

FOSTERING ENGAGEMENT AND CAREER ASPIRATIONS:
THE IMPACT OF SCIENCE ROLE MODELS
ON MOTIVATING STUDENTS AND INCREASING STEM INTERESTS

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DEDICATION

I dedicate this action research to my family. They have been an outstanding support system throughout the Master of Science in Science Education (MSSE) program, particularly during the capstone action research project. The moments of chaos, managing time, schedules, and mental capacity felt overwhelming. Nevertheless, the confidence my family had in me to complete this goal gave me the fulfillment I needed to keep pushing myself through each challenging moment.

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ABSTRACT

This review examines the importance of role models in the classroom to determine students' interests in science and their level of engagement during instruction. To instill lifelong learners who are interested in the world and to provide a variety of career opportunities, I aimed to increase student engagement and interest in science by bringing role models into the classroom. Students were engaged with five role model presentations with authentic activities related to the presenter's career field. The students were given a Likert-style survey assessing their interest and engagement in science and interest in pursuing a STEM career. The students' engagement was observed during all five presentations and three traditional class lessons. After the presentations, each student completed an exit ticket expressing their interest in the presentation, their engagement, and whether the career or a similar field piqued their interest. After all presentations were complete, some students were interviewed to provide more depth on their experiences. The same Likert-style survey was completed at the end of the treatment for comparison. Qualitative data suggested that having professionals in the classroom had the largest impact on STEM interest and engagement. The students' interest and engagement piqued with hands-on activities and tangible items. The pre-and post-surveys showed no statistically significant change in engagement, interest in science, or interest in STEM careers.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

Context of Study

Superior School District is located in the rural area of Superior, Montana. The district consists of two buildings: the elementary building serves grades kindergarten through sixth, and the junior high/high school building serves grades seven through twelve. The 2025-2026 school year had 41 junior high students and 96 high school students, grades 7 through 12 (Labbe, 2025). The school is 56 miles from Missoula, Montana, following I-90 east. According to World Population Review (2025), the town of Superior had a population of 966, with the highest ethnicity being white at 91.6%. Our population numbers are gradually increasing, 2.77%, mostly due to an influx of new, young families moving into the area (Superior, Montana Population, 2025). However, some families come and go throughout each school year, causing our monthly numbers to fluctuate. The once thriving town of Superior grew in numbers due to mining and logging, though it lost many businesses during the economic downturn, leaving many families without jobs. As a result, many people commute to neighboring towns for work and spend their money elsewhere. The town has recently seen a rebound in its population and a small increase in local businesses, but development is progressing at a relatively slow rate. Even with an increasing population, our school receives Title 1 funding and has 100% of students eligible for free or reduced-price meals (Labbe, 2025). The town of Superior has a supportive community, and many students come from generational families of the area, while others venture in and eventually find their sense of belonging. As the town continues to regain its status in the

economy, students must understand the needs of the evolving national job market. By broadening their career options, students prepare themselves for future success and position themselves as valuable contributors to the local and national economies.

Surrounded by nature with the Clark Fork River flowing through town, the students have the opportunity to experience nature firsthand. Access to nature allows students to engage with their surroundings and provides a sense of interest and appreciation for the area. With the incorporation of real-world applications, students can see the relevance of their education and their community. Some students have dreamed about their future with a clear purpose in the world while still in high school. Most students' immediate visions do not often revolve around the demands of the current economy. These students have found a way to connect with the world through volunteer work, extracurricular activities, and various jobs. Conversely, others graduate without a clear direction, feeling anxious and uncertain as to where their professional life will take them. Making a career choice can be a challenging decision that is influenced by family expectations, personal interests, and job market trends. Without a driving passion, students can feel unmotivated, thus affecting their academic performance and overall well-being. Lack of motivation can lead to missed opportunities and hinder their engagement. Teachers and support systems must provide resources and guidance that empower students, encouraging self-discovery that awakens their passion.

Collectively, the influence of family, teachers, and personal interests intertwines to play a role in shaping a student's career path. Similarly, a support system can inspire ambitions and encourage seeking out new interests—a feeling of connection built from positive relationships with staff, peers, and coaches. Conversely, a lack of these connections may hinder students'

ability to explore diverse interests. Interest and engagement can lead students to new, unexpected opportunities. Through an enriched environment that brings awareness of various fields, students can become self-driven and embrace their future with confidence. As educators, we understand that not all students' backgrounds provide the support and understanding of the vast job prospects. Taken together, this forms a complex web of support, and it is our responsibility to expose them to a variety of careers through engaging lessons that may highlight new interests. Similarly, place-based learning, hands-on activities, and guest speakers serve as a way to bridge theory with practice. Collectively, these approaches engage a diverse group of students in real-world applications that foster interest and spark curiosity to pursue their interests. In contrast, traditional classroom settings often lack real-world applications through role models and opportunities that enhance intrinsic motivations.

In my Earth Science classroom with ninth and tenth-grade students, I recognized an opportunity to strengthen the connection between course content and real-world applications. While students participate in required science coursework, structured exposure to science professionals has not been a consistent part of instruction. Given the diverse student backgrounds and various levels of home support, integrating STEM professionals into our curriculum can serve as a positive intervention as students transition from school to the workforce. These professionals serve as role models, can help students find relevance in their Earth Science education, and make real-world connections by supporting interest and engagement in science. Integrating role models and hands-on activities into the curriculum increases students' understanding of Earth science while fostering a deeper appreciation for the environment and local areas, including the Clark Fork River, which helps them understand how they can

contribute to its preservation. Overall, the hands-on experience and the content connections provided by the role models make learning more relevant. Without such interactions, students may struggle to make practical connections, which may affect their overall engagement.

Therefore, I sought to explore whether integrating STEM professionals could deepen engagement and interest in the natural world while broadening students' awareness of possible science-related futures.

Focus Question

To understand how professional role models in the classroom influence engagement, interest, and build career aspirations, my action research will utilize a mixed-methods approach, incorporating both qualitative and quantitative data collection techniques. My focus question is whether exposure to science professionals in the classroom impacts ninth and tenth-grade student engagement in Earth Science, increases interest in science, and enhances interest in pursuing careers related to Science, Technology, Engineering, or Mathematics (STEM).

CHAPTER TWO

CONCEPTUAL FRAMEWORK

This chapter reviews literature on student engagement, curiosity, and the pivotal role that professional role models play in shaping influential career aspirations. The following literature dives into the exposure of various careers, and interacting with professionals can lead to enhanced relevance and practical applications in the world. These themes form the conceptual foundation for investigating how exposure to science professionals influences students' engagement, interest, and career aspirations.

Student Engagement

Career exploration begins with engaged learning and functions as a bridge between learning and real-world career interests. Research shows that when students demonstrate interest and active participation in their education, they are more likely to discover meaningful career paths and be motivated to pursue them. The increased demand for student interest in the Science, Technology, Engineering, and Mathematics workforce has been essential to maintaining a strong and diverse labor pool (Laursen, 2007). As the world progresses, there is a focus on engaging and supporting students to pursue careers in STEM fields (Zhang, 2023). Student engagement has been defined in a variety of ways over the decades, highlighting its complex nature while speaking to multiple dimensions, such as cognitive and behavioral. Consequently, this leads to a better understanding of teaching methods that create active learners.

