0.0)	2 (2.4)	6 (7.1)	33 (38.8)	44 (51.8)	
I listen to my students' ideas.	0 (0.0)	1 (1.2)	2 (2.4)	35 (41.2)	46 (54.1)	
I treat my students fairly.	0 (0.0)	0 (0.0)	1 (1.2)	24 (28.2)	59 (69.4)	
I take my students seriously.	0 (0.0)	0 (0.0)	1 (1.2)	24 (28.2)	59 (69.4)	
I respect my students.	0 (0.0)	0 (0.0)	2 (2.4)	18 (21.2)	64 (75.3)	

Educators Helping Students to Find and Foster Their Sparks

With the overall findings of the model presented, I will now explore each of the three elements found in the 4-H Thriving Model developmental context. To investigate the research question, “what learning experiences and techniques do teachers use to assist students in finding and fostering their sparks?” teachers were interviewed and asked survey questions related to the developmental context area of “sparks”. The attitudes and teaching techniques that educators utilized to promote career awareness are included as part of the responses to how fostering sparks is reported.

Understanding and harnessing youth sparks is essential for educators to help young people grow and develop into successful adults. Youth sparks provide the intrinsic fuel that powers them to grow and build new skills. Educators who understand how sparks can motivate students can personalize learning experiences and demonstrate future career paths. Sparks can be fueled with in-school and out-of-school time. An increased understanding of how educators foster sparks can assist them in designing new learning experiences.

The research questions that focused on sparks in this study include:

- How do teachers work with students to foster their sparks?
- What techniques and experiences do they use to encourage sparks?
- What specific techniques are educators using to connect student sparks with future careers in natural resources management and environmental science?

Youth sparks can open up new opportunities for students in the future. By building skills in areas, they are passionate about, young people may be more likely to

pursue careers or further education in those fields, leading to greater success and fulfillment in their adult lives.

Sparks Qualitative Results

The qualitative portion of this research question examined the interview findings from 10 high school teachers' responses about how they understand and incorporate sparks. Additional questions ask teachers about their attitudes and techniques toward the connection between classroom activities and careers.

The spark-centric interview questions include:

- Do you feel high school classes and experiences play a significant role in laying the foundation for a student to pursue a specific career field?
    - If yes, can you think of any examples as to how? If not, what is the goal of your course instruction?
- What opportunities do you provide youth in your program/class to explore their interests and passions?
- Do you take your students on natural experiences outside the classroom and school grounds?
    - If so, have you found any impact on their performance from these experiences?

Teachers Foster Sparks

Fostering sparks in students is important for student success, and teachers play a crucial role in this process. One of the key ways that teachers expressed nurturing sparks in their students was allowing students to chart their own course. Overall, when teachers shared how they foster spark, the key observation is that teachers show enthusiasm and

pride in their work in promoting spark for environmental science and natural resources education. Teachers were proud of innovative ways that they foster spark in their students. Some teachers described how lack of financial resources to provide unique activities for each student is a real concern. However, teachers found affordable solutions to foster spark in students. This included field trips within walking distance of the school, purchasing affordable kits for 1-2 students to take on a project on their own and using donated supplies.

Nine of the 10 teachers interviewed mentioned 28 times that they give students ownership of their learning. Similarly, eight of the teachers mentioned 18 times that they let students take the lead:

> "Letting them [students] take the lead on things is very important in an agricultural education program and in the FFA. Every year we elect a new set of chapter officers, and … I give the applications to my graduating seniors in the FFA. And they actually choose the officer team for the upcoming year." —CTE 1

Teachers also discussed the shift in their focus from being directly result-driven to focusing on the process of arriving at the result by asking "why" and "how" questions to trigger curiosity and encouraging students to explore a concept. Five of the teachers mentioned six different times that they incorporate inquiry-based learning into their teaching practice. This approach fosters problem-solving and critical thinking skills.

A part of fostering sparks was teachers discussing the process of science as a way of asking questions about something a person may be curious about:

> "For learning to happen, I think there has to be opportunities for students to have time to think and to process. Science is not a set of facts. … It's a process, and

> everything we know and understand about science is because someone took an idea or asked the question and learned how to get answers and learned how to focus on the process of truly coming to understand something where you research it." —Science 2

Classroom teaching techniques assisted in fostering sparks and demonstrating possible career-readiness skills. Teachers were excited to get students out of the classroom and outside, showcasing that "nature" is not a far away place but exists right where students live and attend school.

> "I was trying to teach how important it is for observations. We walked down—there's kind of like this park that's about two, three blocks from our school, and we walked down there, and I gave them an observation scavenger hunt, and they had to find something green … like some kind of bug, some like a type of mushroom or fungi. And it was fun to see." —Science 5

High school teachers can play a pivotal role in fostering a student's spark by focusing on their interests. In the interviews, teachers shared how they recognize that learning is driven by the student's passion. High school teachers can create a rich and supportive environment for students to identify, explore, and nurture their unique interests. When teachers facilitate sparks through positive and supportive teaching methods, students are supported in their growth and encouraged to overcome challenges to reach their goals. All 10 teachers mentioned 117 times that they help their students pursue their interests. With not only the entire teacher group discussing the how to they help their students in pursuit of their own interests, but with the volume of times it was mentioned, it was clear that this this part of the developmental context is not only

important to educators, but is also an active part of the classroom instruction. Teachers play a pivotal role in fostering a spark in their students because it contributes to motivation, engagement, personalized learning, critical thinking, and lifelong learning. It goes beyond academic achievement, impacting various aspects of a student's personal and intellectual development.

Teachers Promote Careers

Career planning is a process that helps high school students make informed decisions about their future careers. It starts with exploring interests, identifying potential careers aligned with the interests, and getting experience through internships, hands-on activities, etc. Teachers play a key role in this process through talks, guidance, and providing opportunities for exploration.

Intentional promotion of careers in natural resources management or environmental science was a question asked of teachers. I wanted to know if and how teachers actively discussed possible career pathways with students. As a researcher, I was interested to know if there were any differences in the way that the two types of teachers - CTE and Science - talked about career exploration and pathway development. By design, the CTE teachers are tasked with building career pathways. However, not just CTE teachers promote careers. Science teachers were just as positive and knowledgeable about career exploration. All 10 of the teachers interviewed mentioned that they discuss career planning with their students. This was mentioned 227 times across the interviews. Career awareness and exploration learning experiences were by far the most popular, mentioned by all 10 teachers 193 times. I found this part of the interviews one of the most promising; it was clear that teachers who are not tasked with preparing students for

specific career pathways are frequently fostering career exploration. Educators are providing experiences to students not because they are required but see the importance of career exploration. One of the long-term outcomes of the Thriving Model is vocational success, and the frequent mention of careers is a promising finding that connects to the long-term outcomes.

Specific career exploration techniques used by teachers include guest speakers, hands-on learning, outside-of-the-classroom experiences, career pathways discussions, and career guidance discussions: “We have something called career and technical education pathways or career pathways. And so, we want them to almost pick one and go towards that.” —CTE 1

Eight of the teachers mentioned 18 times that they utilize career professionals as guest speakers in class: “I specifically asked the people to talk to them about careers, and so they introduced my students to about 10 different careers, and in the DNR.” —CTE 2

Facilitating spark often involves hands-on activities that allow students to engage directly with a topic of interest. Hands-on learning techniques utilize another element of the Thriving Model: relationships. Often, teachers and other professionals guide youth through hands-on activities, providing support and mentorship as youth navigate challenges and learn new skills. One of the thriving behavior indicators is "Challenge and Discovery." Hands-on learning links to this behavior as it often involves tackling real-world problems and tasks, providing students with challenges to overcome as part of their learning process.

Teachers provided opportunities for hands-on learning in several ways to promote career exploration and engage students. Ten teachers mentioned hands-on learning 55

times in the interviews. Teachers expressed that “hands-on learning” (a) engages students, (b) encourages them to try out skills, and (c) prepares them for the labor market. Techniques to do this include lab experiments, field-based exercises, events, competitions, summer programs, internships, supervised projects, jobs, competitions, clubs, and events.

> “I try to bring in as many hands-on experiences as I can. My goal this year has actually been to have two or more hands-on activities in each unit, which is a big task. It’s a very large task, but I think having students get their hands dirty, and actually work with different things.” —CTE 1

Hands-on learning as outlined by educators is important because it enhances retention, promotes application of knowledge, develops critical thinking skills, increases motivation, and prepares students for real-world challenges.

Teachers' interviews reinforce what was found in the literature review, learning experiences outside the classroom in natural spaces and other locations away from the school helps students understand the importance of fostering sparks and allows them to apply their knowledge in a real-world context. This approach enhances student understanding of the subject matter and fosters a sense of responsibility towards the environment. Eight teachers mentioned 43 times the use of outside-of-the-classroom learning experiences. Teachers shared limitations such as budget and not having the ability to have students miss other classes that impact how and the type of out of classroom experiences they can offer. Even with these limitations, the teachers described how they provide outdoor experiences such as field trips most often within a short distance from the school, walks, and classes in the field to help the students connect

theoretical concepts with real-work application, explore careers, and create opportunities for the students to meet, interact, and create connections with experts in their fields of interest:

> "If a kid had an interest in something small, I could take them to a conference or on a field trip to explore those options right." —CTE 3, and "I try and present to them, I guess, or show them the different opportunities that are within our community so like in natural resources, we are going to be talking about like water quality, and that's a huge thing." —CTE 5

By combining hands-on learning with intentional career exploration components, educators create an environment that not only sparks students' interests but also guides them toward discovering and pursuing fulfilling career paths. CTE teachers discussed how the use of the FFA program afforded them the opportunity to travel more with their students to events and competitions including the FFA Career Development Event (CDE).

Career Exploration and Awareness

All teachers in the qualitative interviews, regardless of discipline, discussed using career planning as a process that helps their students make informed decisions about their future careers. They shared how it starts with exploring interests, identifying potential careers aligned with the interests, and getting experience through internships, hands-on activities, etc. Teachers play a key role in this process through talks, guidance, and providing opportunities for exploration. Career planning technique mentions by participant and frequeny of mentions in the interviews are shown in Table 2.

Table 2

Career Planning

Career Planning Technique	# of Teachers Mentioning Item	# of Times Technique Mentioned
	10	227
Awareness and exploration	10	193
Career talks	8	22
Helping students discover their interests	10	117
Surveys	3	3
Providing electives	3	4
Allowing students to choose	4	10
Hands-on learning	10	55
Learning outside the classroom	8	43
Mandatory courses	1	2
Creating career pathways	3	5
Career guidance	7	15
Inviting guest speakers	8	18
Recommending a skill or university	3	7
Linking students with job opportunities	2	2
Emphasizing real-world application of concepts	6	7
Experiences for fostering career skills	10	34
Collaborative learning	7	14
Individualized learning	6	6
Observation	5	8
Inquiry-based learning	5	6

Helping Students Find Their Interests with Career Discussions

Both types of teachers shared that they talk to students about different career opportunities related to subjects taught in the classroom. In both groups, four of the five teachers mentioned discussing career options 22 different times. Additionally, all 10

teachers mentioned helping students find their interests an impressive 117 times throughout the interviews.

> "I try and present to them, I guess, or show them the different opportunities that are within our community, so like in natural resources, we are going to be talking about, like, water quality, and that's a huge thing." —CTE 5

Teachers encouraged students to find their interests and provided direction for them, as exemplified in this quote:

> "As far as encouraging students to pursue their interests, you know, kids come and ask me, right, like if they're interested, they'll come and ask me. … So I'll try to, like, pick away and find out what they're really interested in and then try to point them in the right direction." —Science 4

Teachers talking about careers is helpful to guide students toward informed and purposeful decision-making about their future. These conversations fuel student interest sparks that then encourage them to explore possibilities, set goals, and understand the connection between education and their future careers, fostering motivation and a sense of direction.

Inviting Guest Speakers

Most teachers understood the importance of guest speakers and the benefits that Shane (2021) identified in that guest speakers provide students with:

- Real-world context for their learning concepts, showing how their studies connect to the world outside of school;
- Deepened students' learning by sharing their professional experiences and insights; and

- Increased student engagement and excitement about the subject.

Teachers inviting guest speakers to their classroom was the last technique that was evenly and abundantly mentioned as a method to encourage career exploration. A total of eight teachers, four science and four CTE, referenced this 18 times in the interviews. These teachers invited experts to talk and/or demonstrate what they do, job requirements, and potential job opportunities. These talks from guest speakers foster a sense of authenticity. They also help provide a direct connection between what students are learning and how it could be relevant in the future.

"I specifically asked the people to talk to them about careers, and so they introduced my students to about 10 different careers, and in the DNR." —CTE 2

Guest speakers can play a valuable role in promoting careers in high school classes by providing real-world insights, sharing personal experiences, and offering practical advice.

Pathways, Career Guidance, and Real-World Application

There were three areas that showed the most difference between the two teacher groups: pathways, career guidance, and real-world application. In the area of creating career pathways, CTE teachers described that the school has predefined programs where students follow an education pathway that leads to a career through to college. It is interesting to note that while every CTE program utilizes career pathways as part of the curriculum, only two CTE teachers mentioned it: "We have something called career and technical education pathways or career pathways. And so we want them to almost pick one and go towards that." —CTE 1

Even with the additional science teacher describing it, it was only mentioned a total of five times across all interviews.

Teachers described how they encouraged students to pursue careers related to their interests and guided them in selecting the appropriate courses or joining the right after-school clubs. All five of the CTE teachers mentioned that they provide career guidance, but only two of the science teachers mention this. Of those teachers who mentioned providing career guidance, it wasn't a large theme, with only mentioned one time by teachers who did discuss it.

Science teachers mentioned connecting real-world applications twice as many times as CTE teachers. Four science teachers, compared to two CTE teachers, mentioned real-life application. However, it was only mentioned a total of seven times. One stated:

> "I teach, you know, current things. Try to keep them up to date on what's going on and to give them a science foundation, because this might be the last time, they get some of that in their lives." —Science 1

Utilizing real-life applications in teaching can be a powerful strategy for enhancing the educational experience, fostering student engagement, and preparing students for the challenges and opportunities they will experience in their post-high school lives. Teachers discussed how they encourage students to pursue careers related to their interests and guide them in selecting the appropriate activities, courses, or after-school clubs that match their interests. Teachers also described that the school has predefined programs that students can follow through to college. Ten teachers mentioned 34 times throughout the interviews that they are intentional in providing learning/experiences that foster career skills:

> "As far as encouraging students to pursue their interests, you know, kids come and ask me right, like, if they're interested, they'll come and ask me. … So I'll try to pick away and find out what they're really interested in and then try to point them in the right direction." —Science 4

By weaving student interests with teacher guidance and intentional career exploration activities, educators can create a supportive environment that not only sparks enthusiasm but also helps students navigate and shape their future career paths.

Difference between CTE and Science Teachers in Fostering Sparks

To answer the question "how do science and CTE teachers differ in using the developmental context element of spark and career awareness/promotion?," a multiple regression was first run to predict sparks from the dependent variables mentioned previously, with both CTE and science teachers. The multiple regression model statistically significantly predicted sparks, $F(9, 75) = 2.186$, $p = .032$, adj. $R^2 = .11$. However, only race/ethnicity and educational attainment added statistical significance to the prediction, $p < .05$, not the type of educator between CTE and science. Regression coefficients and standard errors can be found in Table 4 below. However, it is important to note the lack of racial/ethnic differences in the survey sample results in not being able to attribute any real significance of making a difference in predicting the type of teacher's fostering sparks in the classroom.

