THESIS

ENVIRONMENTORS: A MIXED METHODS STUDY OF UNDERREPRESENTED YOUTH PURSUING ENVIRONMENTALLY FOCUSED STEM CAREER PATHS

Submitted by

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ABSTRACT

ENVIRONMENTORS: A MIXED METHODS STUDY OF UDERREPRESENTED YOUTH PURSUING ENVIRONMENTALLY FOCUSED STEM CAREER PATHS

This thesis presents two manuscripts and addresses ways in which the EnvironMentors national organization can improve in its mission to increase the numbers of underrepresented youth entering environmentally-focused science, technology, engineering, and mathematics (STEM) fields. This mixed methods study focused on specific aspects of the program including finding predictors to aid in recruiting efforts and discovering key aspects of participant's experiences that can assist in reaching the desired outcome of increasing the success of EnvironMentors' programming. Both manuscripts were guided by past research and theoretical framework.

In the first paper, a regression analysis was conducted predicting/to predict student participants' interest in studying about the environment in college using three criteria: (1) enjoy nature (2) awareness of environmental issues, and (3) interest in studying science, technology, and engineering (STE) in college. Results from this research indicated that *enjoy nature* and *interest in STE orientations* can predict students' interest in studying about the environment in college.

The second manuscript is a case study and comparison of two EnvironMentors chapters with similar programmatic activities and whose participants share similar demographics. Focus groups, and mid program evaluations were used and analyzed. A deductive analysis approach was utilized to look for the presence of pre-specified categories in the data. Results indicated that students from both chapters place emphasis on expectations, challenges and issues, interactions, and motivation that they experience in their mentor relationships.

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TABLE OF CONTENTS

1. Introduction....1

References....5

2. Predicting Interest of EnvironMentors' Participants to Study

Environmental issues in college....7

Introduction....7

Literature Review....9

Methods....10

Results....12

Discussion....13

References....17

3. Investing in the Future: Underrepresented Youth in a STEM

Based College Initiative Program....19

Introduction....19

Literature Review....21

Methods....23

Findings....25

Discussion....33

References....36

4. Conclusions....39

5. Appendixes....42-45

1. INTRODUCTION

The National Academy of Science consistently emphasizes the need for more qualified individuals from all backgrounds to fill science, technology, engineering and mathematics (STEM) related positions in the U.S. in order for the country to maintain its status as a leading world economy (Riegle-Crumb, 2011; National Research Council, 2007). The dearth of diverse candidates holding proper training and interest in STEM is thought to be a considerable barrier to a vital scientific community and a globally competitive economy (Lewis, Menzies, Najera, & Page, 2009). As the U.S. population continues to diversify, the nation will benefit by being more inclusive with ethnicity and gender in STEM fields. This is due to the fact that minority and female populations in the United States have a long history of low participation in STEM fields (Lewis et al., 2009; Winkleby, Ned, Ahn, Koehler, & Kennedy, 2009). Decades of state, private, and federally sponsored educational initiatives working to increase underrepresented population's[1] participation in STEM vocations have fallen short of creating a truly diverse educational body and workforce (Winkleby et al., 2009).

Results from a 2008 National Science Foundation (2011) study showed that approximately 35% of the U.S. population between the ages of 18-24 consisted of non-Asian ethnic minorities. The white[2] ethnic population in the U.S is growing at the slowest rate of all racial ethnicities in the country. Between the years 2010 and 2050 the total U.S. population is projected to grow from approximately 310 million to 439 million, an accretion of 42 percent. This augmented aggregate minority population is projected to be the majority by 2042, and the

[1] This paper defines underrepresented populations in STEM classifications as African American/black, Hispanic/Latino, American Indian/Alaskan Native, Native Hawaiian/other Pacific Islander, non-Hispanic mixed races, and females (NSF, 2011). People of Asian ethnicity are widely acknowledged as a minority group in the U.S., but for over twenty years they have been adequately represented and even overrepresented at almost all stages of the STEM pipeline (NSF, 2011; Lewis, et al., 2009).

[2] Referring to non-Hispanic Caucasian

nation's racial and ethnic diversity will be enlarged (U.S. Census Bureau, 2010). As minority populations continue to grow and become closer to becoming the majority in the U.S. it is imperative that a continuous effort be made to increase underrepresented populations in STEM. A more equal representation of the U.S. population in STEM will allow future leaders of these disciplines the ability to make decisions that are more representative of the general public.

EnvironMentors

A national college access initiative, EnvironMentors was formed in Washington D.C. in 1992 and was moved to the National Council for Science and the Environment (NCSE) in 2006. The program was created as a response to the disproportionate number of minorities entering STEM fields. Since the program's inception, it has engaged more than 1500 underrepresented youth in scientific experiments and introduced them to a variety of STEM careers (NCSE, 2011). EnvironMentors now oversees 12 chapters in the United States, with 11 of those housed at colleges or universities. Each chapter is responsible for working with high school students in their region and provides them with exposure to environmentally focused STEM college majors and career opportunities (NCSE, 2011). EnvironMentors places emphasis on underrepresented youth learning from mentors how to utilize scientific processes in real world applications, share interests, and receive guidance toward life paths in STEM disciplines.

EnvironMentors matches underrepresented youth with older, more experienced mentors through a series of informal meetings. Mentoring pairs work closely together on students' projects for a majority of the school year. Mentoring pairs are defined as a mentor and a mentee (student participant) and can be made up of one student with one or two mentors. Students are responsible for designing and implementing an experimental project, conducting an expert interview, and producing a poster for their final presentation. Mentors provide guidance

throughout the process and ensure that the student is on track to complete all of the requirements listed above.

Thesis Organization and Purpose

A main goal for conducting research about the national EnvironMentors program is to learn more about its effectiveness and ability to recruit students who will succeed in STEM fields. This study focused on several different aspects of the program and was guided by the concepts of possible selves and significant life experiences. Possible selves is the concept that people make decisions about what profession they would like to pursue based on how well they can see themselves in that particular field (Markus & Nurius 1986; Leondari, Syngollitou & Kiosseoglou, 1998; Stout, Dasgupta, Hunsinger, & McMamus, 2011). On the other hand, significant life experiences are those early moments a child has in nature that influence a young person's desire to learn more about environmentally related topics (Chawla, 2007; Chawla, 2009; Horwitz, 1996; Vadala, Bixler, & James, 2007)

There are two manuscripts that comprise this thesis. The first paper, *Predicting Interest of EnvironMentors' Student Participants to Study Environmental Issues in College* looked at three scales as predictors of whether students will choose to study the environment in college. Specifically, the paper considered if EnvironMentors' students who enjoy nature, are interested in studying science, technology and engineering (STE) in college, and are aware of environmental issues are predicted to show interest in studying about the environment in college. Data for the study were from a pre-program survey that was given to all EnvironMentors' participants in the fall of 2010 and 2011.