Involvement, connection, interest, curiosity, and motivation were terms commonly found in these definitions. Groccia (2018) wrote that the Glossary of Research defined engagement as

“the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education” (pp. 12). The author highlighted the multidimensional effects of engagement: behavioral engagement involved effort and participation; affective engagement involved interest, motivation, and commitment; and cognitive engagement encompassed processing experiences and linking them to previous knowledge or experiences. Understanding the dimensions of engagement has transformed teaching, improving our teaching methods and promoting active learning techniques. These techniques engaged learners with professionals within their communities and connected the classroom to the community (Groccia, 2018). Peer-reviewed research has shown that having a higher interest in science plays a crucial role in decision-making about future-related career choices, although this interest tends to decline as students age (Drytmiotou et al., 2020). Exploring how to develop and maintain interest in science became essential for educators in guiding students' career decisions. Often, engagement begins with curiosity and interest; the next section explores how interest supports motivation and engagement in science.

Student Interest in Science

Introducing science to students at a young age can build confidence and understanding that science is happening all around them. There is value in making science relevant in students' everyday lives to enhance interest in a career and to become leaders in their homes and communities (Martinez et al., 2018). Intrinsic motivation is linked to interest in the performance or what the person perceives to be valuable. When students build confidence and recognize the significance of their work, it can enhance learning and increase interest (Teppo et al., 2021).

A major factor that Drymiotou (2021) identified was interest in science related to making future career decisions. The simplicity of designing a lesson or the use of culturally relevant examples brings value and inspiration into learning. Students who see themselves applying science every day and are aware of the variety of jobs scientists hold can be motivated to pursue a career in science. Discussing relevant scientific topics creates a more tangible scenario and allows us to see the impact of science in our society (Martinez-Orengo et al., 2018). Martinez says that students respond to research opportunities and hands-on learning; however, the effort put into education is still not having an impact on the number of students pursuing careers in STEM. Exposing these techniques to students at a younger age may be received better as they are more eager to learn. Waiting until high school and beyond leads to missed opportunities to inspire future scientists and foster a higher interest in science and learning. Allowing students to be challenged and build problem-solving skills results in greater interest and enjoyment (National Research Council, 2004). As students progress through school, increased engagement may deepen their interests in science; however, connecting students with relatable role models can further increase their motivation and aspirations by shaping their career identity. The next section discusses the impact of role models within the classroom and how building connections with students promotes engagement and intrinsic motivation. Thus, students engage more deeply with the content, and when they see how it relates to their lives, they develop a stronger sense of purpose.

Role Models and Connections

Role models represent specific goals, behaviors, or strategies that influence individuals who aspire to their ideas and careers. When topics are relatable and of personal interest, students

are more likely to be interested and engaged in learning. This engagement not only enhances their enjoyment of the subject but also fosters a stronger sense of purpose. These role aspirants are those who are inspired by role models (Zhang 2023). The influence of role models shapes the perspective of what is possible or achievable through specific goal-setting. Those pursuing certain roles are determined to achieve defined goals, and this motivation influences them to exhibit similar behaviors influenced by role models. Additionally, aspirants enhance their goal attainment through cognitive and emotional strategies (Morgenroth et al., 2015). Relatability was a crucial factor in the successful impact of role models. Students tend to learn more effectively from role models with whom they can identify and find commonalities (Gladstone & Cimpian, 2021). Schools that create a connection with students through a sense of belonging and a supportive environment cultivate more engaged learners. Students who feel supported within the school and have quality interactions in their personal relationships feel more connected and engaged (National Research Council, 2004).

The Motivational Theory of Role Modeling examines the relationship between role modeling and student motivation. According to this theory, three types of role models influence student outcomes. The intertwining themes included skills and achievable goals, representations of what is possible, and being an inspiration. Behavioral models motivate role aspirants to achieve a goal and demonstrate how to attain it. In the second theme of the Motivational Theory, aspirants learn that the goal is reachable and often look to role models for reassurance in difficult situations (Morgenroth et al., 2015). A review of research has identified several characteristics of a role model that were effective at motivating various types of students. The factors that made role models motivating were perceived similarity to students, demographic resemblance,

psychological alignment, and the perception of attainable success, as described by the responsibilities and concrete steps related to STEM careers (Gladstone & Cimpian, 2021). The research supports the inclusion of science professionals in classroom instruction to increase both engagement and perceived attainability of STEM careers. Across these studies, relatability emerges as a central mechanism in the effectiveness of role modeling. When students perceive similarities, their motivation to succeed increases, inspired by role models who represent shared backgrounds and experiences.

STEM-Related Careers

The number of students entering and maintaining science, technology, engineering, and mathematics careers is faltering amid the rapid growth of STEM employment opportunities. A study conducted in Canada by Karen Blotnicky and others (2018) found that a major factor hindering students' STEM career aspirations was limited knowledge of STEM careers. Teachers can broaden students' awareness of potential careers by connecting lesson content to relevant professional fields. The pace of global innovation is speeding up. Thus, an increase in STEM education is highly needed. STEM education has developed a more integrated approach combining real-world applications, critical thinking skills, and collaboration among schools, the community, and the workforce. Soft skills have been another key component of the integral approach to teaching STEM skills, including adaptability, problem-solving, and teamwork. Soft skills enable workers to be able to change course in their line of work to adapt to innovations around the world (Zhang et al., 2023). Scientists need to be part of outreach programs that discuss the variety and valuable roles of scientists in the community and society. In the

classroom, students should learn and discuss scientific topics that are relevant to time and culture (Martinez et al., 2018).

Research indicates that involving scientists as role models in kindergarten through twelfth-grade classrooms through outreach programs or workforce initiatives increases student engagement and interest in science. Students gain new perspectives on science, view scientists as individuals, and recognize science careers as attainable opportunities (Zhang et al., 2023). According to the Motivational Theory of Role Modeling, there is a strong belief that role models significantly influence the motivation and inspiration of those aspiring to roles. However, aspirants are all different, with varying goals. This suggests that exposing students to a diverse range of people would benefit a broader group of learners (Morgenroth et al., 2015). High school students begin to develop preferences for career paths, and exposure to STEM careers can shape their beliefs about what is possible. Teachers, parents, and the media can introduce students to potential career options. As we learn about students' interests, teachers and parents can encourage them to consider careers in STEM (Rosenzweig et al., 2023). Society members can also serve as role models that students interact with through various experiences (Blotnicky et al., 2018).

The presence of science role models is pivotal in engaging students' interest in STEM careers and building confident individuals who understand the importance of science in their lives. Enhancing educational practices supports students' pursuit of a meaningful career by aligning their interests with workforce demands. This creates relatable learning experiences and builds understanding of real-world applications, inspiring students to become future leaders of

their community. Engagement and interest in science cultivate a generation of critical thinkers and innovative problem-solvers.

Collectively, the literature suggests a conceptual pathway in which exposure to relatable science professionals increases perceived attainability of STEM careers, which in turn enhances interest and engagement. Engagement functions to increase students' intrinsic motivation, to find value in their learning, and to expand their exploration of career fields.

CHAPTER THREE

METHODOLOGY

This action research study examined how science professionals serving as role models influence ninth- and tenth-grade students in Earth Science. The purpose of this research was to determine how partnerships with students and science professionals affect the students' engagement and interest in science, as well as to understand their aspirations to pursue STEM careers.

Demographics

The research was designed around the following focus questions: In what ways do partnerships between students and science professionals impact the students' engagement, interest in science, and how do these experiences influence their aspirations to pursue STEM-related careers? Students participated in five presentations with professionals, along with three traditional classroom lessons, to compare classroom engagement, interest in science, and STEM aspirations. A traditional instruction lesson will take place at the beginning, middle, and end of the treatment period. Increasing my understanding of factors that influence engagement and interest in science, I was able to improve my teaching lens to support students by creating a more hands-on approach to science that maintains relevancy. The Institutional Review Board (IRB) at Montana State University oversees the ethical conduct in research involving human subjects, such as this study. This study was approved, kept anonymous, and maintained compliance while working with human subjects throughout the study. The study has been approved and given the number 2323 (Appendix A).