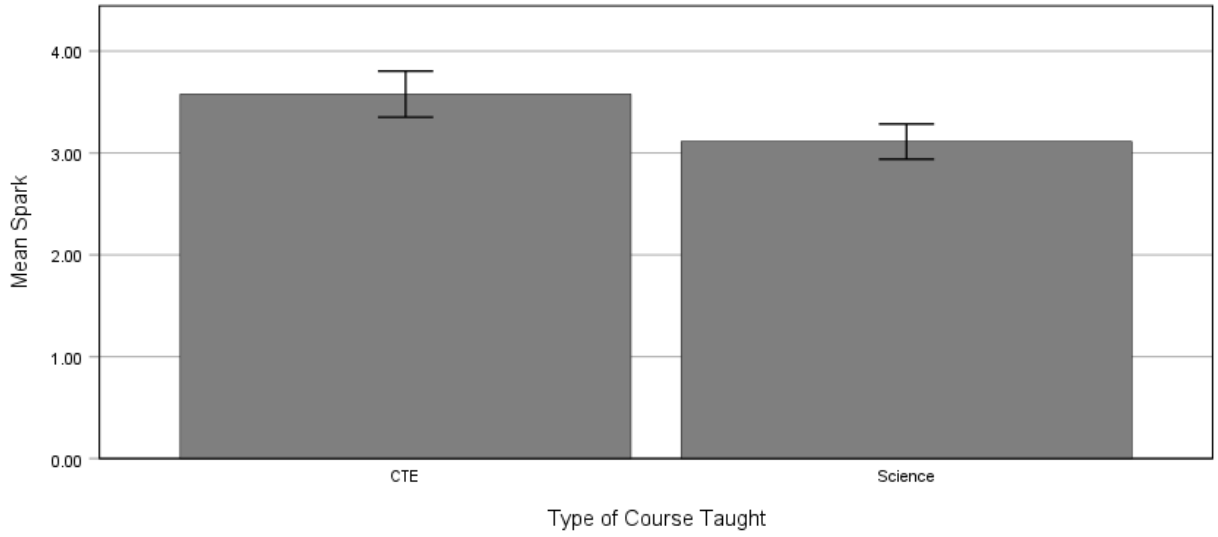
Group Differences

An independent-samples t-test was run to determine if there were differences in spark, student belonging, developmental relationships, and intentional promotion of career pathways scores by CTE and science teachers. Spark was greater for CTE teachers (M =

3.58, SD = 0.59) than science teachers (M = 3.11, SD = 0.64), a statistically significant difference, $M = 0.47$, 95% CI [0.19, 0.75], $t(61.004) = 3.328$, $p = 0.001$ (Image 2).

Image 2

Spark Differences by Type of Course Taught



While student belonging, developmental relationships, and intentional promotion of career pathways were also greater for CTE teachers as compared to science teachers, the differences were not statistically significant, $p > .05$ (Table 4).

Table 4

Differences by Type of Course Taught

Type of Course Taught		N	Mean	Std. Deviation	Std. Error Mean	*p*-value
Spark	CTE	29	3.5776	0.59426	0.11035	0.001
	Science	56	3.1116	0.64477	0.08616	
Student Belonging	CTE	29	4.3966	0.45570	0.08462	0.462
	Science	56	4.3170	0.49656	0.06636	
Developmental Relationships	CTE	29	4.6034	0.33008	0.06130	0.656
	Science	56	4.5670	0.40246	0.05378	
Intentional Promotion of Career Pathways	CTE	29	4.4828	0.50855	0.09443	0.255
	Science	56	4.3393	0.61131	0.08169	

Educator's Passion for teaching Environmental Science and Natural Resources Management

The importance and impact of educator passion for the topic they teach was discussed in the literature review. However, this concept is somewhat subjective and more difficult to measure. To attempt to answer the research question "How does a teacher's passion for the topic increase student engagement?," the attitudes and self-reported passion that educators had for a teaching career and for teaching the subject matter was explored through one-on-one interviews and quantitative surveys.

Teacher Passion Matters

Passion is important but significantly fewer educators mentioned it in the interviews about their classroom learning environment. The interview data showed that four teachers discussed 14 times the importance of their attitude and passion for the topic. These teachers said that being enthusiastic, excited, and loving the job rubs off on the students, and they become excited about learning. Teachers described the impact that their passion or lack thereof impacts classroom instruction: "My attitude matters. If I step in and say, 'We got this unit on birds, and I really freaking hate talking about birds. But we got to talk about it,' they're not going to talk about it." —Science 3

Another teacher discussed the connection of their passion to student interest in science: "If I'm doing my job right, the students have at least an interest in science." —Science 1

Teacher passion can play a vital role in creating a supportive developmental context that leads to the long-term impact of a successful career. The passion can be

contagious, fueling sparks in students' curiosity, enhancing engagement, and providing valuable guidance as students navigate their interests and potential career paths.

Passion for Teaching Natural Resources Management or Environmental Sciences and Belief That Job Opportunities Exist

In previous discussions that I have had with district level career and technical education staff, I found that many staff involved in the larger planning of programs and events such as career days lacked understanding of what job opportunities and careers exist in natural resources management and environmental science. Oftentimes the awareness level of potential career options was limited to very basic examples such as forester, taxidermy, etc. This was not the case for many other industries, who were more active in student recruitment and career readiness events Natural resources and environmental science fields suffered from a lack of understanding in the scope of career options and the large number of job openings.

To determine if the front-line educators also viewed the career potential similarly to their district peers, they were asked questions related to career options. When asked to what level they agree that there are a lot of jobs available in natural resources management or environmental sciences, the largest proportion somewhat agreed (42.4). When asked whether teaching high school is the career they are most passionate about, the largest proportion strongly agreed (50.6). When it came to feeling passionate about natural resources management or environmental sciences while teaching, the largest proportion strongly agreed (40.0%). When asked to rate if natural resources management or environmental science is the course they enjoy teaching the most, the largest proportion selected "neither agree nor disagree" (44.7) (Table 5).

These findings provide unique insight into the teacher passion and belief that jobs in the fields discussed are ready to be filled by students interested in pursuing them. With almost a third of teachers strongly agreeing that there are jobs in natural resources management and environmental sciences and the next largest group (42) somewhat agreeing, the bulk of teachers should be able to at least promote jobs in this area if their students are interested. Teachers' passion for their own career of choice is also mixed, with only half of the educators strongly agreeing that they are passionate about their teaching career. Lastly, it was found that only 17% of teachers view teaching natural resources/environmental science as their favorite subject. However, most all of the teachers expressed that they are tasked with teaching several different courses each year.

Table 1

Teacher Passion Quantitative Results

Teacher Passion	Strongly disagree n (%)	Somewhat disagree n (%)	Neither agree/ disagree n (%)	Somewhat agree n (%)	Strongly agree n (%)
There are a lot of jobs available in natural resources management or environmental sciences.	1 (1.2)	5 (5.9)	15 (17.6)	36 (42.4)	28 (32.9)
Of the potential career choices, teaching high school is a career that I am passionate about.	1 (1.2)	2 (2.4)	4 (4.7)	35 (41.2)	43 (50.6)
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0 (0.0)	2 (2.4)	22 (25.9)	27 (31.8)	34 (40.0)
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	7 (8.2)	11 (12.9)	38 (44.7)	14 (16.5)	15 (17.6)

The largest proportion of teachers expressed a moderate level of agreement that there are a lot of jobs available in natural resources management or environmental sciences, and a significant portion also strongly agreed with the statement, indicating a substantial belief in job opportunities within this field. This is a promising result; teachers see that if they prepare students and promote careers in this field, there is a job market for their students.

The majority of teachers strongly agreed that teaching high school is a career they are passionate about. This suggests a high level of enthusiasm and dedication among the educators towards their role in high school teaching. A considerable portion of teachers also strongly agreed that they feel passionate about natural resources management or environmental sciences while teaching. This implies a strong connection and enthusiasm for the subject matter during the teaching process. The strong agreement on passion for teaching high school indicates a high level of commitment and enthusiasm among teachers for their career choice in high school education. The fact that a significant portion of teachers feel passionate about natural resources management or environmental sciences while teaching suggests a genuine interest in the subject matter, contributing to effective and engaging teaching practices.

The findings indicate a positive outlook on future job opportunities for their students, a high passion for teaching high school, and a strong connection to the subject matter among teachers. It is important to note that teachers don't understand the large scope of potential career options in the field of environmental science or natural resources management. However, there is a more varied perspective when it comes to

whether natural resources management or environmental sciences is the course, they enjoy teaching the most.

Creating a Sense of Belonging in the Classroom and Fostering Positive Relationships

The last two elements of the Thriving Model developmental context, belonging and positive relationships, were examined through interviews and a survey. To answer the research question "In what ways are high school teachers using the developmental context of a sense of belonging and fostering positive relationships with caring adults to create a supportive classroom environment and enhance students' academic achievement?," educators were asked questions that invited them to share their thoughts on classroom belonging and building positive relationships with students.

Belonging Findings

A mixed-methods research approach consisting of qualitative and quantitative methods provided insight into how high school educators incorporate elements of belonging and relationships from the 4-H Thriving Model into their classroom teaching to support a developmental context that includes these elements.

The qualitative interview questions related to belonging and relationships include:

- What do you consider to be essential elements in a classroom environment for learning to happen?
- What strategies do you use to foster a sense of belonging among all students?
- What does the term "belonging" mean to you?

- Are any groups of students **not** attending your programming/classes? Who are they? Why do you think they are not attending?
- Can you describe a successful situation where you showed caring to students?
- In what other ways have you found success in showing caring to students?
- In what ways have you challenged student growth?
- What does it mean to you to "share power" as a teacher when you work with your students?

The quantitative question banks related to belonging and relationships with a caring adult are found in Appendix A. A comparison between the dependent and independent variables of belonging and relationships were analyzed. Specific questions cover the topics of student belonging, developmental relationships, caring adults, challenging growth, and youth–adult partnership. The survey questions are found in Appendix B.

In reviewing the 4-H Thriving Youth Model and the relevant codes, two elements of the model (a sense of belonging and positive relationships between youth and adults) aligned with the interview codes, shown in Table 6.

Table 6

Model Elements and Relevant Codes

Developmental Context Element Mentioned by Teachers	# of Teachers Mentioning Item	Total # of Mentions
Creating a positive learning environment	10	138
Giving students ownership of their learning	9	28
Letting student take the lead	8	18
Giving students a voice	6	7
Power sharing is not easy	3	3
Fostering a growth mindset	9	32

Developmental Context Element Mentioned by Teachers	# of Teachers Mentioning Item	Total # of Mentions
Inquiry-based learning	5	6
Incorporating presentations	4	7
Assigning challenging tasks	3	3
Modeling a growth mindset	2	2
Making students try new things	2	3
Setting high expectations	1	4
Modeling social behavior	9	26
Talking with students	5	6
Providing supportive solutions	5	6
Showing empathy	4	8
Building rapport	2	4
Providing emotional support	2	2
Creating a safe and comfortable environment	4	10
Conducive physical conditions	1	1
Comfortable environment	2	4
Psychologically safe	3	5
Building an inclusive environment	6	10
Group projects	3	4
Equal treatment	3	3
Shared values	2	3
Establishing connections	5	9
Teachers' attitude & demeanor	4	10
Passion for the job	4	4
Being competent	2	2
Friendly attitude	1	1
Teacher effectiveness	1	3
Student factors	3	6
Students' motivation	3	6
Classroom management	4	7
Fostering mutually respectful relationships	3	3
Establishing clear communication	2	2
Being consistent	1	1
Rewards	1	1

The overarching theme of "belonging and relationships" looked at how educators built a classroom environment that had a positive developmental context that fostered belonging among students and positive relationships between teachers and students. All of the educators interviewed described the classroom environment as a place of importance for belonging and positive relationships with adults. These developmental

context elements were mentioned 138 times in the 10 interviews. Within this overarching theme, three primary topics were emphasized in the interviews: the classroom environment was found to be a safe and supportive learning environment, teachers suggested that they foster a growth mindset, and teachers help students with their self-efficacy.

Safety: Students Feel Safe in the Classroom Environment and Know That Their Ideas Matter

One of the principles for a quality youth program outlined by Eccles and Gootman (2002) is that youth need to feel safe and be able to interact positively with others in the learning environment. Educators discussed creating environments in the physical space of their classroom that would allow students to feel welcome at any time, allowing them a space to interact with other students and teachers outside of class time. Within the safe classroom environment, the following sub-themes were found: showing empathy (four teachers mentioned this eight times) and building an inclusive environment (described by six teachers 10 different times). Lasty, three teachers touched on the importance of a psychologically safe space six times: “One of the big things is that feeling of comfort. That’s why I brought the couch in. … It’s just a place where students can sit and relax during lunch and stuff. It’s been really good.” —Science 1

Beyond the physical spaces, educators fostered the developmental context by creating safe spaces where students understand that they don’t have to have all the answers correct: “I try my hardest to make it a place where everyone feels comfortable getting things wrong, not getting it right every time.” —CTE 2

Sharing power in the Thriving Model includes educators actively fostering inclusion, respect, collaboration, and youth-adult partnerships in the classroom. Teachers discussed how they shared power and allowed students to make decisions as part of their learning experience:

> "Letting them [students] take the lead on things is very important in an agricultural education program and in the FFA. Every year we elect a new set of chapter officers, and … I give the applications to my graduating seniors in the FFA. And they actually choose the officer team for the upcoming year." —CTE 1

Supportive Environment: The Classroom Is an Environment That Students Can Trust to Be Positive and Supportive

An additional element of a quality youth education experience is that students experience positive social norms. In the experience, students should find clear rules and expectations for participating in class, including the values, morals, and ethical expectations (Eccles & Gootman, 2002). A safe and supportive classroom environment is a foundation for effective teaching and learning. It nurtures students both academically and emotionally, creating an atmosphere where they can thrive and feel comfortable in sharing their ideas.

Teachers discussed the importance of not just teaching content but establishing a classroom environment in which students have a relationship with a caring adult that they can trust and be respected by. Teacher emotions were found to be highest when discussing this aspect of the developmental context. It was observed that educators recognized the challenges that students faced and wanted to show them the respect and support that they may not be receiving in their home lives. Nine teachers mentioned 26

times that they model social behaviors that they want to see in their students. Behaviors included showing students respect (three teachers mentioned it three times) and providing supportive solutions (discussed by five teachers six times): “I think just having mutual respect—I think it’s probably the number one. I treat these kids like they’re grown because they have seen some shit that I could not even comment on.” —CTE 3

Teachers frequently discussed that they actively demonstrate that the students are important to them: “How I show caring, like, I’ll see him at the county fair, the parents and the family, and I’ll talk to him. If I see him in the grocery store, like, ‘Hey? What’s going on?’ Just like, make them feel like they’re valued and important.” —CTE 4

The importance of students being able to trust educators, both in asking and answering questions was shared:

> “They know I’m friendly. They know I’ll answer all their questions. I never put anyone down or say, ‘No, we’re not going to talk about that,’ or I have no problem. But students are very, very comfortable being here, and they’re comfortable talking with me openly.” —Science 1

Teachers were found to be sensitive to student needs and take proactive measures to address these needs.