The second paper, *Investing in the Future: Underrepresented Youth in a STEM Based College Initiative Program* is a comparison between two EnvironMentors' chapters during the

2011-12 season. This manuscript was guided by two questions: (1) what are the main topics that EnvironMentors' practitioners should consider when managing programs at locations that are similar to the sites in this study? (2) Do differences exist between the two locations with regards to question (1)? This case study was developed primarily through analyzing data collected through focus groups, and mid-program surveys. Using qualitative data allowed for an in depth description about the experience of student participants in the two locations. The two locations – Colorado State University and University of California-Davis -- were chosen because of similarity in demographics of participant populations and programmatic activities. Both chapters cater primarily to underrepresented youth defined by gender, race or socio-economic status.

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2. PREDICTING INTEREST OF ENVIRONMENTORS' STUDENT PARTICIPANTS TO STUDY ENVIRONMENTAL ISSUES IN COLLEGE

INTRODUCTION

The National Academy of Science consistently emphasizes the need for more qualified individuals from all backgrounds to fill science, technology, engineering and mathematics (STEM) related positions in the U.S. in order for the country to maintain its status as a leading world economy (Riegle-Crumb, 2011; National Research Council, 2007). The dearth of diverse candidates holding proper training and interest in STEM is believed to be a considerable barrier to a vital scientific community and a globally competitive economy (Lewis, Menzies, Najera, & Page, 2009). As the U.S. population continues to diversify, the nation will have more equal representation of its residents by being more inclusive with ethnicity and gender in STEM fields (Lewis et al., 2009; Winkleby, Ned, Ahn, Koehler, & Kennedy, 2009). Decades of state, private, and federally sponsored educational initiatives working to increase underrepresented populations[3] participation in STEM vocations have fallen short of creating a truly diverse educational body and workforce (Winkleby et al., 2009).

Results from a 2008 National Science Foundation (2011) study showed that approximately 35% of the U.S. population between the ages of 18-24 consisted of non-Asian ethnic minorities. The white[4] ethnic population in the U.S is growing at the slowest rate of all racial ethnicities in the country. Between the years 2010 and 2050 the total U.S. population is projected to grow from approximately 310 million to 439 million, an accretion of 42 percent. This augmented aggregate minority population is projected to be the majority by 2042, and the

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nation's racial and ethnic diversity will be significantly enlarged from what it is today (U.S. Census Bureau, 2010).

EnvironMentors

A national college access initiative, EnvironMentors, was formed in Washington D.C. in 1992 and was moved to the National Council for Science and the Environment (NCSE) in 2006. The program was created as a response to the disproportionately low number of minorities entering environmentally-focused STEM fields. Since the program's inception it has engaged over 1500 underrepresented youth in science experiments and introduced them to a variety of STEM careers (www.environmentors.org, 2011). EnvironMentors now oversees 12 chapters in the United States, with 11 of those housed at colleges or universities. The program utilizes universities and their faculty to direct chapters. Each chapter is responsible for working with high school students in their region and provides them with exposure to environmentally focused STEM topics and potential career opportunities (www.environmentors.org, 2011).

EnvironMentors' student participants come from a variety of backgrounds, but are united by the fact that they have committed to a program that promotes environmentally focused STEM career paths. What motivates these students to want to study about the environment in college? In the interest of beginning to address this question, this research explores variables that might predict participating students' interest in pursuing environmental studies in college.

Research Objective and Hypotheses

A main objective of this study was to determine the predictors of interest in pursuing environmentally-related science, technology, and engineering (STE) degrees in college by EnvironMentors' participants. In this study, we measured the extent to which enjoy nature,

interest in studying STE in college, and awareness of environmental issues explain/contribute to a desire to study the environment in college.

Specifically, our study considered the following hypotheses:

(H_1) EnvironMentors' students with a positive attitude toward nature will demonstrate stronger interest in studying the environment in college;

(H_2) EnvironMentors' students who are interested in studying STE fields in college will express a stronger interest in studying about the environment in college; and

(H_3) EnvironMentors' students who are aware of environmental issues will express a stronger interest in studying about the environment in college.

LITERATURE REVIEW

Significant Life Experiences

One major barrier to increasing U.S. success in STE fields is the ability to instill in youth the expectation that they will pursue careers in these disciplines (Tai et al., 2006). "Significant life experiences" is the concept that the time that children spend in nature can be pivotal in their decision to want to learn more about the environment later in life (Chawla, 2007; Chawla, 2009; Horwitz, 1996). Experiences that children have in nature, in conjunction with exposure to role models who can guide them along a path of understanding ecology and basic biological processes, are important bridges for them to go onto study about the environment later in life (Chawla, 2007; Chawla, 2009). Children create personal environmental ethics through spending time with influential role models and through playing/recreating in nature (Chawla, 2007; Chawla, 2009; Horwitz, 1996; Vadala, et al., 2007). Further, children gain both knowledge and a personal connection to nature through having positive experiences outside (Chawla, 2009).

Chawla (2009) showed that if people do not develop a connection to nature at an early age it is much more difficult for them to want to protect the environment later in life. The connections that children form towards nature can act as motivation for them to learn the skills necessary to protect it (Chawla, 2007; Chawla, 2009; Horwitz, 1996). People who have been found to love nature as adults have reported that as children they received information about environmental processes from role models outside of a classroom setting; those influential people were often parents, grandparents, friends and even docents at nature centers (Chawla, 2009).

At a young age, children appear to have distinct beliefs about their skills and knowledge and what they value in different achievement domains (Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2000). Significant life experiences can be instrumental in instilling in students a desire to study about the environment and STE as adults. Students as early as junior high who have personal expectations to pursue life sciences and physical sciences/engineering are more likely to obtain baccalaureate degrees in those fields than those who are undecided (Tai, R.H., Liu, C.Q., Maltese, A.v., & Fan, X, 2006). Additionally, students with high mathematics achievement scores in the seventh and eighth grade are even more likely to earn a science or engineering related baccalaureate degree (Tai et al., 2006). Students make decisions about their chosen college/career paths based on their perceptions of previous experiences.