Conducted at Superior High School in Superior, Montana, the study involved 19 students in an Earth Science class. This class had a wide range of learners, including 15.7% receiving special education services through individualized education plans (IEPs). Fifty-three percent of students identified as female, and 47% identified as male (Labbe, 2025). Earth Science is a year-long required course for all ninth graders to graduate from Superior High School. Occasionally, a student transferring from another school must take the course as a sophomore or junior. This course has multiple units, including the history of the universe, the solar system, the internal Earth and plate tectonics, solar energy, human impact, weather and climate, water, and oceanography. Students in this course can engage with the content to gain a deeper understanding of the natural world. By integrating professional scientists into the Earth Science classroom, I aim to foster the students' recognition of science as relevant to their daily lives and to inspire them to understand and engage more deeply with Earth Science systems.

Treatment

Traditional class instruction are vocabulary rich PowerPoint presentations that contain videos and interactive components. These lessons require note-taking for later reference and to increase understanding of the vocabulary. Labs are used after a lesson to reinforce content previously read, discussed, and learned. Typically, before the introduction of a new lesson, demonstrations serve to engage students, and if supplies are limited used in place of a lab. Conventional instruction generally does not include presenters; rather, they seek informal learning through field trips and outdoor excursions. However, it was noted that the Earth science curriculum needed additional hands-on activities and opportunities to interact with role models who share knowledge in related career pathways. In search of ways to enhance engagement,

increase interest in science, and provide more career opportunities to students, I brought scientists into the classroom to share content knowledge and experiences. Throughout eight weeks, the treatment consisted of five career presentations by a science role model in which students participated in hands-on activities and career discussions. The professionals came into the classroom prepared with a 45-minute lesson scheduled during regular class time. They shared their background and personal experiences, paired with a hands-on activity that connected students to their professional work.

Science Professionals

When considering which science professionals to bring into the classroom, the selection was based on their availability during the study and their specific areas of expertise in relation to Earth science concepts. The chosen professionals shared a broad range of science careers with the students. They visited Superior High School equipped with a plan to teach about their careers and facilitated an activity for the students. Three of the presenters were supplied by We Are Montana in the Classroom, a University of Montana initiative designed to connect role models with students.

The first presenter was an Environmental Geologist and professor at the University of Montana. He shared his research surrounding the supervolcano located in Yellowstone National Park. He brought a model into the classroom to simulate the movements of the supervolcano in Yellowstone with GPS sensors. The model had a balloon that he inflated to represent the increase of magma under the ground. The sensors signal the movement and share the data for analysis by scientists. The sensors in this model were three toothpicks connected to a gumdrop candy, which was shifted by the inflation or deflation of the balloon. The professor is also involved in

groundwater and mountain aquifers; his research includes the science behind snowpack and how runoff supplies water to our systems. The students engaged in a discussion relating snowpack to seasonal runoff, which impacts fishing and the fire season in Superior. This presentation brought topics directly relevant to the Superior community.

The second presenter was the owner of Animal Wonders, a Montana-based non-profit organization dedicated to rescuing injured or abandoned wild and exotic animals. The executive director and co-owner of Animal Wonders brought real, exotic animals to share with the students, including a blue-tongue skink, a three-banded armadillo, a red-crested turaco, a white-bellied parrot, a tamandua, and an opossum. The activity showed the importance of caring and respect that is required for all animals, domestic and wild. Her presentation provided knowledge and vocabulary such as detritivore, autotroph, heterotroph, ectothermic, and endothermic, engaging them in the life sciences. The students' retention of this vocabulary was apparent in their exit tickets and carried into other classrooms throughout the week, determining that the presentation remained relevant and provided affective engagement. The students were apparently engaged and curious, and having live exotic animals in the classroom is an experience they rarely receive.

A United States Forest Service archeologist from the Superior Ranger District joined us for our third presentation. She shared the history of Superior, starting with the gold rush that brought 3,000 people to the Cedar Creek drainage overnight and 10,000 people within three years. The town was bustling with people, and mines were established along the creek. She learns about Superior's history by finding shattered dishes or old bottles full of perfume, dye, or seasonings and figuring out which ethnic backgrounds it represents. The archaeologist brought various items in boxes and told the students their job was to research the items. Once the students

figured out what each item was, she then asked them to tell a story to represent the site in which it was found. One group shared that their items represented an old saloon where one might get food and drinks when taking a day off from mining. Another group shared a story of a man and woman homesteading the area, as flowered dishware and perfume were found in the area. It was shared that this was not the reality in most of the items she comes across, thus she brought out artifacts that were unrecognizable due to weathering and were crumbled into pieces no larger than a centimeter. The presentation brought evidence-based reasoning skills to the students and scientific inquiry through the local history of Superior, making it personally relevant.

The fourth presentation was by a Civil and Environmental Engineer who is the Associate Director for Planning, Design, and Construction at the University of Montana. She shared experiences about her work and passion for fixing systems to better our world, things like sewer systems, water systems, and various cleanups of nuclear and hydroelectric plants. The activity she led focused on the impact of pollution on watersheds if structural design is not thoughtful and its relation to civil and environmental engineering. The students were placed in five groups and given a paper to shape into a representation of a watershed. They were asked to use three colors for three different situations: lines where runoff would occur, where water would gather, and land use. Students chose agriculture, an amusement park, a homestead, and a farm for their uses of land. They used a spray bottle to simulate rain and observed how water flow can specifically impact land use. The students observed how land use affects water quality in the area. She explained that being a civil and environmental engineer means understanding these impacts and finding ways to promote sustainability while minimizing impact on the natural

landscape. This presentation connected students to real-world sustainability challenges through civil and environmental engineering careers.

An oceanographer brought the class its fifth and final presentation. He conducts research in various ocean locations, specifically near Hawaii, focusing on ocean microbes, plankton metabolism, and nutrient cycling. He currently works at Flathead Lake Biological Station in Montana, concentrating on similar research. The oceanographer shared a density demonstration that represented the difference between hot and cold water. The warm water was colored red, and the cold water was colored blue. As the two came together, the students noted how the warm water floated and the cold water sank, observing this dynamic firsthand. To deepen their understanding, he introduced essential vocabulary during the presentation, such as upwelling, nutrient cycling, phytoplankton, and El Niño. By connecting these terms to the presentation, he reinforced the important concepts of his research and the broader oceanic ecosystem. One student shared that it was interesting to see concepts learned in these presentations appear in our classroom lessons. The students then had a chance to do their own water density lab, which reinforced the information previously taught in the presentation. The oceanographer shared that he was happy to engage the next generation of scientists to get them interested and curious about the ocean.

Each of these presentations broadened the students' awareness of science careers they may not have previously considered, and many of the professionals made science relevant to their own community, deepening their understanding of local science. During the students' exposure to these five professionals, data were collected simultaneously to document the impact of the presentations on engagement, interest in science, and career aspirations.

Data Collection and Analysis

Qualitative and quantitative data were gathered using four data collection tools.

The tools were selected to address my corresponding focus questions through data triangulation, shown in Table 1. Before the first presentation, data collection began with a pre-survey that contained open-ended questions (Appendix B). The survey aimed to understand students' interest in science, perceived levels of engagement during science, and the career choices they seek to pursue. With the help of a paraprofessional, two observational data sets were collected during traditional instruction: one before the presenters and one at the end of the study to capture growth of engagement (Appendix C). Observations were also gathered during each guest speaker's presentation, and the data were compared with those of the traditional teacher. Exit tickets were completed following each professional presentation, describing the students' interest in science, engagement, and whether they were inspired by the role model's career (Appendix D).