> “I had an FFA president one year. …So the kid that should be the example, turns out, he had quite the drinking problem … so that kid needed a lot of support because Dad was sort of a schmuck. He just didn’t have a lot going on at home, and maybe it was a call for help or whatever. But, my gosh! He got a lot of help.” —CTE 3

Lastly, building a robust developmental context in the classroom goes beyond the transmission of knowledge and plays a key role in creating a supportive and enriching educational experience for students. Two of the eight principles for high quality youth programs identified by Eccles and Gootman (2002) include belonging and supportive relationships. Students need opportunities to learn in an environment that all youth feel included in a meaningful way, regardless of their gender, ethnicity, sexual orientation, or ability. Youth should have opportunities to share their culture and heritage with others and to forge a positive identity. Additionally, quality programs provide supportive relationships that allow all students to feel warmth from and closeness to others in school. Youth need to feel others care about and support them.

One teacher shared his ability to relate and understand students' struggles by leaning into their own experiences and providing assistance. Teachers also share personal experiences to create a safe learning environment where students can open up.

> "We have several transgender students here that have really had a hard time fitting in. … But I have a son that's transgender, which has been a hard transition as a parent over the last 10 years or so. I guess I relate now, and this is the only place they will come to talk with you. They won't even talk with our mental health counselors. They will talk with me, and they feel very comfortable because I treat them like a human being." —Science 1

Fostering a Growth Mindset

One of the seven indicators identified in the Thriving Youth Model is having a growth mindset. The "fostering a growth mindset" indicator was mentioned by nine of the 10 teachers, a total of 32 times across the interviews. , Two educators mentioned

taking this concept further by modeling a growth mindset to students. Teachers talked about strategies they use to challenge what the students believe as their potential versus their actual potential. These include discussing the growth mindset in the first year, encouraging students to explore concepts to a deeper level, and trying new and challenging things. These approaches help students to develop essential skills such as critical thinking and communication. Teachers provide growth opportunities and challenge students to extend their learning through new experiences.

> "I feel like part of what I need to do is stretch my students and get them out of their comfort zone. During some of the modules, I have my students prepare presentations and present in front of the class, and that's just really hard for some kids ... it's safe, but it's hard." —CTE 2

Extended learning opportunities allow sufficient time to manage a long-term project and learn how to manage the challenges that come with it:

> "For the ninth graders, each student has his or her own 10-gallon tank with their own fish that they take care of throughout the year ... this you know, business of taking care of a fish. It's a big deal to a lot of kids. A lot of kids experience a whole lot of growth and responsibility, you know, personal responsibility throughout the year." —CTE 2

As part of fostering a growth mindset, a teacher shared how they connect with students through presenting a personal struggle and the strategies they used to overcome the situation.

> "I give them a little bit of my background. I didn't have straight As; I didn't have scholarships for everything. I was one of those midline guys that went on and did

great things because it took time, and I found a way to do it, and I tell them, 'You can do the same thing.'" —Science 1

Teachers talked about strategies they use to challenge what the students believe is their potential versus their actual potential. This includes reflecting about the growth mindset in the first year, encouraging students to explore concepts to a deeper level, and trying new and challenging things. These strategies help students to develop essential skills such as critical thinking and communication.

The topic was frequently mentioned, with nine of the teachers mentioning it 32 times throughout the interviews, as shown in Table 7.

Table 7

Fostering a Growth Mindset

Fostering a Growth Mindset Technique	# of Teachers Mentioning Item	# of Times Technique Mentioned
	9	**32**
Inquiry-based learning	5	6
Incorporating presentations	4	7
Assigning challenging tasks	3	3
Modeling a growth mindset	2	2
Making students try new things	2	3
Setting high expectations	1	4

Both teacher groups specifically mentioned using class presentation assignments as a strategy to foster a growth mindset.

"Our wildlife biology class is a challenge for a lot of students because there's no tests in that class. It is all presentations. So, we really push the soft skills that are actually really important of, like, collaboration, and it's not enough for you to

> gather the information; you have to communicate it effectively, right? And getting them to converse with and persuade their peers, like, 'Here's why this this matters.'" —Science 3

Another stated:

> "I feel like part of what I need to do is stretch my students and get them out of their comfort zone. During some of the tangential modules, I have my students prepare presentations and present in front of the class, and that's just really hard for some kids ... it's safe but it's hard." —CTE 2

Fostering a growth mindset is essential for creating a positive and effective learning environment. It empowers students to embrace challenges, view effort as a path to mastery, and develop the resilience and skills needed for success in both academics and life. Teachers play a crucial role in shaping and reinforcing this mindset through their words, actions, and teaching practices.

Self-Efficacy: Students Are Reminded to Believe in Their Abilities as They Build New Skills

Self-efficacy is a student's belief in their ability to succeed in a particular task or domain. Teachers shared how this is a key component of student motivation and plays a significant role in influencing academic performance and overall learning outcomes. Several elements contribute to student self-efficacy: teachers discussed how the student relationships eventually transforms from the more classic adult-driven classroom environment to a place that allows students to begin to chart their own course and develop their skill set and abilities. Nine of the 10 teachers mentioned 28 times how they

give students ownership over their learning. Eight mentioned letting the students lead 18 times.

Teachers also encourage students to try tasks they consider challenging or that get them out of their comfort zones to stretch their cognitive abilities and develop essential skills (e.g., preparing and making presentations).

> "Our wildlife biology class is a challenge for a lot of students because there's no tests in that class. It is all presentations. So, we really push the soft skills that are actually really important of, like, collaboration, and it's not enough for you to gather the information; you have to communicate it effectively, right? And getting them to converse with and persuade their peers, like, 'Here's why this matters.'" —Science 3

Relatedly, teachers shared how challenging student growth led them to student success, resulting in increased self-efficacy:

> "Making them try new things. So, we recently just had our area leadership development events here in Utah, and there was an extra spot open on the farm bureau discussion meet. And they like to have four kids on that, and there were only three of them. And so, I looked at my FFA members that weren't competing … and I settled on a freshman who just moved here. … They showed him the questions, he had 10 minutes to basically prepare himself, and he won it. He won it. And he did so great." —CTE 1

Overall, the interviews revealed that teachers play a crucial role in creating an environment that supports the development of a positive and robust sense of self-efficacy in their students.

Creating a Positive Learning Environment

The overarching theme of "creating a positive learning environment" was mentioned 138 times in the 10 interviews. Both the CTE and science teachers were found to have a high level of engagement with this topic.

Giving Students Ownership of Their Learning

The topic of teachers sharing power with students was discussed as part of the concept of giving students ownership of their learning. Sharing power is one of the five dimensions of fostering developmental relationships. Fostering a growth mindset hold students accountable, expects them to do their best, and when needed helps the youth reflect on failure. Sharing power, another dimension is fostering mutual respect and collaboration between the student and the teacher. In the discussions, teachers talked about a shift in the teacher's role in the 2022 classroom. Historically, they described the teacher's role as the bearer of knowledge that they disseminate to their students. Educators took on an authoritarian position/stance and controlled everything. Currently, teachers see themselves as facilitators who empower the students to learn on their own by providing direction, delegating, communicating expectations, and allowing the students to execute. Student agency helps to foster a sense of ownership and enhances academic performance.

Both groups had a high number of teachers discussing how they give students ownership of their learning. Only one CTE teacher did not comment on this. Overall, it was mentioned 28 times across the interviews.

CTE has a long tradition through the FFA program in building leadership skills in students, as highlighted by this teacher:

> "Letting them [students] take the lead on things is very important in an agricultural education program and in the FFA. Every year we elect a new set of chapter officers, and … I give the applications to my graduating seniors in the FFA. And they actually choose the officer team for the upcoming year." —CTE 1

While all five science teachers commented that they did share ownership of the learning experience with their students, it is important to note that it isn't as easy for them to do this. Teachers describe how they struggle, or they don't give students as much ownership as they should.

> "That's hard because how you have students do that [power sharing]. So, we've had some training on that, and he's given us good examples on how to do that. So that's a work in progress. We're working on that. I'm working on that personally." —Science 1

Modeling Social Behavior

The last element of the developmental context that nine of the 10 teachers commented on using is modeling social behavior. The codes found in this sub-theme included talking with students, providing supportive solutions, showing empathy, building rapport, and providing emotional support to students. See Table .

Table 8

Modeling Social Behavior

Modeling Social Behavior Technique	# of Teachers Mentioning Item	# of Times Technique Mentioned
	9	**26**
Talking with students	5	6
Providing supportive solutions	5	6

Showing empathy	4	8
Building rapport	2	4
Providing emotional support	2	2

Regardless of their focus, teachers provided several examples of how they show caring to their students.

> "I currently have a student who is struggling in her personal life. I'm not quite sure what it is, but it's causing her to not go to classes. … And that same day I had actually gone to this student and been, like, 'Hey, like what's going on? Like, why are you late? You haven't brought any of your stuff to class, like, something I can help you with?'" —CTE 1

Another one said:

> "I had an FFA president one year. … So the kid that should be the example, turns out, he had quite the drinking problem … so that kid needed a lot of support because Dad was sort of a schmuck. He just didn't have a lot going on at home, and maybe it was a call for help or whatever. But, my gosh! He got a lot of help." —CTE 3

Teachers discussed how their work with students goes beyond teaching subject matter content. Students needed a safe place to discuss difficult issues that they didn't feel comfortable talking to just any adult about.

> "We have several transgender students here that have really had a hard time fitting in. … But I have a son that's transgender, which has been a hard transition as a parent over the last 10 years or so. I guess I relate now, and this is the only place they will come to talk with you. They won't even talk with our mental

> health counselors. They will talk with me, and they feel very comfortable because I treat them like a human being. —Science 1

Educators modeling social behavior is not just about teaching subject matter content; it's about fostering an environment where students can thrive academically, socially, and emotionally. These social skills are foundational for students to learn in an environment that has a developmental context that supports long-term thriving youth outcomes. It is through this student–teacher interaction that youth learn and practice prosocial values, leading ultimately to a

young person who cares about others and gives back to their community.

Creating a Safe and Comfortable Environment and Building an Inclusive Environment

The topics of creating a safe environment and building an inclusive environment are similar. A safe environment was described by educators as a classroom where the physical and the psychological environment created by teachers enhances learning and promotes a sense of belonging. An inclusive environment was described as one where teachers embrace an inclusive culture, provide equal treatment, and give all students a voice. This is an area where the comments between the two types of educators differ the most in the interviews.

Three CTE teachers commented on creating a safe environment compared to only one science teacher. Conversely, four science teachers discussed creating an inclusive environment compared to only two CTE teachers, as seen in Table.

Table 9

Safe and Comfortable Environment

Creating a Safe and Comfortable Environment Teaching Technique	# of Teachers Mentioning Item	# of Times Technique Mentioned
	4	**10**
Conducive physical conditions	1	1
Comfortable environment	2	4
Psychologically safe	3	5
Building an inclusive environment	6	10
Group projects	3	4
Equal treatment	3	3
Shared values	2	3
Establishing connections	5	9

An example of the teacher creating an environment where students feel comfortable making mistakes without the fear of being judged was described in the CTE classroom: “I try my hardest to make it a place where everyone feels comfortable getting things wrong, not getting it right every time.” —CTE 2

A science teacher commented that they provide equal opportunities to all students: “They’re not being shunned, or, you know, treated like they’re a lesser person, or something like that. … So for me, they feel comfortable.” —Science 1

While discussed less, creating a safe, comfortable, and inclusive environment for students was found to be essential for many teachers. These relationships build a foundation for effective teaching, support students’ emotional well-being, and prepare them for success in both academic and social aspects of life.

Establishing Connections

Teachers demonstrated caring by discussing how they get to know the student at a deeper level and understand the issues they are facing. This positively influences student

attitudes toward learning. The teacher helps establish connections between students and themselves by using techniques such as knowing student names, group projects, and seating charts.

> "I think a really big one is teacher connection. It goes back to the old saying, 'They don't care how much you know until they know how much you care,' especially this day, where kids are struggling so much with anxiety, and, you know, all the gender issues and political issues and that kind of stuff—it, like, it doesn't matter how great your teaching is." —CTE 5

It is interesting to note that while only one of the science teachers discussed making connections with students, four of the CTE teachers noted this in their interviews.

Comparison of Science and CTE Teacher Relationships and Belonging Results

This study population had two primary groups: teachers that teach agriculture and natural resources through the lens of CTE and those who teach life sciences, including environmental science offered by the high school science department. By looking at developmental contexts of relationships and belonging, we begin to see what differences there may be in science teachers and CTE teachers in Utah high schools in the use of building a developmental context and promoting career exploration in the classroom. Relevant codes covered each aspect of the developmental context presented in the 4-H Thriving Youth Model: belonging, and relationships. These codes were summarized and synthesized across interviews to identify common themes for each of the teacher types.

Similarities and Differences in Environmental Science and Natural Resources Management Classes

Results

Table 10 outlines the differences in the primary themes found within the application of the developmental context elements of relationships and belonging in the classroom environment.

Table 10

Differ in Using Developmental Context Elements

How science and CTE teachers differ in using developmental context elements		*# of Teachers Mentioning Item*	*# of Times Technique Mentioned*
	Science	CTE	
giving students ownership of their learning	5	4	9
fostering a growth mindset	5	4	9
modeling social behavior	5	4	9
creating a safe and comfortable environment	1	3	4
building an inclusive environment	4	2	6
establishing connections	1	4	5
teachers attitude & demeanor	1	3	4
student factors	3	0	3
classroom management	1	3	4

There are some differences in the ways that science and CTE teachers are implementing these developmental context elements in the classroom environment. Both science and CTE teachers are equally focused on creating a positive learning environment, with each group having five mentions. This suggests that both types of educators recognize the importance of fostering a positive atmosphere for students' development. Science teachers mention giving students ownership of their learning

slightly more than CTE teachers (five versus four mentions). Both groups, however, emphasize the importance of encouraging students to take an active role in their educational journey.

Both science and CTE teachers show a similar emphasis on fostering a growth mindset, with each subject having five mentions. This indicates a shared recognition of the significance of cultivating a mindset that encourages resilience, effort, and continuous improvement.

Similarly, science and CTE teachers both mention modeling social behavior with the same frequency (five mentions each). This suggests a common understanding of the role teachers play in setting an example for students in terms of social interactions.

There are differences in some areas, with science teachers mentioning creating a safe and comfortable environment more frequently than CTE teachers (three versus one mention). While both acknowledge the importance of safety and comfort, science teachers seem to highlight this aspect less often than their CTE counterparts. Science teachers mention building an inclusive environment more frequently than CTE teachers (four versus two mentions). In this case, word usage matters. Discussions with colleagues about this finding resulted in the idea that perhaps CTE teachers are less comfortable with the word inclusion than their science teacher counterparts.

Establishing Connections

Science teachers mention establishing connections less frequently than CTE teachers (one versus four mentions). CTE teachers seem to prioritize the importance of forming connections, possibly with an emphasis on real-world applications and networks.