METHODS

Sampling Approach

Data for this study were drawn from pre-program surveys that were distributed to all EnvironMentors' participants in the fall of 2010 (n=165) and 2011 (n=126). There were 36 questions in the survey of which 13 were analyzed for this study. Variables focused on student's beliefs about their likelihood for success in college, attitudes towards nature and the

environment, and interest in STE related college and career paths. All variables in the survey were measured on a continuous 5-point scale of one (1; strongly disagree) to five (5; strongly agree).

Variables

Independent variables. Three scales were created and tested for internal consistency, and were labeled "enjoy nature", "interested" and "awareness." An "enjoy nature" scale was comprised of three items: (1) I enjoy going to places where I am surrounded by nature; (2) I enjoy being in places with lots of trees and plants; and (3) spending time in nature makes me feel healthy. The "awareness" scale encompassed the following four items: (1) I am aware of environmental issues facing my community; (2) I am aware of environmental issues facing the earth; (3) I am concerned about environmental issues facing my community; and (4) I am concerned about environmental issues facing the earth. The "interested" scale was based on the following three items: (1) I am interested in studying science in college; (2) I am interested in studying technology in college; and (3) I am interested in studying engineering in college.

Dependent variable. The dependent variable that was utilized for this study was interest in entering college to study a discipline related to the environment. This was measured by one-item, on a scale of 1 to 5; the item stated "I am interested in studying about the environment in college".

Analysis

The Statistical Package for the Social Sciences (SPSS) was used to conduct analyses for this research. A Cronbach's alpha (α) was calculated for the enjoy nature, awareness, and interested scales. A criterion of .65 to .70 was used for a scale and is considered to be "adequate" in human dimensions work within natural resources (Vaske, 2008). A multiple

regression analysis was used to test the predictive relationships between the independent variables and the dependent variable. A standardized regression coefficient Beta (β) was used to show the strength of the independent variables.

Effect size (R^2) was used in this analysis to show the strength of the association between the independent variables and the dependent variable, or the practical significance of findings. For this study, a R^2 greater than .02 was considered minimal, more than .13 was typical, and a value of .25 or higher was considered a substantial relationship (Vaske, 2008). List-wise deletion was used in this study so that only respondents who answered all of the questions were included in the analysis (Vaske, 2008).

RESULTS

An average Cronbach alpha value was reported for each scale; each variable was weighed separately. Reliability analysis of the pre-tests resulted in Cronbach alpha values of .85 for the enjoy nature scale, .86 for the awareness scale, and .69 for the interested scale (see Table 2.1). All values listed above were in the adequate to above adequate range.

Table 2.1 about here

In the regression analysis, the minimal *p*-value for statistical significance was set at .05. The *enjoy nature* and *interested* scales resulted in p-values less than .05, indicating their respective influence on interest in studying the environment in college was statistically significant. The *awareness* scale was just over the preferred minimum *p*-value, at .07. We fail to reject the first and second hypotheses, and reject the third.

There is a noticeable difference in β between all of the variables (see Table 2.2). The "interest" scale variable had the most effect on the dependent variable with β equal to .57. The

"enjoy nature" variable had the second highest β equaling .15. The awareness scale was not found to be statistically significant and therefore β can be disregarded for that relationship.

Table 2.2 about here

High adjusted R^2 values seen in Table 2.2 shows strong effect size and substantial relationships found in both regression analyses. The effect size of $R^{2 =}$ .46 shows that the independent variables can predict outcomes of the dependent variable 46% of the time. This also can be said to have high practical significance.

DISCUSSION

Though not reported in the results section here, students in our survey indicated they are strongly interested in going to college, and believe they can succeed in college. What is of perhaps more interest is whether these same students intend to study about the environment in college, and what factors might influence that choice. This study was an attempt in isolating variables that lead to the desired outcome of increasing underrepresented youth who pursue environmentally focused disciplines in college. Allowing EnvironMentors' practitioners to better understand what might influence student participants' decisions to pursue environmental studies in college will prove advantageous in making future program implementation decisions.

Based on the results above, we can conclude that EnvironMentors' students with a positive attitude toward nature will be more likely to show interest in studying about the environment in college. Further, students who are interested in studying STE in college are likely to show interest in studying about the environment in college. How can we rationalize these trends? In consideration that the concept of significant life experiences explains certain tendencies for people with pivotal childhood experiences in the outdoors will labor to protect the environment and learn more about it, we might consider that participants of this study had

positive childhood experiences in nature (Chawla, 2007; Chawla, 2009; Horwitz, 1996; Vadala, et al., 2007).

If program coordinators know that students who had significant life experiences in nature are more likely to be interested in studying STE in college, to develop the skills necessary to protect the environment, then it makes sense to recruit those students for the program. Student counselors as well as STE focused teachers can be helpful in locating these students. There are also high school clubs that focus on nature/environmentally related topics and recruiting from these pools should prove to be valuable. The reason for this suggestion is that students who show interest in nature/the environment are more likely than the average student to have had significant life experiences that have influenced them to be interested in studying STE or environmental studies in college. The value of EnvironMentors for these students will be to provide them with exposure to different opportunities to work in STE and/or environmentally focused disciplines.

The regression analysis also showed that students with an awareness of environmental issues will not necessarily show a greater likelihood to study about the environment in college. Why doesn't awareness of environmental issues predict this behavior? There are many plausible explanations that are outside the scope of this paper to address. Awareness will not predict behavior in many scenarios in our daily lives. For example, many people are aware that figure skating is good for you, and they are aware that doing things that are good for your health is a smart decision, but they might not be interested in figure skating because it is very difficult and might not suit their personality.

Future Directions

It is recommended that future research address whether EnvironMentors' student participants feel that their time outside, or significant life experiences, have influenced them in their decision to want to study STE and/or environmental studies in college. Is it that EnvironMentors' student participants who enjoy nature also feel the need to study it, in order to be equipped to protect it? Or, is it that those participants who enjoy spending time outside, want jobs in which they can continue to spend time outside?

Limitations

A control group would be helpful in deciding if the relationships of this study are generalizable. We know that results from this study can be used to make statements about EnvironMentors' student participants, but what about other similar audiences? We cannot assume that participants in another STEM based mentoring programming would indicate that enjoying nature, and interest in STE predict wanting to study about the environment in college.