After the eight-week study, the students were asked to complete a Likert post-survey that contained open-ended questions (Appendix B). Pre and post-surveys aimed to reveal the relationship between engagement and interest in science and examined the influence of the scientists on students' career aspirations. Six students were selected for interviews based on the interest and engagement data shown in the pre- and post-surveys. The interview questions conducted at the end of the study were intended to understand students' perspectives and provide depth to their responses in the surveys and exit tickets (Appendix E).

Table 1. Data Triangulation Matrix.

	Focus Questions		
Data Collection Instruments	How do partnerships between students and science professionals impact engagement and interest in science?	Do experiences with science professionals influence students' aspirations to pursue science-related careers?	Data Analysis
Pre- and Post-Survey	x	x	Thematic Wilcoxon Signed-Rank Test
Student Exit Tickets	x	x	Thematic Bar Graph
Student Observations	x		Rubric Bar Graph
Student Interviews	x	x	Thematic Student Quotes

Pre-Treatment and Post-Treatment Likert Survey

The pre- and post-surveys included a mix of Likert-scale and open-ended questions that examined the impact of science professionals on student engagement and interest in science, as well as their influence on career aspirations. The survey was inspired by Bradley O'Connell (2025, pp.42) to collect data on students' interest in science, including Earth science, engagement in science class, and interest in pursuing a STEM-related career. By administering the survey before and after the treatment, to analyze change throughout the study. The Likert scale consists of five options: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree, allowing students to reflect on their engagement and interest in science.

Open-ended responses were thematically analyzed to identify patterns in engagement, interest, and career aspirations. The qualitative data provided comprehensive information that revealed students' perspectives and filled the gaps that are often missed in pre-selected categories (Albudaiwi, 2017). The Likert-style questions supplied quantifiable data and were analyzed by

the Wilcoxon signed-rank test. Collectively, the qualitative and quantitative parts of this instrument provide a more complete understanding of how exposure to science professionals influenced student interest, engagement, and career aspirations over time.

Exit Tickets

An exit ticket modified from Charla Lake (2012, p.27) was used to gather data on whether the student felt engaged in the presentation and topic, was more interested in science, and if the science professional inspired them to choose this career pathway. Students completed an exit ticket after each of the five science professionals' presentations, which resulted in five data sets per student. To maintain anonymity, students selected a random paper from a jar containing letters A-V. The letter served as an identifier for reporting individual trends while protecting anonymity. Exit tickets were analyzed using thematic coding to identify recurring patterns in engagement, interest in science, and perceptions of the presenters' careers, providing a comprehensive understanding of how science professionals collectively influenced student interest and career awareness.

Student Observations

The student observation rubric, adapted from Bradley O'Connell's (2025, p.44), was designed to address the first focus question by measuring student engagement during traditional lessons and professional presentations, providing a comparison across instructional settings. Data were collected with the help of a paraprofessional using a rubric that tallied the number of students on task, participating in discussion, and asking questions every 15 minutes during 45-minute lessons. Groccia (2018) highlights behavioral engagement as involving participation and effort, and these categories effectively capture those dimensions. The tallies were converted to

percentages and used to quantify the data across each observational period. A grouped bar graph was used to display the three categories side by side in both traditional instruction and professional presentations, providing a clear visual comparison. The quantitative observational data served as a point of triangulation alongside the thematic analysis from exit tickets, which deepened the understanding of student engagement throughout the treatment.

Student Interviews

Interviews were designed and conducted with a purposive sampling strategy to address both focus questions by providing a better understanding of the influence of professionals on student engagement, interest in science, and career aspirations. Students were selected based on the data shown from the pre- and post-surveys; two students were selected from each range- little to no increase, partial increase, and higher overall increase in interest and engagement, ensuring a range of student perspectives was represented. Students within each category were placed into an online random picker using the student identifier letters.

Six interviews took place at the end of the research to gain a deeper understanding of the impact of scientists in the classroom. The interview questions were designed for students to elaborate on their experiences with science professionals as role models in the classroom. The use of open-ended questions during interviews gave students the freedom to express feelings related to interest and engagement in science and STEM-related careers. To ensure accurate data collection, audio recordings were taken during the interviews and stored on a password-protected computer. After the data were collected, they were thematically analyzed, identifying patterns and quotes that provide insight into students' understanding of engagement and interest in Earth science and in pursuing a career related to STEM. The interviews allowed students to articulate

their own experiences, complementing the quantitative and observational data. This qualitative data gave depth to how role models in the classroom impacted the students.

Validity, Reliability, and Ethical Considerations

Validation of this study was integrated through pre- and post-surveys, exit tickets, student observations, and interviews. The triangulation method ensured that the research was valid and reliable by using scoring rubrics and cross-comparison data. Student participation in this action research was voluntary and didn't affect the students' grades. The data from individuals remained anonymous and was stored safely on a password-encrypted computer.

CHAPTER FOUR

DATA ANALYSIS: CLAIMS AND EVIDENCE

Results

At the end of the eight-week treatment period, data from pre- and post-surveys, observations, exit tickets, and interviews were analyzed to triangulate the findings and assess whether scientists in the classroom increased engagement and interest in science and whether they benefited STEM career aspirations. Statistical and thematic analyses were used to better understand the impact of student engagement, interest in science, and STEM career aspirations, and the data were used to identify patterns in students' experiences after the presentations with science professionals. Quantitative results from comparing pre- and post-surveys did not show a significant change in engagement, interest in science, or interest in STEM careers. Qualitative data showed an increase in engagement, importance of science, technology, engineering, and mathematics, and in careers related to these topics. Student A did not complete the post-survey, and Student H did not complete the Pre-Survey. The survey results were adjusted to 17 students.

Engagement

The pre- and post-surveys displayed the smallest increase in student engagement, from 3.98 to 4 (Figure 1).

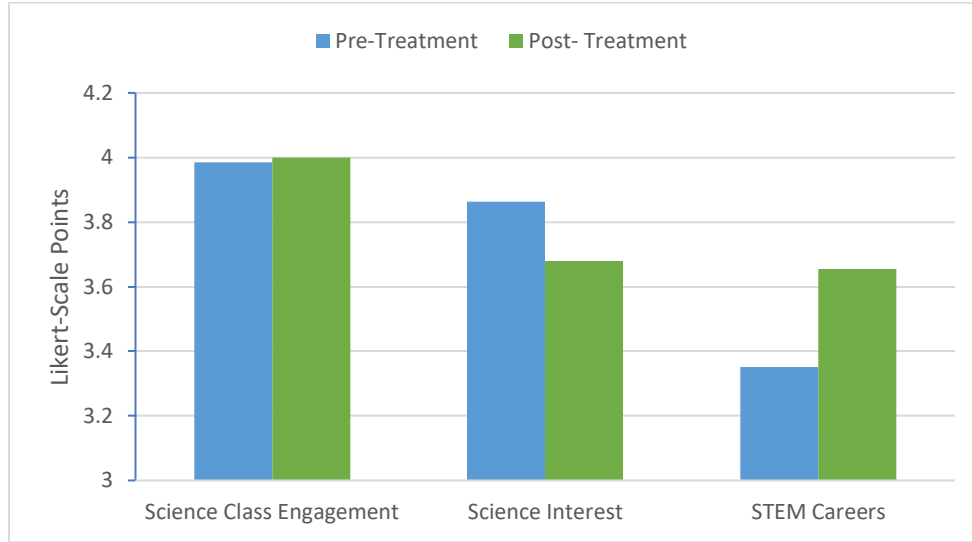


Figure 1. Group averages from the pre-treatment and post-treatment surveys ($n = 17$).