The findings suggest both science and CTE teachers prioritize similar developmental context elements, with minor variations in emphasis.

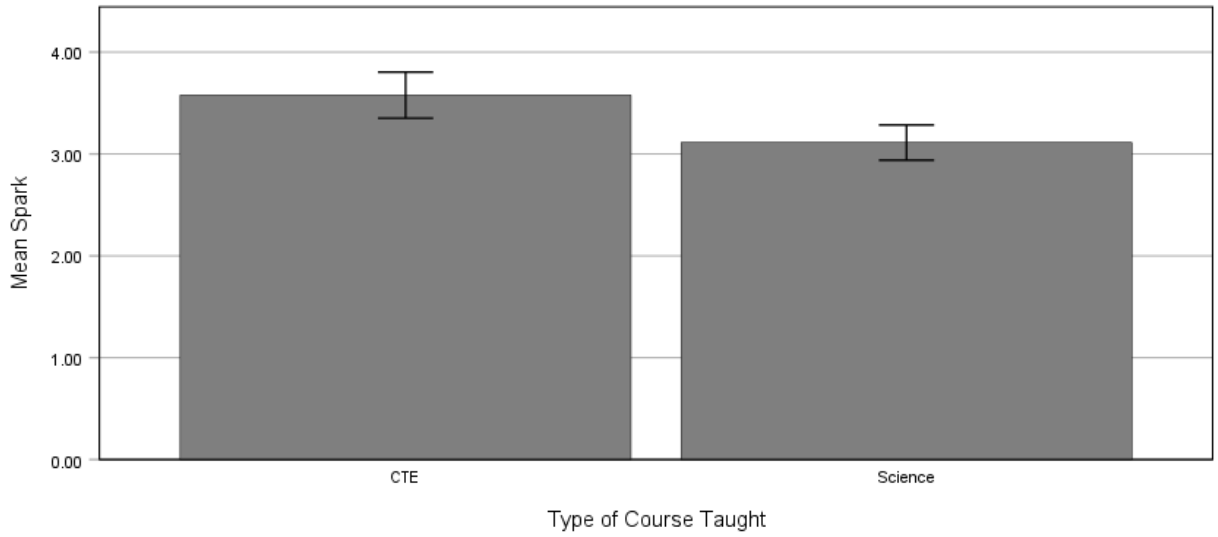
Both groups recognize the importance of creating a positive learning environment, giving students ownership of their learning, fostering a growth mindset, and modeling social behavior. Differences arise in the frequency of mentions for specific elements, indicating subtle variations in priorities between the two subject areas.

Additional Differences between CTE and Science Teachers

To further explore the question "how do science and CTE teachers differ in using the developmental context elements found in the Thriving Youth Model?" An independent-samples *t*-test was run to determine if there were differences in sparks, student belonging, developmental relationships, and intentional promotion of career pathways scores by CTE and science teachers. Sparks was greater for CTE teachers (M = 3.58, SD = 0.59) than science teachers (M = 3.11, SD = 0.64), a statistically significant difference, $M = 0.47$, 95% CI [0.19, 0.75], $t\ (61.004) = 3.328$, $p = .001$. This difference in CTE teachers having a higher fostering of spark in their classroom is interesting to note. Further research could look at what makes this difference (for example, the type of teacher preparation in college, the type of coursework, or the more applied nature of CTE courses). See Figure 4.

Figure 4

Sparks Differences by Type of Course Taught



While student belonging, developmental relationships, and intentional promotion of career pathways were also greater for CTE teachers as compared to science teachers, the differences were not statistically significant, $p > .05$ (see Table 2).

Table 2

Differences by Type of Course Taught

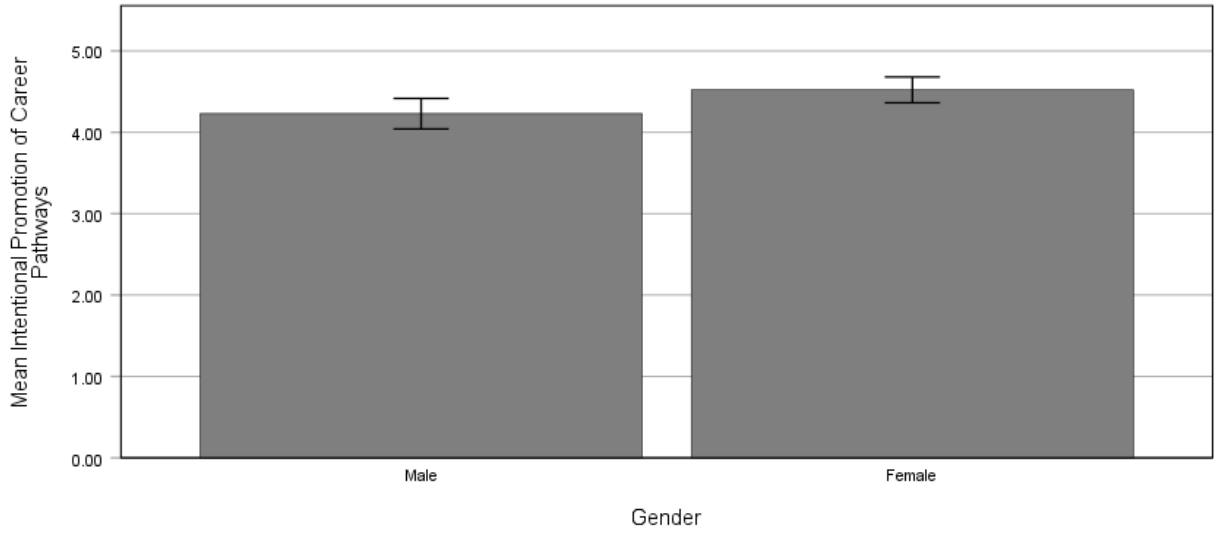
Type of Course Taught		n	Mean	SD	Std. Error Mean	*p*-value
Sparks	CTE	29	3.58	0.594	0.11	0.001
	Science	56	3.11	0.645	0.09	
Student Belonging	CTE	29	4.40	0.455	0.08	0.46
	Science	56	4.32	0.450	0.06	
Developmental Relationships	CTE	29	4.60	0.330	0.06	0.65
	Science	56	4.567	0.40246	0.05378	
Intentional Promotion of Career Pathways	CTE	29	4.482	0.50855	0.09443	0.25
	Science	56	4.3393	0.61131	0.08169	

An independent-samples *t*-test was conducted to determine the differences in sparks, student belonging, developmental relationships, and intentional promotion of

career pathways by gender. Intentional promotion of career pathways was greatest for females (M = 4.52, SD = 0.55), then males (M = 4.23, SD = 0.55), a statistically significant difference: $M = 0.29$, 95% CI [0.05, 0.53], t (73.298) = 2.408, $p = .019$. See Figure .

Figure 5

Intentional Promotion of Career Pathways by Gender



Sparks, student belonging, and developmental relationships scores were also greater for females than males, but the differences were not statistically significant, $p > .05$ (see Table 3).

Table 3

Differences by Gender

		n	Mean	SD	Std. Error	p-value
Sparks	Male	35	3.1357	0.58894	0.09955	0.063
	Female	48	3.4010	0.69140	0.09979	

Student Belonging	Male	35	4.2357	0.42850	0.07243	0.054
	Female	48	4.4375	0.50922	0.07350	
Developmental Relationships	Male	35	4.5000	0.40067	0.06773	0.073
	Female	48	4.6510	0.33140	0.04783	
Intentional Promotion of Career Pathways	Male	35	4.2286	0.54695	0.09245	0.019
	Female	48	4.5208	0.54537	0.07872	

Sparks scores were higher for those who were Caucasian (M = 3.32, SD = 0.64) than "other," a statistically significant difference, $M = 0.87$, 95% CI [0.33, 1.45], $t(5.091) = 4.103$, $p = .009$.

Sparks by Race/Ethnicity

There was no statistically significant difference in student belonging, developmental relationships, or intentional promotion of career pathways by race/ethnicity besides the predominant group, Caucasian, $p > .05$, as shown in Table 4.

Table 4

Differences by Race/Ethnicity

		n	Mean	SD	Std. Error	*p*-value
Sparks	Caucasian	80	3.3219	0.64164	0.07174	0.009
	Other	5	2.4500	0.44721	0.20000	
Student Belonging	Caucasian	80	4.3594	0.47541	0.05315	0.375
	Other	5	4.1000	0.57554	0.25739	
Developmental Relationships	Caucasian	80	4.6052	0.34848	0.03896	0.184
	Other	5	4.1667	0.60953	0.27259	
Intentional Promotion of Career Pathways	Caucasian	80	4.4125	0.56689	0.06338	0.265
	Other	5	4.0000	0.70711	0.31623	

An independent-samples *t*-test was run to determine if there were differences in sparks, student belonging, developmental relationships, and intentional promotion of

career pathways scores between educational attainment. There were no statistically significant differences, $p > .05$. See Table 5.

Table 5

Differences by Educational Attainment

Educational Attainment		n	Mean	SD	Std. Error Mean	*p*-value
Sparks	Bachelor's degree	23	3.4130	0.69335	0.14457	0.230
	Graduate degree	62	3.2177	0.64890	0.08241	
Student Belonging	Bachelor's degree	23	4.2935	0.61539	0.12832	0.558
	Graduate degree	62	4.3629	0.42628	0.05414	
Developmental Relationships	Bachelor's degree	23	4.5942	0.42589	0.08880	0.827
	Graduate degree	62	4.5739	0.36186	0.04596	
Intentional Promotion of Career Pathways	Bachelor's degree	23	4.3478	0.57277	0.11943	0.698
	Graduate degree	62	4.4032	0.58561	0.07437	

A one-way analysis of variance was conducted to determine the differences in sparks, student belonging, developmental relationships, and intentional promotion of career pathways by community type. Again, there were no statistically significant differences (

Table 6).

Table 6

Differences by Community Type

Community Type		n	Mean	SD	Std. Error	*p*-value
Sparks	Rural	17	3.2941	0.65691	0.15932	0.529
	Suburban	45	3.2000	0.64315	0.09587	
	Urban	23	3.3913	0.71441	0.14896	
	Total	85	3.2706	0.66280	0.07189	
Student Belonging	Rural	17	4.3529	0.43354	0.10515	0.764
	Suburban	45	4.3111	0.51444	0.07669	
	Urban	23	4.4022	0.46306	0.09656	
	Total	85	4.3441	0.48178	0.05226	
Developmental Relationships	Rural	17	4.7157	0.24661	0.05981	0.237
	Suburban	45	4.5574	0.39441	0.05880	
	Urban	23	4.5217	0.41303	0.08612	
	Total	85	4.5794	0.37773	0.04097	
Intentional Promotion of Career Pathways	Rural	17	4.4706	0.51450	0.12478	0.788
	Suburban	45	4.3556	0.57031	0.08502	
	Urban	23	4.3913	0.65638	0.13686	
	Total	85	4.3882	0.57929	0.06283	

After examining the results, it only two significant differences showed an impact on the classroom environment with long term outcomes: gender and the type of teacher.

- Female teachers exhibited significantly higher scores in intentional promotion of career pathways compared to male teachers.
- CTE teachers demonstrated significantly higher scores in sparks (igniting students' interest) compared to science teachers.

Community type, the level of education attainment, and race/ethnicity did not have a measurable difference on the developmental context environment created in the classroom.

Regression Models

A total of 12 regression models were tested. The first four included both teacher types: CTE and science teachers. Then, the data was split into two files—those containing only CTE teacher responses and those containing only science teacher responses. The dependent variables included sparks, intentional promotion of career pathways, belonging, and relationships. The independent variables included number of years teaching, number of sources taught, gender, race/ethnicity, educational attainment, type of community, and teacher passion through responses to career choice and interest.

Student Belonging Multiple Regression

To predict student belonging from the dependent variables mentioned above, a multiple regression was run with both CTE and science teachers. The multiple regression model did not statistically significantly predict student belonging, $F(9, 75) = 1.979$, $p = .054$, adj. $R^2 = .10$. Another regression model was subsequently run. This time, educational attainment was removed. The multiple regression model statistically significantly predicted student belonging, $F(8, 76) = 2.256$, $p = .032$, adj. $R^2 = .11$. Feeling passionate about natural resources management or environmental sciences while teaching the subject added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in

Table 7 below.

Table 7

Multiple Regression Results for Student Belonging

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.19	0.11*
Constant	3.03***	2.18	3.89	0.43			
For how many years have you been a teacher?	0.00	-0.01	0.02	0.01	0.09		
How many semesters/trimesters of natural resources management and/or environmental science courses do you teach each year?	-0.04	-0.12	0.05	0.04	-0.09		
Gender	0.14	-0.08	0.36	0.11	0.16		
Race/Ethnicity	-0.10	-0.33	0.13	0.12	-0.11		
Type of Community	0.04	-0.11	0.20	0.08	0.06		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.10	-0.04	0.25	0.07	0.17		
- I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.19*	0.04	0.33	0.07	0.33*		
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	-0.04	-0.15	0.06	0.05	-0.10		

* $p < .05$. ** $p < .01$ *** $p < .001$.

Developmental Relationships Multiple Regression

A multiple regression was run to predict developmental relationships from the dependent variables mentioned above, with both CTE and science teachers. The multiple regression model statistically significantly predicted developmental relationships, *F*(9,

75) = 3.392, $p = .002$, adj. $R^2 = .20$. However, only feeling passionate about natural resources management or environmental sciences while teaching the subject added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in Table 8 below.

Table 8

Multiple Regression Results for Developmental Relationships

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.29	0.20*
Constant	3.87*	3.21	4.53	0.33			
For how many years have you been a teacher?	0.00	-0.01	0.01	0.00	0.04		
How many semesters/trimesters of natural resources management and/or environmental science courses do you teach each year?	-0.04	-0.11	0.03	0.03	-0.13		
Gender	0.10	-0.06	0.27	0.08	0.14		
Race/Ethnicity	-0.15	-0.32	0.03	0.09	-0.20		
Educational Attainment	-0.04	-0.24	0.15	0.10	-0.05		
Type of Community	-0.09	-0.20	0.03	0.06	-0.16		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.06	-0.04	0.17	0.05	0.13		
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.17*	0.06	0.28	0.05	0.39*		
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	0.01	-0.07	0.08	0.04	0.02		

	95% CI for B						
	B	LL	UL	SE B	β	R^2	ΔR^2

* $p < .05$. ** $p < .01$ *** $p < .001$.

Career Pathways Multiple Regression

To predict intentional promotion of career pathways from the dependent variables mentioned above, a multiple regression was run with both CTE and science teachers. The multiple regression model did not statistically significantly predict the dependent variable, $F(9, 75) = 1.801$, $p = .079$, adj. $R^2 = .08$.

Another regression model was subsequently run. This time, years of experience and type of community were removed. The multiple regression model statistically significantly predicted intentional promotion of career pathways, $F(7, 77) = 2.396$, $p = .028$, adj. $R^2 = .10$. However, only feeling passionate about natural resources management or environmental sciences while teaching the subject and gender each added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in

Table .