Table 2.1

Reliability analysis for enjoy nature, awareness of environmental issues, and interest in studying science, technology and engineering as indicators of wanting to study about the environment in college for 2010 and 2011 pre-tests

Scales and variables	N	Mean (M)[1]	Std. Dev. (SD)[1]	Corrected Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Enjoy nature scales	288					.85
I enjoy going to places where I am surrounded by nature		3.94	1.07	.77	.74	
I enjoy being in places with lots of trees and plants		3.81	1.30	.68	.83	
Spending time in nature helps me feel healthy		3.70	1.19	.68	.79	
Awareness scales	289					.86

I am aware of environmental issues facing my community		3.69	1.01	.69	.83	
I am aware of environmental issues facing the earth		4.00	.97	.73	.81	
I am concerned about environmental issue facing my community		3.95	.97	.70	.83	
I am concerned about environmental issues facing the earth		4.15	.97	.71	.82	
STE[2] scales	217					.69
I am interested in studying science in college		3.87	1.40	.43	.70	
I am interested in studying technology in college		3.42	1.32	.57	.52	
I am interested in studying engineering in college		2.91	1.34	.52	.57	

[1] Variables measured on a 5-point scale 0f 1 "strongly disagree" to 5 "strongly agree."
[2] Science, technology, engineering

Table 2.2

Predictors for wanting to study the environment in college for 2011 and 2012 pre-tests

	Regression				
Variables	*B*	*SE B*	B	*t*	*p-value*
Constant	-.17	.27	-	-.62	.536
Enjoy Nature	.17**	.06	.15**	2.82**	.005
Awareness	.13	.07	.09	1.81	.071
Interested in STE[1]	.61**	.05	.57**	12.04**	<.001

Notes: $R^2 = .46$ (*ps* < .05).

** Means that the correlation is significant at the .01 level

[1] Science, technology, engineering

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3. INVESTING IN THE FUTURE: UNDERREPRESENTED YOUTH IN A STEM BASED COLLEGE INITIATIVE PROGRAM

INTRODUCTION

The National Academy of Science continually emphasizes the need for more qualified individuals from all backgrounds to fill science, technology, engineering and mathematics (STEM) related positions in the U.S. in order for the country to maintain its status as a leading world economy (Riegle-Crumb, 2011; National Research Council, 2007). The dearth of diverse candidates holding proper training and interest in STEM is thought to be a considerable barrier to a vital scientific community and a globally competitive economy (Lewis, Menzies, Najera, & Page, 2009). As the U.S. population continues to diversify, the nation will benefit by being more inclusive with ethnicity and gender in STEM fields (Lewis et al., 2009; Winkleby, Ned, Ahn, Koehler, & Kennedy, 2009). Decades of state, private, and federally sponsored educational initiatives working to increase underrepresented populations[5] participation in STEM vocations have fallen short of creating a truly diverse educational body and workforce (Winkleby et al., 2009).

Results from a 2008 National Science Foundation (NSF) (2011) study showed that approximately 35% of the U.S. population between the ages of 18-24 consisted of non-Asian ethnic minorities. The white[6] ethnic population in the U.S is growing at the slowest rate of all racial ethnicities in the country. Between the years 2010 and 2050 the total U.S. population is projected to grow from approximately 310 million to 439 million, an accretion of 42 percent.

[5] This paper defines underrepresented populations in STEM classifications as African American/black, Hispanic/Latino, American Indian/Alaskan Native, Native Hawaiian/other Pacific Islander, non-Hispanic mixed races, and females (NSF, 2011). People of Asian ethnicity are widely acknowledged as a minority group in the U.S., but for over twenty years has been adequately represented and even overrepresented at almost all stages of the STEM pipeline[5] (NSF, 2011; Lewis, et al., 2009).

[6] Referring to non-Hispanic Caucasian

This augmented aggregate minority population is projected to be the majority by 2042, and the nation's racial and ethnic diversity will be enlarged (U.S. Census Bureau, 2010). There have been a disproportionate number of minorities involved in STEM career paths for too long. As minority populations continue to grow and become closer to becoming the majority in the U.S. it is imperative that a continuous effort be made to increase underrepresented populations in STEM. A more equal representation of the U.S. population in STEM will allow future leaders of these disciplines the ability to make decisions that are more representative of the general public.

EnvironMentors

A national college access initiative, EnvironMentors, was formed in Washington D.C. in 1992 and was moved to the National Council for Science and the Environment (NCSE) in 2006. This program was created as a response to the disproportionately low number of minorities entering STEM fields. Since the program's inception it has engaged over 1500 underrepresented youth in rigorous scientific experiments and introduced them to a variety of STEM careers (NCSE, 2011). EnvironMentors now oversees 12 chapters in the United States. Each chapter is responsible for working with high school students of that region to provide them with exposure to environmentally focused STEM college majors and career opportunities (NCSE, 2011). The program provides students with valuable experiences that make them more attractive to universities seeking STEM candidates.

EnvironMentors matches underrepresented youth with older, more experienced mentors through a series of informal meetings. Mentoring pairs work closely together on student's projects for a majority of the school year. Mentoring pairs are defined as a mentor and a mentee (student participant) and can be made up of one student with one or two mentors. Students are responsible for designing and implementing an experimental project, conduct an expert

interview, and produce a poster for their final presentation. At the end of the program, each chapter holds a chapter science fair in which students are judged on the results of their projects for a chance to advance to a national competition. The top three students from each chapter are selected for an all-expenses paid trip to Washington D.C. where they present their findings to a panel of judges to win college scholarships, in competition with other top performing students from 11 other locations around the country. Mentors provide guidance through the process and ensure that the student is on track to complete all of the requirements listed above.

Each EnvironMentors chapter is unique in the way that they operate and the participants they attract. This paper focuses on two EnvironMentors chapters that are similar in their demographics and the administration of their respective programs. The goal for this study is to compare experiences of students at Poudre High School (partnered with Colorado State University) to those of students at Woodland Senior High School, who are partnered with University California-Davis. This study is guided by the following two questions: (1) what are the main topics that EnvironMentors' practitioners should consider when managing programs at locations that are similar to the sites in this study? And, (2) Do differences exist between the two locations with regards to question (1)?

LITERATURE REVIEW

At a young age, as early as elementary school, children appear to have distinct beliefs about their skills and knowledge and what they value in different achievement domains (Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2000). As people age, their ability-related beliefs and values commonly become more negative because one's own perception of inadequacies are reinforced by experiences, preferences, and judgments from peers (Wigfield et al., 2000). Peoples' decisions about their future are strongly influenced by others opinions.

When attempting to create motivation to pursue a particular goal it is beneficial to reinforce roles, behaviors, beliefs, and values that promote the desired outcome (Wigfield et al., 2000).