However, the data show that the students felt engaged in science before the treatment. The pre- and post-survey results did not show a significant change when averaging the categories of science class engagement, science interest, and STEM careers using the Wilcoxon signed-rank test ($W = 34$, $Z = -0.81$, $P\text{-Value} > 0.05$), thus, the study fails to reject the null hypothesis. While the survey data did not show a statistically significant change, qualitative data suggest that students perceived the presentations as more engaging. Students shared in the open-ended questions on the exit tickets that hands-on activities and visuals made the presentations more engaging. Student G wrote, “We got to do an activity and see some of the problems they face”, during the civil engineering presentation. Students made notable comments in the post-survey about the class being engaging with activities and labs. Student P wrote, “The presentations were engaging,” and Student L noted that “When teachers add activities and show how things they are teaching work.” Reiterating that students perceived the presentations as engaging through qualitative data, while surveys suggest little increase in engagement at 0.02.

The observational data were quantified to deepen the understanding of student engagement. Data results imply that students demonstrated higher behavioral engagement during STEM presentations compared to traditional instruction. On-task behavior during the presentations averaged 90% (Figure 2), and traditional classroom instruction averaged 80% (Figure 2) ($N = 19$).

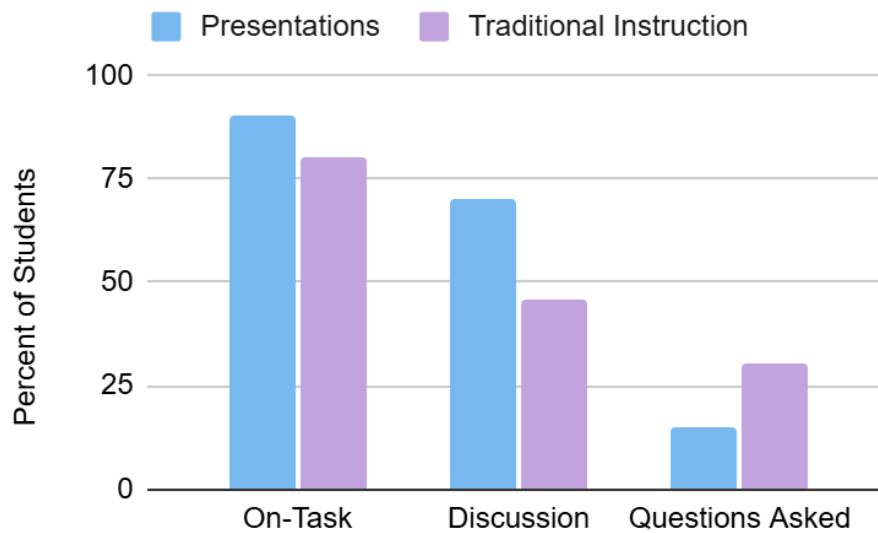


Figure 2. Averaged observational data comparing students' engagement during traditional instruction and professional presentations ($N = 19$).

During presentations, discussions were more frequent than in traditional class lessons, with 69.8% of students engaging in discussions during presentations compared to 45.8% during traditional lessons ($N = 19$). The students were actively participating by answering questions and discussing topics amongst their groups or with partners during the activities. The observations showed that 30.5% of students asked questions during traditional lessons, while 14.5% posed questions during the presentations.

The paraprofessional noted that students were highly engaged during presentations with hands-on activities and those that contained tangible items. The presentation with the archaeologist student L wrote, “I liked that she gave us something to do so that we could experience what it would be like to be an archaeologist.” Student H said it was engaging because “We got to hold and research the artifacts.” After the oceanographer’s presentation, student L stated, “The experiment was hands-on and entertaining (and) everyone was engaged.”

Using the qualitative data from all five presentations, I identified several themes of engagement in the exit tickets (Figure 3).

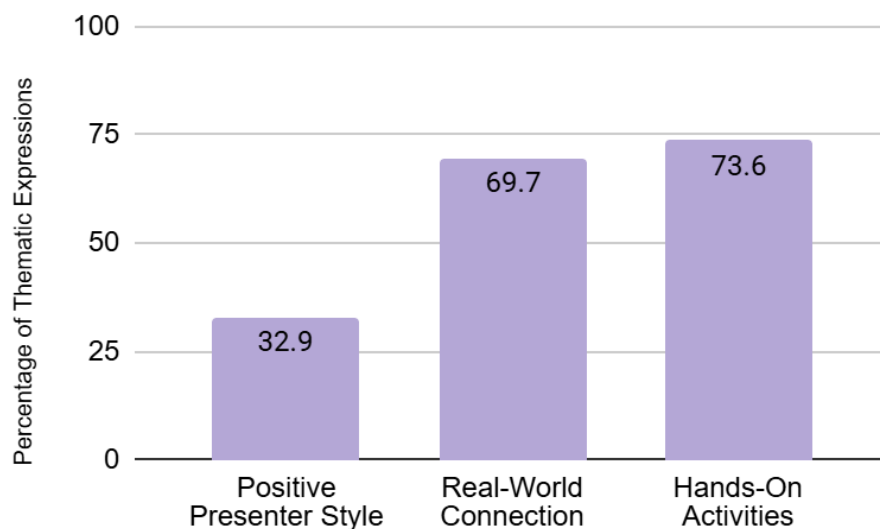


Figure 3. Exit ticket themes grouped by questions related to engagement from all presentations.

Due to absenteeism, the number of students present varied throughout the treatment. Students expressed 53 times that the hands-on activities were the most engaging part of the presentations. Student S expressed, “It was very hands-on, and the more animals she brought out, the cooler the presentation got.” Sixty-nine percent of the themes mentioned that real-world

connections and inferences made the presentations more engaging. Student G wrote, “It was engaging, and I liked learning about the things, considering they are so close to me.” The qualitative data align with the research conducted by Martinez-Orengo et al. (2018), which found that students are more engaged when content is locally and culturally relevant to science. Students most frequently responded to topics related to environmental impact and local relevance, indicating that a stronger interest correlates more with a real-world connection than content alone.

The students highlighted engagement in the interviews by expressing specific examples, combined with hands-on activities that brought more engagement to the classroom. Student V stated, “It was engaging with hands-on activities and visual aids. Like with the water activity, when it visually showed the water flooding the fields.” Many students shared in interviews about the oceanographer and the animal behaviorist as being the most memorable. Student B shared about the animals because they were from different places, and it is a topic that is particularly interesting. Student O noted, “I remember the experiments and the interactive things because they are the funnest part.” That particular student remembered something specific from each presentation. Two students shared in the interview that when the presenter or teacher asks questions, it makes the learning more engaging.

STEM Career Aspirations and Awareness

STEM interest, the importance of STEM, and considering a career in STEM all had a positive shift in the pre- and post-survey data. The questions related to STEM in the pre- and post-surveys averaged 3.35 to 3.65 on a 1-5 scale (Figure 1). This aligns with Morgenroth et al.’s

(2015) Motivational Theory of Role Modeling, which states that exposure to science professionals increases STEM career aspirations by helping students see careers as achievable.

Viewing individual survey items provides a clearer picture of where the shift occurred. Blotnicky et al.'s (2018) research found that a major barrier to STEM career aspirations was limited knowledge of what STEM careers entail. The question, "I think science is important," from 15 students to all 17 students selected Agree or Strongly Agree, suggesting that the presentations were effective at shaping value in science. The number of students who agreed or strongly agreed with "I want to learn more about STEM" increased from 9 to 11 (Figure 4).