Table 18

Multiple Regression Results for Intentional Promotion of Career Pathways

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.18	0.10*
Constant	3.27***	2.21	4.33	0.53			
How many semesters/trimesters of natural resources management and/or environmental science courses do you teach each year?	0.02	-0.08	0.13	0.05	0.05		
Gender	0.27*	0.01	0.53	0.13	0.25*		
Race/Ethnicity	-0.22	-0.49	0.06	0.14	-0.20		
Educational Attainment	0.08	-0.20	0.36	0.14	0.06		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.07	-0.10	0.23	0.09	0.09		
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.19*	0.01	0.36	0.09	0.28*		
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	-0.09	-0.21	0.04	0.06	-0.17		

* $p < .05$. ** $p < .01$ *** $p < .001$.

Sparks Multiple Regression: CTE

A multiple regression was run to predict sparks from the dependent variables: how many courses taught, race/ethnicity, educational attainment and passion for teaching the subject matter. specifically, among CTE teachers. The multiple regression model did not statistically significantly predict sparks, $F(7, 21) = 1.217$, $p = .337$, adj. $R^2 = .05$.

Student Belonging Multiple Regression: CTE

The multiple regression model to predict student belonging from the dependent variables: how many courses taught, race/ethnicity, educational attainment and passion for teaching the subject matter, specifically, among CTE teachers, did not statistically significantly predict student belonging, $F(9, 19) = 1.738$, $p = .149$, adj. $R^2 = .19$. Another regression model was subsequently run. This time, semester/trimesters of courses taught, gender, and educational attainment were removed. The multiple regression model statistically significantly predicted student belonging, $F(6, 22) = 2.921$, $p = .030$, adj. $R^2 = .29$. However, factoring in the results for the answer regarding teaching high school as a career that respondents are passionate about added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in

Table .

Table 19

Multiple Regression Results for Student Belonging

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.44	0.29*
Constant	1.97**	0.61	3.33	0.66			
For how many years have you been a teacher?	0.01	-0.01	0.02	0.01	0.12		
Race/Ethnicity	0.28	-0.15	0.72	0.21	0.23		
Type of Community	-0.13	-0.35	0.08	0.10	-0.22		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.32*	0.05	0.60	0.13	0.45*		
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.15	-0.09	0.40	0.12	0.28		
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	0.09	-0.07	0.24	0.07	0.23		

* $p < .05$. ** $p < .01$ *** $p < .001$.

Developmental Relationships Multiple Regression: CTE

To predict the connection between developmental relationships and the dependent variables: how many courses taught, race/ethnicity, educational attainment and passion for teaching the subject matter, a regression model was run with only CTE teachers. The multiple regression model did not significantly predict developmental relationships, *F*(9,

19) = 1.551, p = .201, adj. R^2 = .15. Another regression model was subsequently run. This time, responses about feeling passionate about natural resources management or environmental sciences while teaching, the type of community the school is located in, and number of semesters educators teach the environmental science or natural resources course were removed. The multiple regression model statistically significantly predicted developmental relationships, $F(6, 22) = 2.583$, p = .048, adj. R^2 = .25. However, including the responses only for teaching high school is a career that the respondent is passionate about added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in Table 20.

Table 20

Multiple Regression Results for Developmental Relationships

		95% CI for B					
	B	**LL**	**UL**	**SE B**	**β**	**R^2**	**ΔR^2**
Model						0.41	0.25*
Constant	3.51***	2.49	4.53	0.49			
For how many years have you been a teacher?	0.01	-0.01	0.02	0.01	0.17		
Gender	-0.11	-0.37	0.15	0.12	-0.16		
Race/Ethnicity	-0.14	-0.47	0.18	0.16	-0.16		
Educational Attainment	-0.11	-0.43	0.20	0.15	-0.17		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.30*	0.09	0.50	0.10	0.57*		
Compared to the other classes I teach, natural resources management or environmental science is the course	0.07	-0.03	0.16	0.05	0.24		

	95% CI for B						
	B	**LL**	**UL**	**SE B**	**β**	**R^2**	**ΔR^2**
that I enjoy teaching the most.							

* $p < .05$. ** $p < .01$ *** $p < .001$.

Career Pathways Multiple Regression: CTE

To predict intentional promotion of career pathways from the dependent variables: how many courses taught, race/ethnicity, educational attainment and passion for teaching the subject matter with only CTE teachers, a multiple regression was run. The model did not statistically significantly predict the dependent variable, $F(9, 19) = 0.632$, $p = .756$, adj. $R^2 = -.13$.

Sparks Multiple Regression: Science

A multiple regression was run to predict sparks from the dependent variables: from the dependent variables: how many courses taught, race/ethnicity, educational attainment and passion for teaching the subject matter, with only science teachers. The multiple regression model did not statistically significantly predict sparks, $F(9, 46) = 0.955$, $p = .489$, adj. $R^2 = -.01$.

Student Belonging Multiple Regression: Science

To assist in understanding how the dependent variables among just science teachers and student belonging, a multiple regression was run to predict student belonging from the dependent variables mentioned above, with only the science teachers. The multiple regression model did not statistically significantly predict student belonging, $F(9, 46) = 1.381$, $p = .224$, adj. $R^2 = .06$.

Developmental Relationships Multiple Regression: Science

The predictive power of developmental relationships among science teachers was assessed through a multiple regression analysis. The multiple regression model statistically significantly predicted developmental relationships, $F(9, 46) = 2.614$, $p = .016$, adj. $R^2 = .21$. However, only feeling passionate about natural resources management or environmental sciences while teaching added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in Table 21.

Table 21

Multiple Regression Results for Developmental Relationships

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.34	0.21*
Constant	4.09***	3.19	5.00	0.45			
For how many years have you been a teacher?	0.00	-0.01	0.01	0.01	0.01		
How many semesters/trimesters of natural resources management and/or environmental science courses do you teach each year?	-0.04	-0.12	0.04	0.04	-0.15		
Gender	0.16	-0.07	0.39	0.11	0.22		
Race/Ethnicity	-0.18	-0.39	0.03	0.11	-0.26		
Educational Attainment	-0.04	-0.32	0.25	0.14	-0.04		
Type of Community	-0.15	-0.31	0.02	0.08	-0.24		
Of the potential career choices, teaching high school is a career that I am passionate about.	0.02	-0.11	0.15	0.06	0.05		
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.17*	0.03	0.31	0.07*	0.38		
Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	0.00	-0.11	0.12	0.05	0.01		

* $p < .05$. ** $p < .01$ *** $p < .001$.

Career Pathways Multiple Regression: Science

A multiple regression was run to predict intentional promotion of career pathways from the dependent variables mentioned above, with only science teachers. The multiple regression model did not statistically significantly predict the dependent variable, $F(9, 46) = 1.354$, $p = .237$, adj. $R^2 = .06$. Another regression model was subsequently run. This time, years of experience, number of semesters taught, educational attainment, and teaching high school as a career that the respondent is passionate about were removed. The multiple regression model statistically significantly predicted intentional promotion of career pathways, $F(5, 50) = 2.509$, $p = .042$, adj. $R^2 = .12$. However, feeling passionate about natural resources management or environmental sciences while teaching added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors can be found in Table 22.

Table 22

Multiple Regression Results for Intentional Promotion of Career Pathways

		95% CI for B					
	B	LL	UL	SE B	β	R^2	ΔR^2
Model						0.20	0.12*
Constant	3.57***	2.61	4.52	0.47			
Gender	0.26	-0.08	0.59	0.17	0.24		
Race/Ethnicity	-0.23	-0.55	0.09	0.16	-0.22		
Type of Community	-0.09	-0.34	0.17	0.13	-0.09		
I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.	0.23*	0.02	0.44	0.11	0.34*		

Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.	-0.05	-0.22	0.12	0.08	-0.09

* $p < .05$. ** $p < .01$ *** $p < .001$.

Several statistical analyses were conducted to assess group differences and predict various outcomes among CTE and science teachers. Regression analyses were utilized to examine the relationship between independent variables, such as teacher demographics, passion, and developmental context elements, were the dependent variables. Initially, educational attainment was found to be significant in predicting sparks, but after removing it, belonging became significant. Passion for natural resources emerged as a significant predictor in various regression models.

Group differences between CTE and science teachers were observed, with CTE teachers scoring higher in spark. Gender differences in the area of fostering sparks were also observed to have statistical significance with females having higher spark scores. Regression analyses revealed that passion for natural resources significantly predicted student belonging and developmental relationships. Gender and career preferences, such as teaching high school, also played a role in predicting intentional promotion of career pathways among science teachers.

Overall, the findings underscored the importance of passion for specific subjects and career preferences in predicting various aspects of teaching and teacher–student relationships.

Chapter V: Discussion

This study explored the research question, "**How do high school educators who teach environmental science and natural resources management foster an inclusive developmental context supporting academic motivation, career awareness/aspiration, and positive youth development for their students?"** Utah high school CTE and science teachers were the population examined through interviews and an email survey. The study investigated group differences and predicted outcomes among CTE and science teachers, focusing on factors such as teacher demographics, passion, and developmental context elements.

CTE teachers exhibited higher spark scores compared to science teachers, while gender differences were observed in fostering sparks, with females scoring higher. Teacher passion was an additional variable explored in this study, investigated through both self-perceived passion for the subject and teaching in general. Passion for natural resources emerged as a significant predictor in regression models, particularly in student belonging and developmental relationships. Additionally, for science teachers more so than CTE, passionate about a career in teaching high school influenced the intentional promotion of career pathways. These findings highlight the importance of subject-specific and career passion in predicting teaching dynamics, underscoring the nuanced influences on teacher–student relationships. However, the question still remains "can passion be taught?" to future and current teachers?

The 4-H Thriving Model is designed to foster the positive development of youth across various domains, preparing them for success in different aspects of life, including the workforce. The model is built on the premise that thriving youth are those who are

engaged in a learning environment with strong developmental context of sparks, belonging, and relationships (Arnold, 2018). This model was designed for youth development programs, not school-based education experiences. However, based on the findings, the model could be considered for use in classroom learning environments. The developmental context found in the model is similar to that which many educators employ who use social and emotional learning (SEL) in the classroom.

According to the Collaborative for Academic, Social, and Emotional Learning (CASEL, 2020), SEL involves acquiring skills to manage emotions, set positive goals, and establish positive relationships. SEL is an integral part of education, aiming to foster students' emotional well-being, interpersonal skills, and overall social competence. Teachers who use SEL can contribute to a more comprehensive and effective education. The integration of SEL is seen as a way to prepare students not only for academic success but also for personal and social challenges they may encounter in life. Longitudinal studies suggest that SEL developed during school years have long-term benefits, including improved mental health, reduced risk of criminal behavior, and enhanced career success (Jones, Greenberg, & Crowley, 2015).

Critics argue that dedicating time to SEL might detract from academic instruction, especially when there are already tight schedules and limited resources in schools (Belfield et al., 2015). However, findings in this study found evidence of teachers building a strong developmental environment in their classroom by helping students identify and then fuel their sparks, foster a sense of belonging in the classroom, and develop positive relationships with teachers. This strengthened the academic experience

rather than detracted from instruction and was an organic part of the classroom environment, as opposed to an additional piece to fit in with already tight schedules.

Career awareness helps students understand the connection between their education and future career goals. This understanding can motivate them to perform better academically as they see the relevance of their coursework to their desired professions (Savickas, 2013). Teachers helping their students identify their interests and passions early and understanding what excites them can guide their educational and career choices. This career-planning effort has the potential to lead to greater satisfaction and engagement in students' future endeavors.

Teachers interviewed as part of this study described that building a learning environment that fosters sparks likely leads to their students developing an interest in science and a science-related career. One of the key ways that teachers expressed nurturing a spark in their students was allowing students to chart their own course. Nine of the 10 teachers interviewed mentioned 28 times that they give students ownership of their learning. Similarly, eight of the teachers mentioned 18 times that they let students take the lead.

All 10 teachers mentioned 117 times that they help their students pursue their interests. Teachers play a pivotal role in fostering sparks in their students because it contributes to motivation, engagement, personalized learning, critical thinking, and lifelong learning. In the quantitative survey only 11% of teachers stated that it was probably untrue that their students aren't passionate about topics studied in class. Additionally, 25% of teachers indicated that the topic/class is integral to who their students think they are. It goes beyond academic achievement, impacting various aspects

of a student's personal and intellectual development. There is good evidence that when the teacher understands the importance of fostering sparks, students connect the sparks to a career. It is recommended to provide teachers with specific techniques including student self-directed research and student driven projects like those found in the CTE SAE program to help them in their ability to foster student sparks.

All 10 of the teachers interviewed mentioned that they discuss career planning with their students. This was mentioned 227 times across the interviews. Career awareness and exploring learning experiences were by far the most popular, mentioned by all 10 teachers 193 times.In the quantitative survey 65% of teachers indicated that it is" very true" that they expect students to do something positive with their future. Teachers may not have specific career goals for their students but they do have high expectations that the will do something positive after high school.

It was very clear that teachers involved in the study understand the importance of helping students find and foster their sparks. Exposure to and promotion of career pathways to further fuel sparks was completed using a variety of classroom teaching techniques. Lastly, it was apparent that teachers relied on resources outside the classroom and school day to support their teaching efforts.

Early exposure to various careers and industries broadens student horizons. Students can begin to see future jobs that they might enjoy. Lent, Brown, and Hackett (1994) investigated the impact of career exploration activities on students' self-efficacy and motivation. They found early exposure to diverse career opportunities can enhance students' confidence and motivation in pursuing their career goals. Having opportunities to explore different paths, understand the skills required, and get the education needed for

those careers can help students make informed decisions. Teachers utilized specific strategies like guest speakers and career development contests to provide "sparks opportunities" for students to increase their understanding of future career options they might pursue in environmental science or natural resources management.

Reviewing the teaching techniques utilized—and more importantly, those not used—sheds light in areas of possible improvement for educators interested in increasing their ability to foster sparks. The participants indicated varying levels of the use of out-of-classroom strategy types. Almost half, 43.5% (*n*=37), of teachers surveyed do not take students on any field trips; even fewer teachers, over half 51.8% *(n*=44), never used community science data collection at all. It is interesting to note that all of the teachers who participated in the interview described using field trips. The bulk of field trips were local, within walking distance of the school and allowed students to complete the activity without impacting other class periods during school. The one exception was the teacher who organized a multi-day excursion to Central America in the summer. This study only included those teachers willing to commit to being interviewed or complete the survey. Not knowing the techniques and attitudes of the non-responders limits the strength of the findings. Of the out-of-classroom experiences listed in the survey, the one used by the least number of teachers is incorporating service learning, 55.3% (*n*=47).

This is a missed opportunity, as these methods were identified in the literature review as all demonstrating positive impact on future career choice and concern for the environment. By contrast, the largest proportion of teachers indicated that they use lab experiences five or more times, 85.3% (*n*=73), and classroom demonstrations were used five or more times, 67.1% (*n*=57). Increased focus on activities that happen inside a lab

environment instead of in the field is one of the primary concerns that Unger (2007) identified in a lack of preparedness in the wildlife science career field.

The relationship between youth and adults is the second component in the 4-H Thriving Model for positive development. Student–teacher relationships are about trust, mutual warmth, and respect. Classroom teachers and the classroom environment needs to be viewed by students as a safe place with caring adults who are willing to help them navigate coursework and the larger challenges that they face. These relationships are foundational to student success and to realize the long-term outcomes of the 4-H Thriving Youth Model, including academic motivation and success, increased competence in hard and soft skills, and becoming contributing members of their community.