Possible Selves

Possible selves was developed out of psychology and is the concept that people make decisions about what profession they would like to pursue based on how well they can see themselves in that particular field (Markus & Nurius 1986; Leondari, Syngollitou & Kiosseoglou, 1998; Stout, Dasgupta, Hunsinger, & McMamus, 2011). For example, if a student enjoys going into nature and is interested in science, their possible self could be that of a nature-scientist. A University of Missouri-Columbia study showed a link between possible selves and adolescent's career path choices (Markus et al., 1986). Possible selves are thought to influence motivation in two ways: they provide a clear goal to strive for if the impression is positive and one to avoid if it is negative (Leondari, et al., 1998). Young people assessing what careers to pursue after high school may look past the sciences because of their negative feeling of people who take those kinds of jobs. Mentors can be instrumental in creating a positive impression for people trying to decide if science is right for them (Markus et al., 1986).

In Packard and Nguyen's 2003 study, 41 female high school graduates from diverse ethnic and socioeconomic backgrounds, who had enrolled in an intensive math and science program while in high school, participated in interviews that focused on their perceptions of factors that influenced their career plans over time. Results of this study support the claim that when adolescents perceive people in a particular career positively, they are more likely to pursue that profession for themselves. Findings by Stout et al. (2011) indicated that many women are disinterested in pursuing STEM professions because of low female professional representation and because it has a male dominant reputation. Results from a study of whether or not women

are influenced by their instructor's gender indicate that females overwhelmingly show a stronger liking towards STEM when it's being represented by a person of the same sex as them (Stout et al., 2011).

Not only has research shown that there can be benefits to providing same-gender role models for students wishing to pursue STEM; studies have pointed out the importance of providing students with mentors who are of the same race as them (Syed, Azmitia, & Cooper., 2011). The reality of STEM education is that students' ability to construct such an imagined future is often blocked by the very small number of ethnic minority representatives of those fields (Syed et al., 2011). However, it is not definitive that all minorities have preference towards mentors, teachers, and professors that come from the same ethnic background as them (Syed, et al., 2011).

METHODS

Qualitative research, when conducted in a thorough, organized, and thoughtful manner is highly useful for describing social situations (Pyett, 2003). A qualitative approach was chosen for this research because it allows for an in depth analysis of how meaning was given to this specific social situation. The researcher is not as much concerned with the amount, intensity, or frequency of the experience as s/he is with the details of it (Denzin & Lincoln, 2005). Specifically, the researcher attempted to analyze the particularity and complexity of two specific cases (Woodland Senior High School and Poudre High School) and therefore has adopted a double case study design for this research (Yin, 1984; Stake, 2000). Case studies are guided by one or more research questions and seek to discover intricate details of a case and can be conducted through interviewing participants (Stake, 2000).

A constructivist perspective was taken in this case study which posits the belief that people actively assign meaning to everyday activities and objects. This belief holds that personal constructions of meaning are tested in group settings; those which seam useful and accurate are maintained and that which isn't are let go (Lindlof & Taylor, 2011; Guba et al., 1994). There are multiple perspectives to any given situations as they are created by diverse human intellect and change as people become more sophisticated (Guba et al., 1994). Qualitative methods allow researchers more access to constructions or meaning as they happen and therefore allow for a more truthful picture of what has occurred.

This case study conducted pre- and mid-program focus groups; and relied on responses to mid program student surveys. Student's mid-program surveys were not designed specifically for this study; they were general surveys with open ended questions intended to get a sense of how well programmatic activities were working for the student. Deutsch and Spencer (2009) found that single-point-in-time surveys or interviews, using both validated measures and open-ended questions, are effective tools for assessing individual relationships in mentorship programs. Results of these qualitative methods can provide perspective into influences of successful outcomes.

Focus groups were facilitated at both EnvironMentors chapters. This evaluation design was chosen because of the small size of the group, its homogeneity, and because gathering in depth information about program outcomes is of concern (Fitzpatrick et al, 2011). This design can help practitioners gather rich details of the participants' perspectives that would be more difficult to achieve in a quantitative study (Guba, et al., 1994). There was one group interview at the onset of the program in two EnvironMentors locations. A second focus group was conducted

at both schools at the mid-program stage. The protocol used for all of the focus groups is displayed in Appendix 3.A and outlines the topics covered during the interviews.

Analysis and Interpretation

A deductive analysis approach was chosen for interpreting the focus group transcripts in this study. The pre-determined codes (19) were identified inductively in previous case studies of the same project, as the two chapters in this paper are a subset of a larger research effort to evaluate a total of nine locations. Students' mid program survey responses were referred to for contextual background after transcripts were coded.

The researcher coded interview responses based on Boyatzi's (1998) parameters and looked for both words identical to those contained in themes and statements that elaborated on the themes. In addition, a graduate student and CSU professor familiar with the project reviewed the coded data to help ensure the analysis remained accurate and objective.

FINDINGS

Very distinctive trends arose in the frequency in which categories were detected. The far right column in Table 3.1 outlines the top six overall categories. The following list includes those themes in order from most frequent to least frequent: mentor relationship, challenges and issues, expectations, interactions, motivations, and EnvironMentors online community. The researcher then looked to find examples of those top six categories in the raw data, and mid program evaluations; the following is what was discovered.

Insert table 3.1 here

Overwhelmingly, mentor relationship was found to be the most common overall theme among student responses from coded transcripts, but was not referred to often in student's mid-program surveys. Many of the comments found in the remaining five themes, those other than

mentor relationship, were made in the context of mentor relationship. To illustrate this point, "expectations" often had to do with student's expectations of the mentor relationship. In all other categories except for EnvironMentors online community there was some mention of mentor relationship.

In response to these observations and in an attempt to best organize the findings, the researcher has broken the mentor relationship theme into four main parts: (1) expectations of mentor relationship, (2) examples of mentors providing motivation to students, (3) challenges and issues with mentors, and (4) interactions with mentors. The researcher took the four most salient themes listed above and looked at how they affected the mentor relationship. New codes were not created; the researcher simply organized the mentor relationship code into parts to be more easily understood.

In the following two sections there will be a brief description of the two EnvironMentors chapters that are of focus in this manuscript as they relate to the overall findings. Attention will be given to the two chapters individually as a means to clarify differences and similarities among the chapters, to provide some contextual background, and to further illustrate the overall findings of this analysis. There will be a lot of attention paid to the mentor relationship category and will be organized in accordance to the four parts of mentor relationship outlined earlier in this section.

Poudre High School

At the time of this case study, EnvironMentors was in its second year of programming at Poudre High School in Fort Collins, Colorado. Six students from Poudre High School's Talent Search[7] program showed initial interest in EnvironMentors by attending meetings and participating in the fall focus group in November. Two of the six original participants decided

[7] A program dedicated to assisting 6^{th} – 12^{th} grade students pursue college after graduating from High School.

not to participate in the program within the first couple of weeks and one student dropped out in February of 2012. Two male, and one female Hispanic student completed the requirements of the program in April, 2012.