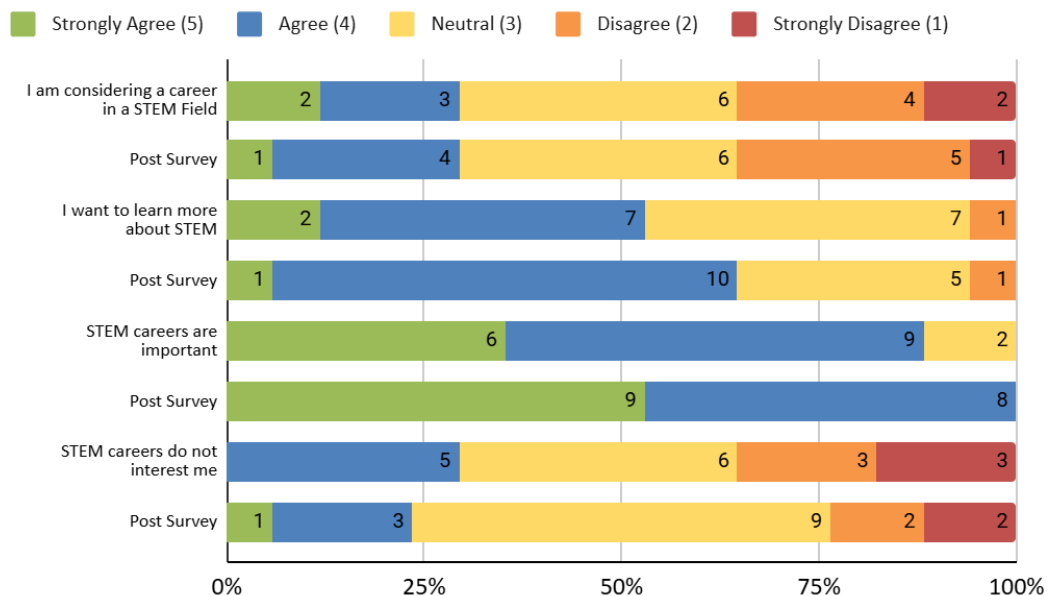


Figure 4. Likert-scale pre- and post-survey results related to STEM questions ($n=17$).

This study showed that once the professionals entered the classroom and made connections with the students, the barrier began to break down. As students learned about each

career presented by the hydrogeologist, the civil engineer, the animal behavioralist, the archaeologist, and the oceanographer, the ideas about STEM became less abstract.

The exit ticket data in Figure 5 show that 23.7% of students expressed interest in pursuing a career similar to that of one of the presenters ($n = 17$).

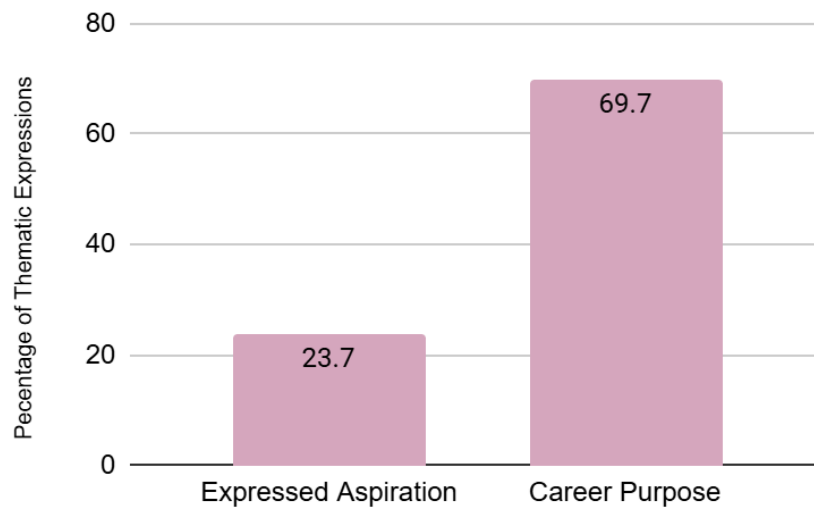


Figure 5. Exit ticket themes related to STEM expressed by students from all presentations.

Morgenroth and others (2015) described the influence of role models on aspirants as representing achievable goals and skills, options for what's possible, and serving as a source of inspiration. Evidence of all three of these influences appeared in the data. After the Animal Behaviorist presentation, Student B said in the exit ticket, "She has my dream job." Student L reflected in the post-survey, "Science interests me because I see how it affects everyday life and how crucial it is that you need to understand it." Students expressed more interest in science, technology, engineering, and mathematics after the presentations. Students began to recognize how science is connected to mathematics, engineering, and technology, and the purpose each serves within the career. Student T commented, "The civil engineer talked about where to put

different houses based on the weather patterns of the area and how their placement would be affected by where the water flows.” While Student K wrote in an exit ticket, “I learned that there is more to just building a house; you have to take into consideration that there could be natural disasters harming your house.” Students gained awareness of attainable goals, indicating a new understanding of the work involved in engineering.

Students were able to identify all parts of STEM within the presentations. They began to observe how science overlaps with mathematics, engineering, and technology, which expanded their understanding of STEM as an integration of parts rather than individual parts. Student V said in the interview, “I was intrigued when the oceanographer talked about how the probes open and close to get different water samples at various depths of the ocean,” connecting data collection and technology. Zhang et al. (2023) found that students who interact with scientists begin to view science careers as attainable. The students were intrigued by the presentations when they could see and interact with people in these roles. Student B shared in the interview, “I was very interested and excited to see what neat experiences they had, how they lived, and what their jobs entail.”

The positive shift across most STEM survey items, combined with thematic analysis of interviews and exit tickets, confirms a growing awareness of STEM’s real-world application and suggests that structured exposure to science professionals moves students toward STEM career awareness and its importance to everyday life.

Interest in Science

Sixteen out of seventeen students expressed that science is important in the post-survey (Figure 6), suggesting that students’ perceived value of science increased with exposure to

professionals. Teppo and others (2021) found that intrinsic motivation is linked to what a person believes to be valuable, and when students recognize the significance of their learning, interest increases.

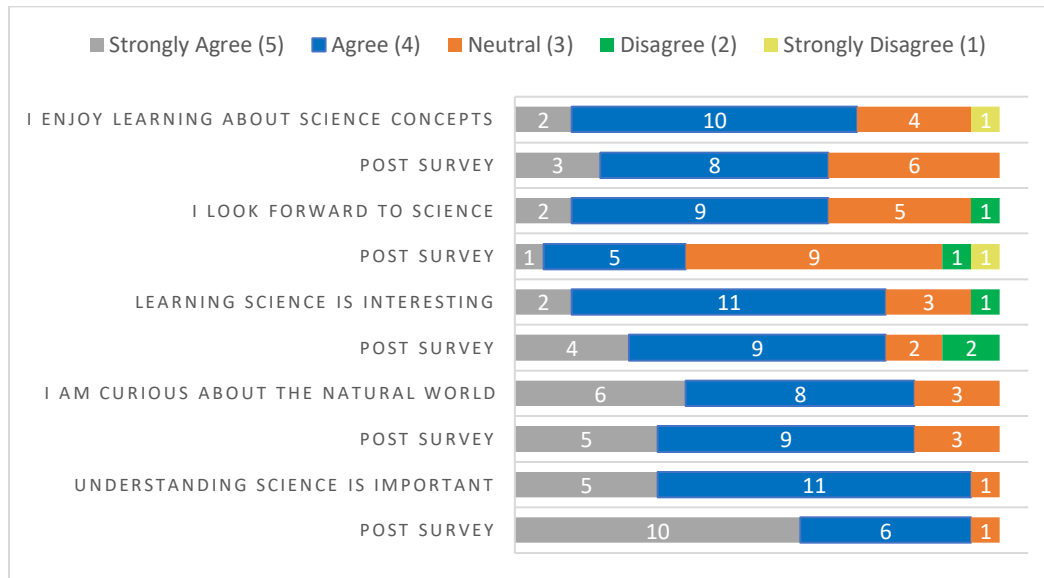


Figure 6. The comparison of interest categories from the pre- and post-surveys ($n = 17$).