This research provided several examples of teachers actively taking steps to create a positive developmental context in their classroom through building positive relationships between students and teachers. Educators described how they increased trust and safety with students by adding elements like couches to the physical space of the classroom, creating an environment where students felt they could relax, talk, and "hang out" with the teacher and fellow students. These spaces and teachers' willingness to build open, honest relationships with students created a safe environment for students. In these classrooms, students felt comfortable with asking questions and taking chances. One teacher summed this up well:

> "Our charter school has this motto that is everywhere in our school, and it's everything we live by, and it's 2, 4, 3, where it takes only 2 letters to say we, 4 letters love, and then 3 for you. So, we love you." —Science 5

Teachers consistently shared stories of encouraging students to pursue efforts that assist with their learning experiences. Several teachers described using projects and contests to measure student success. These measurement strategies went beyond the traditional test-based assessment. Students involved in projects and contests assisted in building self-efficacy.

Many of the interactions that teachers described happened outside of the typical classroom environment. Teachers described their interactions with students during lunch breaks, field trips, and county fairs, as well as helping with student projects outside of school hours. However, teachers discussed that barriers do exist that limit their ability to foster positive relationships. Two barriers that teachers mentioned included the lack of financial resources and having a large scope of coursework topic responsibilities, spreading them "too thin." This limited their ability to provide the kind of experiences that allowed them to foster stronger relationships with students.

Each of the questions that made up the teacher–student relationship bank asked teachers about their relationships with students. Questions asked if they pay attention to their students, like working with their students, and help their students see future possibilities for themselves. Over 90% (n=74) of the teachers surveyed either said "probably true" or "very true" in response to these questions. Along with that, 75% (n=75) of teachers indicated a response of "very true" in the areas of investing time and respecting their students. Two areas that teachers ranked "probably true" most often are in helping students see future possibilities and stretching students' growth to push them in new ways. It is important to note the only teacher construct that had no teachers say "very untrue" or "probably untrue" was the Developmental Relationships Construct. The

presents the idea that no teacher disagreed with the ideas presented in the developmental context area of relationships.

Conversely, the area that had the highest level of "very untrue" or "probably untrue" is found in the Sparks Developmental Relationships Construct. It is concerning that:

- 11.8% (*n*=10) of teachers surveyed responded they don't allow their students to explore topics they care about, and
- 10.6% (*n*=9) of teachers don't think that their students are passionate about the learning experiences provided in class.

Even more concerning is that 47.1% (*n*=40), of teachers responded to this question as "neither true" or "untrue". Lastly, when asked the question, "My students want to learn all they can about the topic of this program," only one teacher selected "very true" and 29.4% (*n*=25) selected "probably true." If teachers don't think that their students are interested in the topics they are teaching, how might this impact their teaching of the topic?

The current teacher shortage is less about losing teachers to retirement and more to do with high workloads, excessive administrative tasks, and demanding job responsibilities contributing to teacher burnout (Ingersoll, 2001). More recently, Marshal et al. (2023) surveyed 830 teachers to understand what would make them likely to leave the classroom. Increased workload, ongoing stress, and lack of support from administrators and parents were all factors that teachers shared that had them considering leaving the classroom. Further investigation into barriers that teachers face in their

teaching experience could provide additional insight. This insight may help keep quality teachers in the classroom.

Belonging is a crucial aspect of a positive developmental context, especially in high school classrooms. The sense of belonging refers to students feeling accepted, valued, and connected within their school community. As teachers discussed belonging, the primary focus of the discussions was their relationship with the students. Teachers outlined the continued impacts of the COVID-19 pandemic on their students that had disrupted classroom learning and having students feel a lack of belonging. Teachers also discussed the importance of fostering belonging in students who identify with the LGBTQ+ community and refugee/immigrant populations.

Findings from the bank of survey questions related to belonging provide additional insight into the topic of belonging that goes beyond the teacher–student relationship. When asked the question, “My students feel supported by other students in this class,” only 14% (*n*=12) of teachers indicated that this was “very true” in their classroom. Nine percent (*n*=9) of teachers stated that it was “neither true nor untrue” when asked the question, “My students feel like they matter in this class.” On a positive note, 55% (*n*=47) of teachers reported “very true” to the question “My students feel safe in this class” with only one teacher expressing “neither true nor untrue” and no teachers expressing that it is “not true”.

Potential Future Research: Belonging and Representation

What appeared to be missing from the belonging discussion, and could be a subject of further research, is what educators are doing to foster belonging in the classroom environment. Diversity, equity, and inclusion (DEI) efforts in public schools

support students who are underrepresented on campuses. This includes students of color, students with disabilities, and LGBTQ+ students.

As of March 2024, at least 24 states are weighing anti-DEI bills that would forbid employees from providing specific supports to these students (NEA NEWS, 2024). In response, CTE teachers discussed how to better use the FFA program as part of their three-part approach to education. In June 2023, the National FFA Organization created a new position, an executive in residence for DEI, also abbreviated as EDI (FFA, 2023). This executive is responsible to design, implement, and evaluate an EDI strategy in alignment with the FFA's strategic plan. This individual creates and moderates safe spaces for honest and practical dialogue around diversity and inclusion while challenging conventional wisdom and developing and delivering EDI training, tools, and resources to FFA stakeholder groups. This represents a significant move forward for the organization and warrants further study to determine how it impacts a sense of belonging for students at the local school level. For this to be successful, more must be done to engage FFA Advisors/members at the local level. In March 2024, a black member of the FFA Chapter from Westlake High School of Saratoga Springs, Utah came back from the state FFA convention to find his hotel room in disarray and a racial epithet spelled out on a bed (DeBrule, 2024). This kind of behavior must be stopped at the local level for youth to feel like they belong to this group.

Underrepresented minority students, women, and other marginalized groups in STEM fields may experience feelings of isolation and a lack of belonging due to stereotypes and underrepresentation (Cheryan et al., 2009). In 2021, the National Science Teaching Association recognized that inclusion should be a central component in all

aspects of education. But challenges to achieve equity and social justice in science education are a real problem for science educators. The situation is more dire when considering the connections between racial injustice, the environment, and climate change. Overall, students from disenfranchised communities often face opportunity gaps in their educational experience.

To promote equitable learning environments for all students, the organization began providing professional development for science and STEM educators (National Science Teaching Association, 2021). Similar to their CTE teacher colleagues, more research can be done to examine what specific measures to promote belonging are being used in the larger classroom environment. This is especially important in states like Utah that have seen significant pushback from increasing DEI efforts in public school classrooms.

Roles and Responsibilities of CTE and Science Teachers

CTE teachers and science teachers have distinct roles and responsibilities. CTE teachers focus on career-specific skills and knowledge within a particular industry or vocational area. Science teachers aim to provide students with a comprehensive understanding of scientific principles and methodologies. CTE teachers often emphasize hands-on, practical, and experiential learning. They may incorporate real-world projects, internships, or industry partnerships to provide students with applied skills. Science teachers tend to focus on theoretical concepts, scientific inquiry, and laboratory experiments to help students understand fundamental principles. The emphasis may be on developing critical thinking and analytical skills.

It appears that the differences between the two kinds of teaching are less distinct in the area of environmental science and natural resources management. CTE includes fields such as health care, information technology, agriculture, business, and manufacturing. Similar to the agricultural biology course, it could be suggested that the natural resources management CTE course is more of a science course with more applied learning than a skill-building CTE course. Key differences were found between the two teacher groups with CTE teachers providing more career guidance and science teachers connecting the learning more to the real world.

Looking at the differences in the classroom developmental context that includes sparks, belonging, and relationships, both sets of teachers had similar findings in these areas. The largest differences were that science teachers mentioned more about fostering an inclusive environment, and CTE teachers mentioned the environment's safety and comfort. Science teachers said that learning is influenced by "the why," whether those entails obtaining good grades or students believing that the content serves their purpose. Not one CTE teacher mentioned student motivation.

Interconnected Factors in a Successful STEM Ecosystem

This research examined one aspect, the high school classroom experience, that can impact student interest and successful preparation for further education and work in the area of natural resources management or environmental science. This is one of many possible influences and sources of career interest. Several studies demonstrate the importance of family members, role models, and after-school and summer experiences in developing students' awareness and commitment to pursuing particular STEM learning pathways (Bell et al., 2019; Falk et al., 2017; Halim et al., 2018; NRC, 2015). An

editorial in *Nature* in 2010 stated that much of what community members know about science is learned informally. This article provided a call to action that education policymakers should take note and focus more on increasing the investment in informal science education.

In 2018, the National Research Council described the importance of a STEM ecosystem. Similar to a natural ecosystem that has several interconnected elements, a STEM ecosystem creates seamless connections between formal and informal learning environments, as well as linking education to the broader community and industry. These collaborative networks of individuals, institutions, and organizations work together to advance STEM education and opportunities. STEM ecosystems promote the idea that learning in STEM is not confined to traditional classrooms but instead that schools are one piece of a much larger solution.

Diverse learning environments collectively contribute to a comprehensive and interconnected approach to STEM education and workforce development. Helping teachers and other organizations, companies and agencies understand the potential impact of actively participating in building and supporting a STEM ecosystem can assist youth to find and fuel their sparks that could lead to a future career in natural resources management or environmental science.

Lastly, as identified in the 4-H Thriving Youth Model, one of the long-term impacts of fostering sparks and career awareness is that they can lead to better academic performance (Arnold, 2018). When students have a goal or a sense of purpose, they often become more motivated and focused on their studies. Understanding the relevance of

what they're learning to their future career aspirations can make education more meaningful and impactful.

Potential Future Research Lines

There are several next steps for research that can go in a variety of directions:

- Explore the specific impacts of SEL on academic success, personal development, and career outcomes to understand how teachers can build a stronger developmental context in their classroom environments to support student growth and success.
- Identify strategies to increase the teacher response rate and find ways to reach non responders who may have a different view point.
- Investigate the reasons behind the variation in the use of out-of-classroom strategies among teachers. Understanding the barriers preventing some teachers from incorporating field trips, community science data collection, and service learning into their teaching methods could increase the use of these teaching techniques.
- Assess the effectiveness of DEI initiatives in fostering a sense of belonging in high school classrooms, particularly in states facing resistance to such efforts.
- Investigate the differences in the approach to career guidance between CTE teachers and science teachers. It is worth further examining the impact of these approaches on students' understanding of career pathways in environmental science and natural resources management.
- Explore the implementation and impact of STEM ecosystems in education. Research could help us see how these contribute to a more comprehensive and

interconnected approach to STEM education and workforce development as we assess the role of schools within the broader STEM ecosystem.

- Investigate strategies used by educators to foster a sense of belonging in the larger classroom environment, going beyond teacher–student relationships. The impact of these strategies on students' perceptions of support from peers and their overall sense of safety and acceptance would provide valuable insight.
- Conduct a longitudinal study to track the academic performance and career trajectories of students who have undergone sparks and career awareness programs and assess the long-term impact of these programs on students' motivation and success.

These research recommendations aim to further deepen our understanding of the complex dynamics involved in fostering PYD, particularly in the realms of SEL, career guidance, DEI efforts, teacher experiences, and the broader STEM education ecosystem.

Recommendations for Practice

There are several recommendations for practice from this research:

- Encourage educators to incorporate SEL principles into their teaching practices. Provide training and resources for educators to develop skills in managing emotions, setting positive goals, and establishing strong relationships with students. The 4-H Thriving Model training materials could be used as part of this effort.
- Emphasize the importance of early exposure to various careers and industries. Encourage teachers to help students identify their interests and passions, fostering

a sense of sparks. Provide tools and strategies for educators to guide students in career planning and exploration.

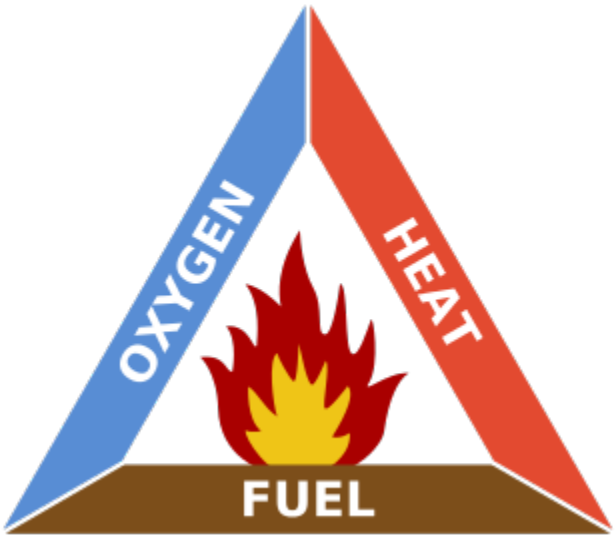
- Highlight the benefits of diverse teaching strategies, both inside and outside the classroom. Encourage educators to utilize a mix of approaches, including field trips, community science data collection, service learning, and other hands-on experiences. Address concerns and barriers related to resource limitations that limit these approaches.
- Emphasize the significance of positive teacher–student relationships in creating a safe and supportive learning environment. Encourage educators to invest time in building trust, mutual warmth, and respect. Provide guidance on creating physical spaces conducive to open and honest interactions.
- Advocate for the inclusion of DEI efforts in public schools. Support educators in fostering a sense of belonging in the larger classroom environment, focusing on underrepresented groups. Provide resources and training to address DEI challenges and promote inclusivity.
- Facilitate collaborations between schools and external resources. Encourage partnerships with professionals, guest speakers, and organizations to provide real-world exposure and opportunities for students. Highlight the value of community engagement in broadening students' horizons.
- Promote the concept of STEM ecosystems that connect formal and informal learning environments. Encourage schools, organizations, and industries to actively participate in building and supporting STEM ecosystems. Showcase the potential impact on youth development and career exploration.

- Encourage collaboration and information sharing between CTE teachers and science teachers. Recognize the unique strengths of each group and facilitate cross-disciplinary insights. Identify common ground in creating inclusive and engaging learning environments.

Throughout the research study, each of the developmental context elements of the 4-H Thriving Model were examined. Most often, each element was treated as a "stand alone." Through the interviews, specific teachers and in once case the overall school focused on only one element (i.e. relationships) versus engagement with all three of the developmental relationship context elements. As I have reflected on this and the Thriving Model, I think that the elements found in the model are similar to those in a fire triangle.

Figure 5

Fire Triangle (Wikipedia, 2024)



The fire or combustion triangle is a simple model used to understand the necessary ingredients for most fires. It consists of three elements: heat, fuel, and oxygen.

The fire triangle shows that a fire needs all three elements to ignite. Removing any one of these elements will extinguish the fire. Like the fire triangle, the Thriving Model has three components: sparks, belonging, and relationships. All three elements are needed to realize the most significant short and long-term impacts. Removing one or adding too much of another will lessen the potential impact.

These practice recommendations aim to provide a holistic approach to fostering PYD, integrating SEL, career awareness, diverse teaching strategies, and supportive learning environments. Ongoing support, resources, and collaboration are essential to implementing these recommendations effectively. High school is a critical time in students' lives when they undergo significant cognitive, emotional, and social development. As teachers understand and apply the concepts of the foundation of fostering sparks, promoting a sense of belonging, and encouraging relationships between students and teachers based on trust, mutual warmth, and respect, the classroom environment will be more ready to prepare students for the long-term outcomes of experiencing academic motivation and success.