Students met weekly and on-site at the school to work on the requirements of the projects. Mentors also attended these meetings to help students with their work. There were additional one-on-one meetings that occurred between mentors and mentees during mutually available times for working on tasks such as literature reviews and writing research papers. In addition, there were several opportunities for students and mentors to attend field trips and learn from an occasional guest speaker.

Mentors at Poudre High School were primarily undergraduate participants from an environmental leadership program at CSU though one of the mentors was a female graduate student. All of the mentors were Caucasian. Specific mentors were chosen by students through a series of interactions over the course of a couple of months. Students formed relationships with mentors who shared personal interests with them and who they thought would be a good workable match. The following is a description of the findings regarding the theme mentor relationship organized according to the four parts listed above.

Expectations of the Mentor Relationship

All student participants in the Fall focus group at Poudre High School agreed they would be responsible for a majority of the work and that mentors were there primarily to help where needed. The following is an example of one student talking about their expectation of the mentor relationship.

Roberto was a senior and in his first year with the program. He decided to join EnvironMentors because it seemed to be an easy way to see if science was something that he was

interested in doing and required a relatively short term commitment. When Roberto was asked about his expectations of the amount of work that would be split between him and his mentor he thought that anything above a 70% workload for him would be tough. When asked why, Roberto explained that he has a crazy schedule as a senior, EnvironMentors workload sounded like a lot, and meeting with mentors would require flexibility and strong overall communication. He indicated in the beginning of the program that he would like to meet with his mentor at least once a week and that phone calls would be the best way for them to stay in touch.

Relationships between students and mentors often consisted of some small talk between each other, working on parts of their projects together and coming up with a plan for the week ahead. Each mentor-mentee pair had unique interpersonal characteristics which became more rigid with time. Some pairs spent more time on small talk and enjoying each others company, where others were more concerned with getting work done.

Examples of Mentors Providing Motivation to Students

Many responses from students indicate that they wanted mentors to help them stay focused on their projects. The following is an illustration of what Roberto felt a mentor could do to keep him motivated to finish the work. At the beginning of the program he told our facilitator in a focus group that he thought that the program was going to be a lot of work and that his mentor was going to have to "get on his back" in order for him to get all of the work done. Roberto also emphasized that when he is not interested in something in class that it is hard for him to stay focused on it and that he needs to be interested in the topic in real life for it to mean something. Roberto was excited that the EnvironMentors project would be something real and that he would be working with a mentor that could help him to better understand the subject. The mentor was there to motivate the student by ensuring that his or her project was obtainable.

Challenges and Issues with Mentors

Some of the most common challenges and issues that students voiced about mentor relationships as the program was implemented was that they needed to have a connection with their mentor; it was difficult to coordinate with busy schedules, and it took a long time for them to choose a mentor. The following is a specific challenge and experience of one of the students at Poudre High School to further illustrate the importance of students having a connection with their mentor. Angela, a junior at the time of this case study, was not entirely happy with her first year experience with EnvironMentors; but thought she would give the program one more try this year. Angela felt that her mentor was not great the year before and when asked why, she stated "we didn't have a great connection". She remembers talking with the mentor in the beginning, but then not meeting very much as the program progressed. This student also indicated that they didn't start their project until a month before it was due.

In the student's mid-program surveys they were asked to describe positive and negative experiences with their mentors within the past 30 days. The most common response that students had for a negative experience was that it was difficult for students to stay in touch with their mentors. Student participants indicated that they are not used to staying in contact with someone on a regular basis using phones or email.

Interactions with Mentors

Overall, interactions between students and mentors at Poudre High School were positive. None of the students involved in this study indicated negative interactions. To further illustrate, one student from Poudre High school stated "I really like my mentor, we get along really well. We continue to accomplish a lot of things when we are together." Another student said "they'll help me with whatever I need; I just got to ask them." Furthermore, a third student said "he

printed off my binders so that was helpful and he gives me rides". Lastly, a student stated, "it's cool because they both help me and tell me what articles to research". These are some examples of reactions to student's interactions with mentors and are in accordance with students' overall sentiment that mentors were supportive in their efforts throughout the program.

Woodland Senior High School

The University of California at Davis (UCD) has managed an EnvironMentors chapter since 2009, and partnered with Woodland Senior High School for the first time in the fall of 2011. The chapter began with 11 students in the fall and all of them completed the requirements of the program in the spring. Student participants consisted of two males and nine females, in which eight were Hispanic and three Caucasian. Many students discovered the program from their science teachers who advertised with an EnvironMentors video and informational flyer. Unlike students at Poudre High school, Woodland Senior High School students were not persuaded or recruited through Upward Bound or Talent Search as they were attracted to the program from watching a video about EnvironMentors in their science classes. The UC Davis chapter coordinator informed us that all student participants were underrepresented, mostly from farming families.

The program at Woodland Senior High School started at the end of September when the fall quarter began. Programmatic activities consisted of weekly meetings with mentors at the school or on campus for about two hours. Students were also encouraged to attend additional monthly fieldtrips to the UC Davis campus. The chapter coordinator met with students for regular check-ups, when difficulties arose, and to organize and guide them on their campus visits. In addition, there was a teacher from the school who assisted with EnvironMentors programming.

Mentors for EnvironMentors at Woodland Senior High School were recruited through advertisement through campus emails and are all graduate students from UC Davis. There were 11 mentors, with four males and seven females. Nearly all mentors were Caucasian except for one who was Hispanic. The following is a description of the findings regarding the theme mentor relationships organized according to the four parts of the codes listed above. The following depictions of student experiences at Woodland Senior High School are based on responses to focus group questions and what was provided in the mid-program evaluations.

Expectations of Mentor Relationship

Students at Woodland Senior High School indicated some similar results to those students at Poudre High School in regards to expectations of how much work would be shared between them and their mentor. To illustrate this point, Sandra a 10th grade student, stated that she wanted to be a geneticist and joined EnvironMentors because it sounded interesting. When asked what percentage of work that she was expecting to do with her mentor she responded by saying that she was planning on doing 70% and that mentors should just be there to help and point students in the right direction.

Students indicated in the mid program surveys that mentors were helpful in choosing project topics, keeping them on task, and being friends to them. Mentors are expected to do some of the work, but mainly to find commonality with students and to be there when issues arise. Student's expectations of mentors remained the same throughout the program; they wanted a friendly person to provide guidance throughout the process of EnvironMentors.