The interviews showed a similar pattern. Student T shared, “It was helpful to see what they did and why it matters. What is learned in class is relevant to their jobs, and helps me find interest in science. I think, is this something I might continue pursuing?” Students were able to articulate the real-world necessity of science, connecting content from the presentations to problems and careers they had not previously considered. Student B expressed, “This changed the idea that not all scientists sit in the lab, they adventure too, and how you can do so many different things other than one particular job.” An unexpected finding emerged in the survey data surrounding interest: question seven, “I look forward to science,” declined the most, from 11

students to 6 in the post-survey, with the shift moving from positive (Strongly Agree and Agree) to Neutral.

The exit ticket themes showed that the presentations created meaningful interest in science content, particularly when the topic was connected to students' local community and environmental impact (Figure 7).

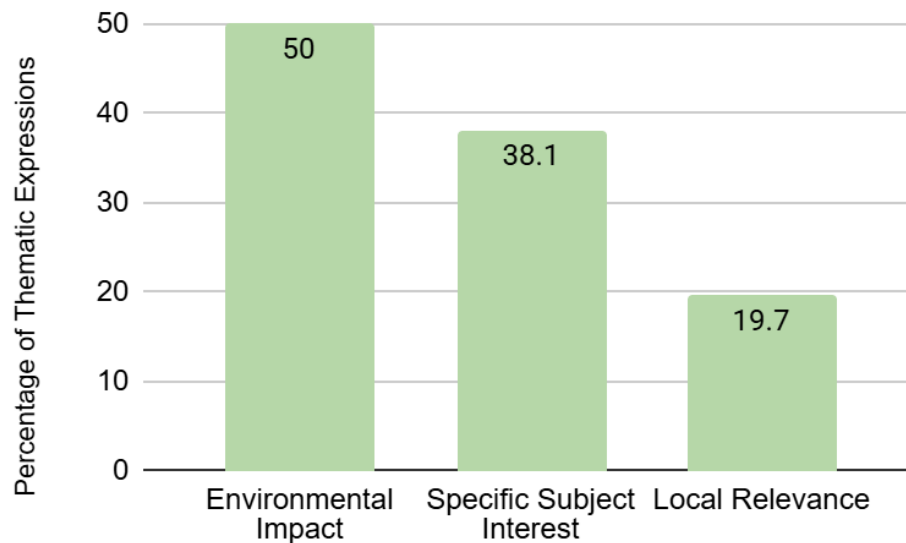


Figure 7. Themes expressed by students in the exit tickets related to interest in science.

These themes connect with Martinez-Orengo and others (2018), who argued that making science relevant in students' everyday lives enhances career interest but also positively impacts society. In the archaeologist's exit ticket, Student C wrote, "I learned a lot about Cedar Creek." Student P, "It was interesting because she explained all the artifacts in depth." Student L shared after the hydrogeologist's presentation, "It was interesting because it was fun to learn more about Yellowstone and what would happen if it were to erupt, as well as learning about how they would predict the explosion." During the interview, Student V shared, "I was very interested

because they brought hands-on examples and activities, and the physical application of the real-world examples was very engaging.” The theme mentioned the most, at 50%, was environmental impact.

A small group of students, approximately 10.5%, reported negative feedback in their exit tickets regarding the presenter's delivery style, noting that some presenters talked too much or allowed minimal time for hands-on activities. This finding aligns with Groccia’s (2018) behavioral and affective engagement framework, identifying active participation and interest as a key component of engaging students. Students tend to disengage when delivery is primarily lecture or direct instruction. This was highlighted in the interviews as well, with Student L saying, “Topics are not engaging when a teacher drones on about a subject, but doesn’t make it sound interesting.” In another interview, Student V stated, “It isn’t engaging when there is talking for long periods of time and then an assignment is given.”

The data collected over eight weeks suggest that incorporating science professionals into the Earth Science classroom increased student engagement, interest in science, and awareness of STEM careers with ninth and tenth-grade students. While pre- and post-survey results did not show a statistically significant change in engagement, the observational data imply that students were more engaged during presentations than during traditional instruction. Qualitative data also confirmed that this engagement was connected to hands-on activities, tangible items, and local relevance. A notable pattern emerged: students responded most when science felt personally relevant. The presentations were effective in shaping students' perceptions of science, with 16 of the 17 students agreeing that science is important in the post-survey. The data suggest that

structured exposure to science professionals brings students increased STEM awareness, complementing traditional teaching methods in ways that surveys alone did not fully capture.

The next chapter explores the inferences of the findings, discusses future research, and identifies how the study impacted the author.

CHAPTER FIVE

VALUE: REASONING AND REFLECTION

Claims from the Study

The study's goals were to understand the correlation between science professionals in the classroom and student engagement, interest in science, and STEM career aspirations. To determine whether these goals were met, multiple strategies were used. The research was conducted over the course of eight weeks, observing five scientific presentations and three traditional lessons. The survey results imply higher interest in STEM careers and a stronger understanding of the relevance of science in everyday life. While survey data did not show statistically significant changes, qualitative and observational data suggest that students experienced increased engagement and STEM awareness, indicating that the intervention influenced perception and experience more than measurable attitudinal shifts.

Students displayed interest in the presentations and the professionals' careers, supporting the findings of Zhang et al. (2023), who suggested that when students gain new perspectives on science and view scientists as individuals, they engage more deeply. Although the quantitative data indicate that overall interest in science was lower than anticipated, the data imply that the largest increases occurred in categories related to interest in STEM and awareness of STEM careers, suggesting the presentations had a meaningful impact. While the number of students considering a STEM career remained small, many demonstrated a greater understanding of the world around them, an important piece to deeper engagement. Additionally, the interviews and

exit tickets provided qualitative depth, highlighting distinctions in students' responses to the presentations, which the quantitative data alone could not capture.

Value of the Study and Consideration for Future Research

Professionals in the Classroom

The findings of this study were meaningful for students, educators, and the literature, especially for rural communities with limited access to science professionals. The intentional partnerships between the professionals and the classroom teacher worked to build a meaningful understanding of what is possible for students' futures. A positive outlook when connecting with these scientists was their ability to connect their studies with the local environment during the activities and presentations. Student G shared, "It was engaging and I liked learning about the things (Yellowstone and the local watershed), considering they are so close to me."

Bringing relevant information to the students created a meaningful and engaging lesson. As the scientists continued to share the correlation between the rivers, mountains, and the history of their community, science students found them to be relatable. Gladstone and Cimpian (2021) state that students who find similarities and understand that success is attainable through role model interaction consider STEM careers to be more attainable. STEM careers suggest a positive shift across the study, whether from interest in STEM or understanding the importance of STEM in the world. Both factors play a significant role in influencing the lives of students as they connect to the world around them and think about their futures.

Local Connection

The study helps existing literature as it emphasizes the importance of role models and extends to rural communities. The Motivational Theory of Role Modeling (Morgenroth et al., 2015) states that the perceived similarity, relatability, and representation of attainable goals are drivers of student motivation, even with efforts to assemble a group of professionals to present. The university outreach initiative, We Are Montana in the Classroom, can be replicated by other rural districts seeking to create partnerships with STEM professionals. Reaching out to local professionals and establishing a relationship in which presentations take place yearly has been a great way to utilize these people and bring Superior locals into the classroom. Some jobs budget for outreach programs, which fund professionals to educate youth.