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Appendices

Appendix A: Predetermined Question Guide for Qualitative Data Collection

1. Please describe your educational and professional background leading to your current role.
    a. What are your current teaching assignments?
2. Do you feel high school classes and experiences play a significant role in laying the foundation for a student to pursue a specific career field?
    a. If yes, can you think of any examples as to how? If not, what is the goal of your course instruction?
3. What do you consider to be essential elements in a classroom environment for learning to happen?
4. What opportunities do you provide youth in your program/class to explore their interests and passions?
5. What strategies do you use to foster a sense of belonging among all students?
6. What does the term “belonging” mean to you?
7. Are any groups of students not attending your programming/classes? Who are they?
    a. Why, do you think?
8. Can you describe a successful situation where you showed caring to students?
    a. What other ways have you found success in showing caring to students?
9. In what ways have you challenged student growth?
10. What does it mean to you to “share power” as a teacher when you work with your students?
11. What learning experiences are most important for your students?
    a. Why?

12. How often do you connect classroom learning experiences with potential career options in natural resources or environmental science?
    a. Can you think of any specific career options in these fields?
13. Do you take your students on natural experiences outside the classroom and school grounds?
    a. If so, have you found any impact on their performance from these experiences?

Appendix B: Sparks Quantitative Question Bank

A spark is a passion for a self-identified interest or skill or a capacity that metaphorically lights a fire in a young person's life, providing energy, joy, purpose, and direction. Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Very Untrue

Untrue

Probably Untrue

Neither True nor Untrue

Probably True

Very True

- I allow my students to explore topics they care about.
- My students are passionate about the learning experiences provided in this class.
- My students want to learn all they can about the topic of this program.
- This topic/class is integral to who my students think they are.

Belonging Quantitative Question Bank

Belonging is when adult educators create a space where youth feel physically and emotionally safe in a group or class. Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Very Untrue

Untrue

Probably Untrue

Neither True nor Untrue

Probably True

- My students feel safe in this class.
- My students feel supported by other students in this class.
- My students feel like they matter in this class.
- My students feel welcome in this class.

Caring Adult Quantitative Question Bank

Caring adult relationships foster trust, mutual warmth, and respect. Students view educators as safe and there to help. Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Very Untrue

Probably Untrue

Neither True nor Untrue

Probably True

Very True

- I pay attention to my students.
- I like my students.
- I invest time in my students.

Challenging Growth Question Bank

Educators who challenge students' growth encourage them to embrace new experiences as a growth opportunity and to welcome challenges. Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Very Untrue

Probably Untrue

Neither True nor Untrue

Probably True

Very True

- I help my students see future possibilities for themselves.
- I expect students to do something positive with their future.
- I stretch my students and push them in new ways.

Youth–Adult Partnership Question Bank

Student–educator relationships eventually move from adult-driven to a partnership, reflecting the young person's "increasing competence, personal autonomy, decision-making, and identity formation." Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Very Untrue

Probably Untrue

Neither True nor Untrue

Probably True

Very True

- I listen to my students' ideas.
- I treat my students fairly.
- I take my students seriously.
- I respect my students.

Career Connections Question Bank

Please check the bubble that best resonates with your perceived level of importance in helping students connect classroom activities to a career pathway.

Bubble range:

Very Unimportant

Somewhat Unimportant

Neither Important nor Unimportant

Somewhat Important

Very Important

Please identify your perceived level of importance in connecting students' out-of-classroom experiences with in-school instruction.

Bubble range:

Very Unimportant

Somewhat Unimportant

Neither Important nor Unimportant

Somewhat Important

Very Important

How often do you use the following strategies in your classroom?

Number of times scale:

0 times

1–2 times

3–4 times

5 or more times

- Lab experiences
- Community (citizen) science data collection
- Service learning
- Supervised Agriculture Experience (SAE)
- Field trips
- Guest lectures from industry professionals
- Demonstrations
- Contests
- Other

To what level do you agree or disagree that there are a lot of jobs available in natural resources management or environmental sciences?

Strongly Disagree

Somewhat Disagree

Neither Agree nor Disagree

Somewhat Agree

Strongly Agree

Teacher Passion for Subject Question Bank

Please check the bubble that best describes your agreement with the following statements:

Bubble range:

Strongly Disagree

Somewhat Disagree

Neither Agree nor Disagree

Somewhat Agree

Strongly Agree

- Of the potential career choices, teaching high school is a career that I am passionate about.
- I feel passionate about natural resources management or environmental sciences while I'm teaching the subject.
- Compared to the other classes I teach, natural resources management or environmental science is the course that I enjoy teaching the most.

Demographic Questions

Which courses do you primarily teach? (Check one)

Career and technical education courses

Science courses

For how many years have you been a teacher?

Insert whole number

How many semesters/trimesters of natural resources management and/or environmental science courses do you teach each year?

Insert whole number

What other courses do you teach? (Check all that apply)

Biology

Biology: Agricultural Science & Technology+

AP or IB Biology

Biology With Lab CE Chemistry

Chemistry

AP or IB Chemistry

Chemistry With Lab CE Earth Science

Environmental Science/IB Environmental Systems Agricultural Biotechnology+

Agricultural Science+ I, II, III, IV

Aquaculture

Animal Science+ I or II

Botany

Geology

Marine Biology/Oceanography

Meteorology

Natural Resource Science I, II

Plant and Soil Science I, II

Wildlife Biology 1, 2

Zoology

Other

None of the above

What gender do you identify as?

Male

Female

Nonbinary

Prefer not to answer

Please specify your ethnicity. (Check all that apply)

Caucasian

African American

Latino or Hispanic

Asian

Native American

Native Hawaiian or Pacific Islander

Other

Prefer not to answer

What is the highest level of degree you have been awarded? (Check one)

Associate's degree

Bachelor's degree

Graduate degree

In what field(s) were your degree(s)?

Insert answer

What type of community is the school you teach located in? (Check one)

Urban: 3,000+ persons per square mile

Suburban: 1,000-3,000 persons per square mile

Rural: less than 1,000 persons per square mile

Appendix C: Codebook Classroom Developmental Context and Career Awareness

Category	Sub - category	Code	Description	Example
Creating a positive learning environ-ment				
	Giving students owner-ship of their learning		Teacher talks about a shift in the teacher's role. Traditionally, the teacher was seen as the bearer of knowledge. They took on an authoritarian position/stance and controlled everything. Currently, teachers see themselves as facilitators that empower the students to learn on their own by providing direction, delegating, communicating expectations, and allowing the students to execute. Student agency helps to foster a sense of ownership and enhances academic performance.	
		Letting students take the lead	Teacher sees themselves as a facilitator where their role is to provide direction, assign responsibilities (delegate), communicate expectations (this is what needs to be done), and allow students to execute (or take ownership).	"Letting them [students] take the lead on things is very important in an agricultural education program, and in the FFA. Every year we elect a new set of chapter officers, and … I give the applications to my graduating seniors in the FFA. And they actually choose the officer team for the upcoming year." —CTE 1

Category	Sub - category	Code	Description	Example
		Giving students a voice	Teacher says they ask students for opinions on how to handle a situation and how to solve an issue and allow them to propose things. That engagement increases motivation as they are involved in the learning process and fosters a sense of ownership.	"In natural resources we have probably three or four projects. Some are small and some are larger … and I allow the students to design and choose topics and choose how they'd like to get that done, so there's some of that." —CTE 2
		Power sharing is not easy	Teacher says they struggle, or they don't give students as much ownership as they should.	"That's hard because how you have students do that [power sharing]. So we've had some training on that, and he's given us good examples on how to do that. So that's a work in progress. We're working on that. I'm working on that personally." —Science 1
	Fostering a growth mindset		Teacher talks about strategies they use to challenge what the students believe is their potential versus their actual potential. These include talks about the growth mindset in the first year, encouraging students to explore concepts to a deeper level and trying new and challenging things. This helps students to develop essential skills such as critical thinking and communication.	
		Inquiry-based learning	Teacher says they shift focus from the result to the process of arriving at the result by asking "why" and "how" questions to trigger curiosity and encouraging students to explore a concept. This approach fosters problem-	"For learning to happen, I think there has to be opportunities for students to have time to think and to process. Science is not a set of facts. … It's a process, and everything we know and understand about science is

Category	Sub - category	Code	Description	Example
			solving and critical thinking skills.	because someone took an idea or asked the question and learned how to get answers and learned how to focus on the process of truly coming to understand something where you research it." —Science 2
		Incorpo-rating presenta-tions	Teacher incorporates activities to help students develop soft skills.	"Our wildlife biology class is a challenge for a lot of students because there's no tests in that class. It is all presentations. So we really push the soft skills that are actually really important of, like, collaboration, and it's not enough for you to gather the information; you have to communicate it effectively, right, and getting them to converse with and persuade their peers, like, 'Here's why this matters.'" —Science 3
		Assignin g challeng -ing tasks	Teacher encourages students to try tasks they consider challenging or that get them out of their comfort zone to stretch their cognitive abilities and develop essential skills (e.g., preparing and making presentations).	"I feel like part of what I need to do is stretch my students and get them out of their comfort zone. During some of the tangential modules, I have my students prepare presentations and present in front of the class, and that's just really hard for some kids ... it's safe but it's hard." —CTE 2
		Making students try new things	Teacher invites students to try things that they wouldn't normally. This helps students to develop new skills and exposes them to potential career opportunities.	"Making them try new things. So we recently just had our area leadership development events here in Utah, and there was an extra spot open on the farm bureau discussion meet. And they like to have four kids on that, and there were only

Category	Sub - category	Code	Description	Example
				three of them. And so I looked at my FFA members that weren't competing … and I settled on a freshman who just moved here. … They showed him the questions, he had 10 minutes to basically prepare himself, and he won it. He won it. And he did so great." —CTE 1
		Modeling a growth mindset	Teacher shares a personal struggle and the strategies they used to overcome the situation.	"I give them a little bit of my background. I didn't have straight As; I didn't have scholarships for everything. I was one of those midline guys that went on and did great things because it took time, and I found a way to do it, and I tell them you can do the same thing." — Science 1
		Setting high expecta-tions	Teacher teaches advanced content and the approach helps to unconsciously improve the student's potential.	"I don't water anything down. I give them the science that I want them to know. I don't make them feel like, 'Oh, this is too hard for you to understand.' I just make it feel like, 'This is just what we're learning.' And I think with that attitude students can rise into a higher level and not knowing that they're actually there." —Science 1
	Modeling social behavior			
		Talking with students	Teachers say they have one-on-one conversations with students to understand a change of behavior (like	"I currently have a student who is struggling in her personal life. I'm not quite sure what it is, but it's

Category	Sub - category	Code	Description	Example
			skipping class). In some cases, teachers engage parents and colleagues for advice.	causing her to not go to classes. … And that same day I had actually gone to this student and been, like, 'Hey, like what's going on? Like, why are you late? You haven't brought any of your stuff to class, like, something I can help you with?'" — CTE 1
		Providing supportive solutions	Teachers are sensitive to students' needs and take proactive measures to address the need.	"I had an FFA president one year. … So the kid that should be the example, turns out, he had quite the drinking problem … so that kid needed a lot of support because Dad was sort of a schmuck. He just didn't have a lot going on at home, and maybe it was a call for help or whatever. But, my gosh! He got a lot of help." —CTE 3
		Showing empathy	Teacher is able to relate and understands students' struggles by leaning into their own experiences and provides assistance. They also share personal experiences to create a safe learning environment where students can open up.	"We have several transgender students here that have really had a hard time fitting in. … But I have a son that's transgender, which has been a hard transition as a parent over the last 10 years or so. I guess I relate now, and this is the only place they will come to talk with you. They won't even talk with our mental health counselors. They will talk with me, and they feel very comfortable because I treat them like a human being. —Science 1
		Building rapport	Teacher gets to know the students' personal lives by visiting their families. This	"How I show caring, like I'll see him at the county fair, the parents and the family,

Category	Sub - category	Code	Description	Example
			helps in establishing connections and making students feel valued.	and I'll talk to him if I see him in the grocery store like, 'Hey? What's going on?' Just like make them feel like they're valued and important." —CTE 4
		Providing emotional support	Teachers provide emotional support by listening to students, acknowledging their feelings, and giving them time to take care of themselves.	"My student was having severe friend problems, and she would come into my classroom every morning before school and just talk. And just that chance for her to come in and have somebody listen to her completely changed the rest of her high school experience." —CTE 5
	Creating a safe and comfort-able environ-ment		This describes the physical and the psychological classroom environment created by teachers to enhance learning and promote a sense of belonging.	
		Comfort-able environ-ment	Teacher creates a fun and relaxing atmosphere that encourages students to share experiences, interact, build student–student and student–teacher connection, and fosters a sense of community. This may be achieved by having a couch, sharing snacks, and having a personal touch.	"One of the big things is that feeling of comfort. That's why I brought the couch in. … It's just a place where students can sit and relax during lunch and stuff. It's been really good."Science 1
		Conducive physical conditions	Teacher ensures that the physical conditions in the classroom are conducive for learning. These include adjusting lighting and air conditioning. A conducive	"If it's really hot in your room, no one's going to learn anything. If it's really cold, no one's going to learn anything. If it's too dark or too bright … right? Like

Category	Sub - category	Code	Description	Example
			learning environment enhances learning.	those physical conditions really matter." —Science 3
		Psycho-logically safe	Teacher creates an environment where students feel comfortable making mistakes without the fear of being judged.	"I try my hardest to make it a place where everyone feels comfortable getting things wrong, not getting it right every time." —CTE 2
	Building an inclusive environ-ment		Teachers embrace an inclusive culture with equal treatment, giving all students a voice.	
		Group projects	Teacher incorporates group work where groups may have the freedom to select their topic. Studying in groups encourages all members to contribute and participate and fosters a sense of belonging.	"A class-wide project going on this year…there's a cohesion in our class this year, because of that. It's pretty strong, you know that that's been a good thing." —CTE 2
		Equal treatmen t	Teacher says they provide equal opportunities.	"They're not being shunned, or, you know, treated like they're a lesser person, or something like that. … So for me they feel comfortable." —Science 1
		Shared values	The teacher talks about tools such as class theme songs and a school motto that help create a sense of community.	"Our charter school has this motto that is everywhere in our school, and it's everything we live by, and it's 2, 4, 3, where it takes only 2 letters to say we, 4 letters love, and then 3 for you. So we love you." —Science 5
		Establish -ing connect-ions	Teacher cares to know the student at a deeper level and understand the issues they are facing. This positively influences the student's attitude toward learning.	"I think a really big one is teacher connection. It goes back to the old saying, 'They don't care how much you know until they know how much you care,' especially