Examples of Mentors Providing Motivation to Students

Student responses at Woodland Senior High School indicated that they felt a mentor could be a person to inspire you, and to figure out what to do after high school. To illustrate this

point further, 10th grader John, was motivated by an opportunity to learn more about science by working with college student mentors. When asked what a mentor should do or be, John responded by saying that they can help you get in contact with people who can answer your questions. More importantly, John said "like you can see what they're doing right now and maybe you think that's cool and you want to get into it. Get motivated to go to college, you know". He also felt that since mentors have experienced a lot of different things in their college years, undergraduate or graduate, that even if they are not an expert on the student's topic they will prove to be helpful.

Challenges and Issues with Mentors

The challenges and issues that students felt they had with mentors were similar to those of students at Poudre High School. Students felt that it was difficult to stay in communication with mentors, found it difficult to meet with them at times without having a car, and it took a long time for some students to find a match. For example, John (from above) decided that the project that he chose for EnvironMentors was too complicated because his mentor really didn't know anything about the topic: water quality testing through DNA analysis. The idea was to test the water in the drinking fountains around school to find out what was living in it. John felt that he did not have the expertise to truly understand what he was doing, but was thankful that his mentor had friends that worked in a lab at UC Davis and were willing to help. In the last month of the program, John had a low confidence rating on his ability to finish the project. He said that on a scale from 1 to 10 that he would rate himself at 4.5.

Interactions with Mentors

Overall, student participants reported to have great interactions with their mentors, got along with them, and learned many new skills from them. Students and mentors often met well

after school on their own time to work on requirements of the project. There were multiple experiences in which strong bonds formed between students and mentors. John Kenny from above reported to have such an experience with his mentor and went on to say

> "it's funny because we collected samples outside and spent several hours just standing out in the cold and you know you just come up with random conversations. You know, of what's going on that week and life, you know. Some things as stupid as teachers and how they can frustrate you to t.v. shows… Different stuff like that. It's been interesting you know getting to know someone else. Especially somebody much older and has some of the experiences that you wish to have later in life. You know, it's cool!

Like John, two other students indicated that they were afraid in the beginning that the relationship with their mentor would be awkward. They indicated that their fear was related to the fact that their mentor was of the opposite sex as them. To illustrate this point, one of the girls stated "so, I was really close with Miguel, he has really helped me a lot. I could not have done it without him. Yeah, we got a long fine. I thought that it was going to be awkward, but it was good." Students suggested that once the male-female relationship took a hold, fear of having a mentor of the opposite sex diminished.

DISCUSSION

Mentoring is at the heart of EnvironMentors programming. Students indicated that learning new skills, preparing for college, and deciding what field to go into were all things with which mentors can assist them with. The findings above suggest that mentor-mentee pairs work best when a personal connection forms between the two people. Students were clear that mentors can help them decide what they want to do in college, help them see their "possible

selves". Mentors provide students with opportunities to see that STEM can be fun, and that these fields are worth pursuing.

Student participants involved in this study were eager to work with mentors to help them figure out what they want to be when they grow up, their possible selves. EnvironMentors provides students with many opportunities to see if STEM is for them as an individual. Each student who comes into the program holds a different perspective of where they fit in the world. As shown in the literature review, female students tend to prefer to learn from other females. Our findings showed that female students were hesitant to work with male mentors. Once the relationship was established and nurtured, however, the student's initial issue of having a mentor of the opposite sex dissipated. This research shows that male-female mentor pairs can work in this particular situation and further studies would need to be done to make larger generalizations.

All of the students in this study indicated that they enjoyed working with their mentors. Students stated that all mentors are going to be different but that they all have something positive to offer. Furthermore, a majority of the mentor-mentee relationships were mixed ethnicities. Specifically, almost all of the mentees were Hispanic and all but one of the mentors were Caucasian. This research shows that at the two schools of focus that mixed race mentor pairs work. Students indicated that they were able to work on their possible selves in these relationships.

The most common challenge that students from both chapters voiced was that they have many other commitments after school and that makes it difficult for them to finish the program requirements. Students play sports after school, are trying to get good grades in high school to ensure them acceptance into colleges and have busy home lives. They also have a difficult time with transportation and meeting with their mentors after school. Some students can drive and

have cars, but others rely on parents, friends, and public transportation to get around. Providing transportation to students presents issues of additional time and money, but mentors often can aid in getting students to meetings.

EnvironMentors can increase success rate and ensure that more of its students will go onto pursue STEM career paths if it provides students with mentors who can show them strong possible selves. Students want their mentors to help them choose what to do in college. They want mentors to guide them through the process and teach them skills. Mentors don't need to come from any specific ethnicity, gender, race or specific college major; they just need to have useful skills, an understanding of the college access process, do 30% of the work, and be able to promote STEM.

Overall, students that participated in this case study benefited from working with mentors by having an opportunity to see if STEM is a good fit for them. They had many positive interactions, and were motivated by working with college students. The two schools voice many of the same challenges, concerns, and successes. Both schools will benefit by paying attention to the successes and failures outlined in this paper and by purposely working to provide their students with opportunities to build strong possible selves in STEM.

Table 3.1
Top six categories for Poudre High School, Woodland Senior High School, and overall

	Poudre High School	Woodland Senior High School	Overall*
1	Challenges and Issues	Mentor Relationship	Mentor Relationship
2	Mentor Relationship	Interactions	Challenges and issues
3	Expectations	Challenges and Issues	Expectations
4	College Access	Expectations	Interactions
5	Interactions	Motivations	Motivations
6	Motivations	EM Online Community	EM online community

* The overall top six categories were calculated by adding frequencies from fall and spring focus groups for both schools

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4. CONCLUSIONS

The purpose of this thesis was to explore ways in which EnvironMentors can improve its ability to increase the number of underrepresented youth entering environmentally focused STEM fields. In particular, findings from this research could be used in recruiting future student participants and to increase retention once in the program. The researcher wanted to discover what students at similar EnvironMentors chapters had to say about their experiences with the program and find out if there are predictors for improving recruiting efforts for interested students.

Both manuscripts were guided by unique theoretical framework. In the first paper, the researcher wanted to know if there were variables that could help predict if potential students would be interested in pursuing environmental studies in college and was guided by the concept of significant life experiences. The second paper was a case study based on the concept of possible selves and was conducted to discover if there were themes voiced by students that might be valuable to EnvironMentors' practitioners when considering programmatic changes. Although each paper utilized different methodologies, results and findings from these papers will prove to be beneficial for EnvironMentors' managers.