Overcoming Obstacles

Beyond providing more career opportunities for students, a takeaway from this study is that the barriers to bringing professionals into the classroom can be overcome. The presenters came from federal agencies, non-profit organizations, research facilities, and universities, and this all happened in a small community. Organizing and connecting with the presenters required time and commitment; given the short time frame, this became challenging. Future planning will span a year to be more manageable. Teachers, not only in science, who dedicate a small amount of time to coordinating this interaction with professionals can create experiences that extend beyond the classroom. It allows students to build connections with professionals who share knowledge and bring relevant ideology to the classroom. Beyond the content, the students saw the scientists' work and understood its value in everyday life. It was of less concern if the students wanted to work in this field, and more about connecting and understanding the value of

being their own stewards of the land. This can happen in art, history, literature, writing, math, etc. Finding value in connecting to people and embracing the knowledge is meaningful work.

Future Direction

Future research would examine whether having a scientist present during relatable topics throughout the year produces more significant changes in student engagement and interest in science than the previous treatment. A possible limitation of the study was that within a unit of study, there were five presentations, which lessened the connection to science content. As Martinez et al. (2018) suggest, younger students may be more receptive to role models and have an increased interest in science. I want to provide presenters for other classes, especially for the seventh-grade life science class. Drymiotou (2021) proposes that interest begins to decline as students age; earlier intervention may be necessary to sustain curiosity and an openness that makes role model exposure most effective. Suggesting that this would have a larger impact on students' interest, engagement, and STEM career aspirations at a younger age. This study had a small sample size; however, a study could build upon the findings by comparing the content with a much larger, more diverse population.

Impact of Action Research on the Author

Conducting this research went beyond my initial goal of engagement, interest in science, and building career aspirations to develop the whole child. This experience reshaped how I understand my students and my purpose as a rural educator. The students shared meaningful feedback about the study, but not all the information presented or compared on a five-point scale captures the complete impact of these presentations. Students didn't report a dramatic change in

engagement or interest in science in the surveys; some even stated that their interest in science decreased after the treatment. I noticed a change in the classroom when students began to stigmatize science as being uncool in their social groups. This happened in the middle of the treatment, thus it may have affected the post-treatment results. The changes aim to reeducate the cultural narrative surrounding scientific fields as unengaging. Beyond the focus questions, meaningful shifts happened that were harder to decipher with quantitative data.

These small shifts started when students began recalling information in other classrooms and sharing their experiences with friends and teachers. The moment students could identify old artifacts and share their connection and background knowledge with the class. In the interviews, their excitement about the presentations came back easily. I felt they understood that science goes beyond memorizing information to examining the world and discovering its truth. Student T noted, “It was interesting to see concepts from the presentation appear later in our classroom lessons.” These shifts share a deeper meaning that science, whether as a career or in school, is interdisciplinary. The shifts didn’t show up in my Wilcoxon Signed Rank Test or in the mean, median, or mode. They did show up in the exit tickets, interviews, and in the engagement and interest that the seasoned paraprofessional recognized but struggled to quantify.

The study transformed what I want to accomplish in my classroom. I was focused on engagement and interest as a measurable outcome, but the deeper achievement could have been developing the whole child. I want my students to leave my classroom understanding weather, and what an oceanographer studies, but also with a connection to the natural world and establishing a sense of responsibility for it. Superior is in an area with a vast history of science and is shaped by its landscape- by the river and creeks, the mountains, the amount of snowpack,

and the fire season. The scientists made abstract ideas more concrete by creating relevant activities, connecting students to their area through science, and sharing their own experiences working on real problems that matter to the area my students call home. I want to continue building upon relevancy and the local environment to begin moving towards developing the whole child and stewards of the land.

In the coming years, as I continue to invite scientists into my classroom, I expect my approach to evolve as I learn more about my students and my role in this community. The presentations will span an entire year within multiple units, so that students can apply their knowledge to future units. I will be more intentional in connecting each presenter to the curriculum by selecting scientists whose work relates to specific units. I value the feedback from students who are willing to share their experiences, and I will pay closer attention to those who didn't share as much. These students may be the ones who are most impacted by the experience of meeting someone who transformed their curiosity about the natural world into a passion-driven career. I would hope for this in any classroom. Exposure to professionals can create a meaningful impact on their lives, encouraging them to follow a dream or passion and turn it into a viable career. I may never know if any of these students were positively impacted. I do know that I will continue to ask whether what I am doing is enough to plant the seed.

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APPENDICES

APPENDIX A: MSU IRB APPROVAL

Hello Firestone, Samijo,

Your protocol was reviewed by the IRB and has been approved.

PI: Firestone, Samijo

Approval Date: 5/8/2026

Title: FOSTERING ENGAGEMENT AND CAREER ASPIRATIONS: THE IMPACT OF SCIENCE
ROLE MODELS ON MOTIVATING STUDENTS AND INCREASING STEM INTERESTS

Protocol #: 2025-2323-EXEMPT

Review Type:

Expiration Date: 11/19/2030

Work described under this protocol may now commence. The PI is responsible for ensuring that the protocol accurately describes research practices being conducted.

APPENDIX B: PRE- AND POST-LIKERT SCALE SURVEY
FOR PROFESSIONALS IN THE CLASSROOM

Google Form

Select how much you agree or disagree with each of the following statements

Scale: 1-Strongly Agree 2-Agree 3-Neutral 4-Disagree 5-Strongly Disagree

1. It is important for people to understand science
2. I am curious about the natural world
3. I am considering a career in a STEM Field
4. I want to learn more about STEM
5. Learning science is interesting
6. I put effort into science assignments
7. I look forward to science
8. STEM careers are important
9. I do not find science engaging
10. I enjoy learning about science concepts
11. STEM careers do not interest me
12. I actively participate in science class
13. I ask questions when I do not understand

Answer the following questions to the best of your ability.

1. Describe your experience in science.
2. What makes you interested or not interested in science?
3. What careers are you considering for your future?
4. What makes a class engaging or not engaging?

APPENDIX C: OBSERVATIONAL ENGAGEMENT RUBRIC

Lesson: _____

Presenter's Name: _____

Class: _____

Date: _____

Number of Students: _____

	0-15 minutes	15-30 minutes	30-45 minutes	Notes
On-Task				
Discussion				
Asking Questions				

On Task behaviors- focused, active listening, responding to questions

Discussion- (related to the topic, helping each other answer the questions, returns to lesson with answers,

Asking questions relates to the lesson, a deeper understanding of the topic, curiosity (if this, what then).

APPENDIX D: PROFESSIONAL PRESENTER EXIT TICKET

GOOGLE FORM

Student _____

Presenter _____

Participation is voluntary and will not affect your grades or standings in class. It is purely used for data collection in this action research project. Please answer honestly.

1. The presentation was engaging.

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

Explain your answer

2. I can see how this career connects to real-world problems.

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

3. The presentation was interesting.

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

Explain your answer

4. What is one important thing you learned in class today?

5. I am interested in learning more about careers related to this field of study.

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

6. Any further comments?

APPENDIX E: PROFESSIONALS IN THE CLASSROOM
STUDENT INTERVIEW QUESTIONS

INTERVIEW FORM

1. Have you ever thought about what job you might want when you grow up?
2. Tell me about the visits. What do you remember most?
3. When professionals were here, how did you feel? Interested? Excited? Bored?
Something else?
4. Has meeting these professionals changed how you think about science?
5. What makes a class engaging or not engaging?
6. Are you interested in learning more about any of these career fields, the professionals,
or the science content brought up during the presentations?
7. What kept you focused or interested during presentations?
8. Is there anything else you want to share about these visits?