Category	Sub - category	Code	Description	Example
			Teacher helps establish connections between students such as knowing student names, group projects, and seating charts.	this day, where kids are struggling so much with anxiety, and you know all the gender issues and political issues, and that kind of stuff, it, like it doesn't matter how great your teaching is." —CTE 5
	Teacher's attitude & demeanor			
		Passion for the job	Teacher says that being enthusiastic, excited, and loving the job rubs on the students, and they become excited about learning.	"My attitude matters. If I step in and say, like, you know, 'We got this unit on birds, and I really freaking hate talking about birds, but we got to talk about it,' they're not going to talk about it." —Science 3
		Being compe-tent	Teacher level of competence (i.e., knowledge and skills) influences the students toward learning.	"I think you need to have the knowledge and skill set of what you're teaching." —CTE 4
		Friendly attitude	A friendly attitude makes the students feel valued and comfortable talking to the teachers openly.	"They know I'm friendly. They know I'll answer all their questions. I never put anyone down or say, 'No, we're not going to talk about that,' or I have no problem. But students are very, very comfortable being here, and they're comfortable talking with me openly." —Science 1
		Teacher's effective-ness	Teacher says that doing their job right increases the likelihood that students will develop an interest in	"If I'm doing my job right, the students have at least an interest in science." —Science 1

Category	Sub - category	Code	Description	Example
			science and a science-related career.	
	Student factors			
		Student's motiva-tion	Teacher says that learning is influenced by "the why," whether that's to get good grades or believing that the content serves their purpose. Some of the strategies teachers use to foster motivation is using hands-on activities and emphasizing real-world application of concepts.	"Obviously the students have to be motivated, so there has to be a certain level of interest, has to be something that, you know, kind of the hook that gets them started." —Science 2
	Class-room manage-ment		Strategies teachers use to maintain a favorable classroom environment for learning	
		Fosterin g mutually respectfu l relation-ships	Teacher treats students as adults and shows respect for their background and experiences.	"I think just having mutual respect. I think it's probably the number one. I treat these kids like they're grown because they have seen some shit that I could not even comment on." —CTE 3
		Being consiste nt	Teacher is consistent in their routines/rules so that students are aware of what to expect, and that creates a sense of stability.	"… Being really clear and consistent with simple things, like rules. Routines, right? That when you walk into class, I have a slide up on my screen every day. That, when you walk in, these are the things you need. right? So they know every single day that's there. They know what to get out." —Science 3
		Establish -ing clear	Teacher says they communicate expectations/rules up front.	"Establishing up front that like … This is the way that it is, and I mean what I say,

Category	Sub - category	Code	Description	Example
		commun -ication		and with all of the love and grace that I can, but that matters too, and establishing that up front." —Science 3
		Rewards	Teacher gives rewards to encourage positive behavior in the classroom.	"It's been a challenge with one of my biology classes getting them to pay attention. But we've done kind of like the give-and-take, and a little bit of reward type stuff, like, 'If you guys will listen to me for 10–15 minutes and listen'—'Really?' 'Well, then, I'll give you some extra time to work on homework.'" —CTE 5
		Teachin g current content	Teacher keeps the students up to date with what's going on.	"I teach, you know current things. Try to keep them up to date on what's going on and to give them a science foundation, because this might be the last time they get some of that in their lives." —Science 1
Career planning for students			Career planning is about the process that helps high school students make informed decisions about their future careers. It starts with exploring interests, identifying potential careers aligned with the interests, and getting experience through internships, hands-on activities, etc. Teachers play a key role in this process through talks, guidance, and providing opportunities for exploration.	

Category	Sub - category	Code	Description	Example
	Aware-ness and explora-tion			
		Career talks	Teacher says they talk to students about the different career opportunities related to subjects taught in the classroom.	"I try and present to them, I guess, or show them the different opportunities that are within our community so like in natural resources, we are going to be talking about like water quality, and that's a huge thing." —CTE 5
		Helping students discover their interests	Teacher talks about activities used to help the student choose courses and careers that interest them (e.g., conducting surveys).	
		Surveys	Teacher guides students in conducting interest surveys to identify career interests.	"It's like an ag explorer. I can't remember the exact name of it, but we, I do, take a survey about like just random agricultural questions, and it'll kind of give them their top three careers." —CTE 5
		Providing electives	Teacher says electives provide opportunities for students to try different things. This exposure helps them discover their interests, which can motivate them to pursue a career in that direction.	"We have a lot more electives like a jewelry-making class, a ceramics class, drawing, painting, several different mechanics classes, woodworking … which then allows them the opportunity to kind of like stick a finger in everything and figure out what you're good at." —Science 3
		Hands-on learning	Teacher provides opportunities for hands-on learning to 1) engage students, 2) try out skills, and 3) prepare students for the labor market. These	"I try to bring in as many hands-on experiences as I can. My goal this year has actually been to have two or more hands-on activities in each unit, which is a big

Category	Sub - category	Code	Description	Example
			include lab experiments, field-based exercises, events, competitions, summer programs, internships, supervised projects, jobs, competitions, clubs, and events.	task. It's a very large task, but I think having students get their hands dirty, and actually work with different things." —CTE 1
		Learning outside the classroom	Teacher says they provide outdoor experiences such as field trips, walks, and field classes to help the student connect theoretical concepts with real-work application, explore careers, and create opportunities to meet, interact, and create connections with experts in their field of interest.	"If a kid had an interest in something small, I could take them to a conference or on a field trip to explore those options right." —CTE 3
		Allowing students to choose	Teacher allows students to make decisions about courses and research topics. This agency helps students to determine their interests.	"My final projects are usually, they kind of choose from a list of what they would like to research and study, and what projects they would like to lead, kind of to give them that opportunity to explore more of what they're interested in." —Science 5
		Manda-tory courses	Teacher says that making it mandatory to pursue subjects like agriculture would provide opportunities for students to explore nontraditional courses.	"I believe that all students should be required to take an agricultural class to understand where their food, fiber, and natural resources are coming from, and not only that, but to see all the opportunities and careers that are available to them through that." —CTE 1
		Career guidance	Teacher encourages students to pursue careers related to their interests and guides them in selecting the appropriate courses or	"As far as encouraging students to pursue their interests, you know, kids come and ask me, right, like if they're interested they'll

Category	Sub - category	Code	Description	Example
			joining the right after-school clubs.	come and ask me. … So I'll try to like pick away and find out what they're really interested in, and then try to point them in the right direction." —Science 4
		Creating career pathways	Teacher says the school has predefined programs that students follow through to college.	"We have something called career and technical education pathways or career pathways. And so we want them to almost pick one and go towards that." —CTE 1
		Emphasizing real-world application of concepts	Teacher talks about how concepts learned in the classroom are applied in the industries.	"We'll talk about local problems in class, for like, for example, the bird flu that went around. You know we talked about that in animal science. And you know, if you have backyard chickens, what have you been doing? That kind of stuff." —CTE 5
		Inviting guest speakers	Teacher invites experts to talk/demonstrate what they do, requirements, and potential job opportunities. Talks from guest speakers foster a sense of authenticity. This provides a direct connection between what students are learning and how it could be relevant in the future.	"I specifically asked the people to talk to them about careers, and so they introduced my students to about 10 different careers, and in the DNR." —CTE 2
		Linking students with job opportunities	Teachers link students with potential job opportunities.	"I don't like, 'Hey, this is legitimate. You can do this: this is sweet. You don't have to go flip burgers at McDonald's, like you can go do this.'" —CTE 4
		Recommending a skill or	Teacher directs students who express interest in a certain career to a higher education	"We do direct students to Utah State specifically if

Category	Sub - category	Code	Description	Example
		university	institution known to have a strong program.	they're interested in those topics." —Science 1
	Experi-ences for fostering career skills		Teachers discuss learning experiences that help students to build skills like team working skills, critical thinking, problem-solving, and observation.	
		Collabo-rative learning	Teacher says that students form groups to complete a hands-on activity/project. Students engage in posing questions and fostering curiosity. The interaction also fosters teamwork, interpersonal skills, and a sense of belonging.	"They also work in teams. Each team has an aquaponics system with koi and plants, and so this, the skills that are required to work as a good team member are fostered." —CTE 2
		Individ-ualized learning	Teacher assigns students personal projects that help students to develop personal responsibility.	"For the ninth graders, each student has his or her own 10-gallon tank with their own fish that they take care of throughout the year … this, you know, business of taking care of a fish. It's a big deal to a lot of kids, a lot of kids experience a whole lot of growth and responsibility, you know, personal responsibility throughout the year." —CTE 2
		Inquiry-based learning	Teacher provides opportunities for students to focus on learning/the process rather than the outcome. They ask questions to encourage students to research and develop thinking and problem-solving skills.	"I have been desperately trying to teach my students to think for themselves, to reason, to problem-solve, to find sources rather than believe what's on there." —Science 1

Category	Sub - category	Code	Description	Example
		Observation	Teacher says they organize outdoor activities such as school trips, star parties, and projects to teach students observation skills.	"I was trying to teach how important it is for observations; we walked down. There's kind of like this park that's about two, three blocks from our school, and we walked down there, and I gave them an observation scavenger hunt, and they had to find something green ... like some kind of bugs, some, like, a type of mushroom or fungi. And it was fun to see." —Science 5

Appendix D: Coding Themes

Themes	# participants that mentioned the theme	# times theme mentioned across all interviews
Creating a positive learning environment	10	138
giving students ownership of their learning	9	28
letting student take the lead	8	18
giving students a voice	6	7
power sharing is not easy	3	3
fostering a growth mindset	9	32
inquiry-based learning	5	6
incorporating presentations	4	7
assigning challenging tasks	3	3
modeling a growth mindset	2	2
making students try new things	2	3
setting high expectations	1	4
modeling social behavior	9	26
talking with students	5	6
providing supportive solutions	5	6
showing empathy	4	8
building rapport	2	4
providing emotional support	2	2
creating a safe and comfortable environment	4	10
conducive physical conditions	1	1
comfortable environment	2	4
psychologically safe	3	5
building an inclusive environment	6	10
group projects	3	4
equal treatment	3	3
shared values	2	3

Themes	# participants that mentioned the theme	# times theme mentioned across all interviews
establishing connections	5	9
teacher's attitude & demeanor	4	10
passion for the job	4	4
being competent	2	2
friendly attitude	1	1
teacher's effectiveness	1	3
student factors	3	6
student's motivation	3	6
classroom management	4	7
fostering mutually respectful relationships	3	3
establishing clear communication	2	2
being consistent	1	1
rewards	1	1
Career planning	**10**	**227**
awareness & exploration	10	193
career talks	8	22
helping students discover their interests	10	117
surveys	3	3
providing electives	3	4
allowing students to choose	4	10
hands-on learning	10	55
learning outside the classroom	8	43
mandatory courses	1	2
creating career pathways	3	5
career guidance	7	15
inviting guest speakers	8	18
recommending a skill or university	3	7
linking students with job opportunities	2	2

Themes	# participants that mentioned the theme	# times theme mentioned across all interviews
emphasizing real-world application of concepts	6	7
Experiences for fostering career skills	**10**	**34**
collaborative learning	7	14
individualized learning	6	6
observation	5	8
inquiry-based learning	5	6

Appendix E: Reflexivity Statement

For the qualitative portion of this study, I have checked my biases, assumptions, and beliefs about this topic through a subjectivity statement. Going into this research, I have identified the following biases and beliefs:

- I am a product of a CTE natural resources class taught in Utah public schools. I participated in CTE Natural Resources courses, NR 1 and NR 2, in my senior year of high school. My enjoyment of the course and deep involvement increased my bias toward CTE as a potent vehicle for natural resources management in high school versus a biology course.
- Much of my life, from childhood forward, I have been involved in some aspect of outdoor recreation or environmental education experience. This increases my bias towards the importance of experiences in the out-of-doors.
- Professionally, I work with many teachers who bring high school teams to the annual Envirothon. Because of this, I am more familiar with the courses and teaching styles than a typical investigator.
- My previous work on the Granite School District Agriculture and Natural Resources Advisory Board strengthened my belief about the strength of CTE programs' proactive approach to building pathways.
- My work in 4-H created bias toward experiential learning and using and understanding the 4-H Thriving Youth Model.

Curriculum Vitae

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PROFESSIONAL EXPERIENCE

Utah State University Cooperative Extension

2019-current Extension Youth Programs Department Head/4-H State Director

2018-current Extension Professor

July 2009–2018 Extension Associate Professor

2003–June 2008 Extension Assistant Professor

2001–2003 Thanksgiving Point Institute Youth Education Manager

AWARDS AND HONORS

National and Regional

2016 National Association of Extension 4-H Agents Meritorious Service Award

2016 eXtension Foundation eXtension Fellow

2015 National Association of Extension 4-H Association (NAE4-HA) Search for Excellence in Teen Programming Team Award. 1st Place Western Region/1st Place National. Fidelity Financial Education Grant Program.

2015 National Extension Association of Family & Consumer Sciences (NEAFCS) Dean Don Felker Financial Management Team Award. 1st Place Western Region/1st Place National. Fidelity Financial

State and Local

2017 Utah State University Extension Faculty University Service Award

2017 Epsilon Sigma Phi, IOTA Chapter Mid-Career Service Award

2016 Utah State University Extension Researcher of the Year

2011 Utah State University Extension Spirit of Extension

2007 Utah Non-Point Task Force Non-Point Source Water Quality Award

2006 Utah State University Extension Specialist Association New Specialist Award

2004 Utah State University Extension Taggart-Ballard Award of Excellence

2004 Governor Walker's Watershed Initiative Utah Watershed Education Award

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National and Regional

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Francis D.W. (2016). Utilizing Maker Movement and Design Challenges to Make Resilient Kids with Strong STEM Abilities. Presented at 4-H Military Partnership Conference in San Antonio, TX.

Totten, J. & Francis, D.W. (2016). The Making of Agriculture: The Intersection of the Maker Movement and Modern Small Scale Agriculture and How Extension Professionals Can Encourage Both. Presented at the National Small Farm Conference in Virginia Beach, VA.

Francis, D.W. (2016). Military Makers Presented at 4-H Military Partnership Conference in San Antonio, TX.

Dierenfield, C., Kraft, G., & Francis, D.W. (2016). SPINing up 4-H Presented at 4-H Military Partnership Conference in San Antonio, TX.

Brown, M., Kham A., & Francis, D.W. (2015). Youth on the Pathway. Presented at National 4-H Partner Summit in Chevy Chase, MD. (invited).

Francis, D.W. (2014). Grow and Learn Across the State. Presented at the National Children and Youth Garden Symposium of the American Horticulture Society in Columbus, OH.

Francis, D.W., Dart, P.C, & Reeve, K. (2014). 4-H and the Maker Movement. Presented at Western Regional 4-H Leaders' Forum in Billings, MT.

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CONTRACTS AND GRANTS

External Funding

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Utah Statewide Extension Program Leadership

2010–2019 Utah 4-H Military Liaison

2007–2019 Utah Junior Master Gardener State Coordinator

2007–2019 Utah 4-H Science Liaison

National and Regional Service

2009–2012 National Gardening Association Kids Gardening Advisory Board Member

2009–2011 National 4-H Council Science Management Team Member

2007–2009 National 4-H Council SET Leadership Task Force

2008–2011 National 4-H Council SET in Urban Communities Task Force

2003–present National Association of Extension 4-H Agents member

State and Local Service

2017–present Utah Envirothon Steering Committee Chair

2016–2019 Granite School District Agriculture Education Advisory Committee Co-Chair

2009–present Utah Envirothon Steering Committee