Summary and Integration of Findings

Based on the results from the first paper, we can conclude that EnvironMentors' students with a positive attitude toward nature are predicted to show interest in studying about the environment in college. Further, students who are interested in studying science, technology and engineering (STE) in college are likely to show interest in studying about the environment post high school. Significant life experiences can help to explain why EnvironMentors' participants

who indicated that they enjoy nature also are interested in STE and studying environmental issues in college.

The findings from the second paper show that mentor relationship was the most common theme discussed by participants of this study. The researcher then looked at the mentor relationships at both schools focused on in this study, based on the following four categories: expectations of mentor relationships, examples of mentors providing motivation to students, challenges and issues with mentors, and interactions with mentors. The findings of this study show that student participants are eager to work with mentors who they can find a strong connection with, feel supported by, meet with regularly, and those who are willing to do 30% of the work.

This study also indicates that gender and race can become a non-issue once the mentoring relationship has been established between individuals. Once the male-female relationships take place, the student's initial issue of having a mentor of the opposite sex goes away. Specifically, this research showed that male-female mentor pairs can work well. This research also showed that at the two schools focused on in this study that mixed-race-mentor-pairs work. Mentors don't need to come from any specific ethnicity, gender, or race to be effective in their role with EnvironMentors.

Management Implications

Knowing that students who enjoy nature might be good candidates for EnvironMentors could prove valuable in recruiting efforts. When EnvironMentors' coordinators are looking to recruit new student participants, they should consider looking into outdoors related clubs and activity groups within the high schools they are involved with. In addition, if EnvironMentors' managers know that students who are interested in studying STE and environmental disciplines

in college, most likely had significant life experiences and enjoy nature, it makes sense to recruit those students into the program. Student counselors, as well as science, technology, and engineering teachers will know who these students are. Based on this knowledge, it is advised that coordinators consider these people as resources in recruiting new students each year.

Findings from the second paper have management implications in that we know that mentor relationships are very important to student participants in EnvironMentors. These relationships are important for students discovering their possible selves in STEM. It has been found that students who participated in this study are not concerned so much with the demographics of mentors more than they are with how strong of a connection they will have with them; and, whether they can provide them with their time, skills and motivation to complete the tasks at hand. Knowing this can prove valuable when looking for mentors to assist with EnvironMentors programming in the future.

APPENDIX 3.A

Notes for NSF fieldnotes when on a site visit – 2011

So usually when we visit chapters we take down some notes as we go there based on our conversations, what we observe, hear, etc as we try to capture the context for each of the chapters. Here is an unofficial list of these things that Brian and I constructed as he was getting ready for LSU – we thought we would share to gain some parity in data collection….

Try and ask some questions around the following topics and jot down what you hear….

- Student demographics
- Nature of fieldtrips
- Returning student numbers and retention characteristics
- Background/history of the chapter – how they got started, how they got students, mentors etc
- Club or class?
- Recruitment tactics – students and mentors
- Sustainability measures – retention, financing etc
- Mentoring sources – returning mentor pairs? Training or development for mentors? Relationships with mentors? Demographics?
- **Non successful students – when, why did they job or choose not to re-up?
- **Parental involvement?
- School context if possible
- **Where do they meet? Logistical issues?
- Partnerships in place – GEAR UP? TRIOS? UB?
- **Online community participation, initiatives, perceptions of utility for students and chapter coordinators
- **What has been the most and least effective part of the program? What have they changed over time?
- **Barriers to student success outside of their control? How did they overcome them?

APPENDIX 3.B

Poudre High School Frequency of Codes				
Number	Categories	Fall Frequencies	Spring Frequencies	Total*
1	Career	2	4	6
2	Challenges & Issues (1)	15	45	60[1]
3	Chapter	7	0	7
4	College Access (4)	13	10	23[4]
5	EM Online Community	0	8	8
6	Environmental Experiences	0	0	0
7	Expectations (3)	29	19	48[3]
8	Field Trips	0	0	0
9	Fun	1	0	1
10	Incentives	1	0	1
11	Interactions (5)	7	12	19[5]
12	Mentor Relationship (2)	32	23	55[2]
13	Motivations (6)	8	1	9[6]
14	Personal Development	3	1	4
15	Project Ideas	2	7	9
16	Scientific Topics	4	1	5
17	Skill Building	1	0	1
18	Success	0	2	2
19	Technology	5	1	6

* The following are in order of most frequent occurrence observed through deductive analysis: [1] Challenges and Issues, [2] Mentor Relationship, [3] Expectations, [4] College Access, [5] Interactions, and [6] Motivations

APPENDIX 3.C

Woodland Senior High School Frequency of Codes				
Number	Categories	Fall Frequencies	Spring Frequencies	Total*
1	Career	10	3	13
2	Challenges & Issues (3)	25	27	52[3]
3	Chapter	4	0	4
4	College Access	4	0	4
5	EM Online Community (6)	0	23	23[6]
6	Environmental Experiences	2	1	3
7	Expectations (4)	20	23	43[4]
8	Fields Trips	0	2	2
9	Fun	0	1	1
10	Incentives	3	0	3
11	Interactions (2)	44	16	60[2]
12	Mentor Relationship (1)	42	26	68[1]
13	Motivations (5)	25	0	25[5]
14	Personal Development	8	1	9
15	Project Ideas	3	1	4
16	Scientific Topics	0	15	15
17	Skill Building	1	3	4
18	Success	1	6	7
19	Technology	0	0	0

* The following are in order of most frequent occurrence observed through deductive analysis: [1] mentor relationship, [2] Interactions, [3] Challenges and Issues, [4] Expectations, [5] Motivations, and [6] EnvironMentors Online Community

Appendix 3.D

Both Poudre High School and Woodland Senior High		
Number	Categories	Overall Frequencies*
1	Career	19
2	Challenges & Issues	112[2]
3	Chapter	11[3]
4	College Access	27
5	EM Online Community	31[6]
6	Environmental Experiences	3
7	Expectations	91
8	Field Trips	2
9	Fun	2
10	Incentives	4
11	Interactions	79[4]
12	Mentor Relationship	123[1]
13	Motivations	34[5]
14	Personal Development	13
15	Project Ideas	13
16	Scientific Topics	21
17	Skill Building	5
18	Success	9
19	Technology	6

* The following are in order of most frequent occurrence observed through deductive analysis: [1] mentor relationship, [2] Challenges and Issues, [3] Expectationss, [4] Interactions, [5] Motivations, and [6] EnvironMentors Online Community