STEM Corps: A Workforce Enhancement Experience for At-Risk Students

Joann Zadrozny[a]
[a]Texas State University
Department of Geography
601 University Drive
San Marcos, TX 78666
USA
Email: j_z37@txstate.edu

Carmen P. Brysch[b]
[b]Texas State University
Department of Geography
601 University Drive
San Marcos, TX 78666
USA
Email: cb1404@txstate.edu

Dr. Richard G. Boehm[c]
[c]Texas State University
Department of Geography
601 University Drive
San Marcos, TX 78666
USA
Email: rb03@txstate.edu

Dr. Francisco Morales[d]
[d]Texas State University
Department of Geography
601 University Drive
San Marcos, TX 78666
USA

[a] Corresponding Author

Abstract

The STEM Corps program brings at-risk students from the Gary Job Corps Center to The Meadows Center for Water and the Environment to learn about STEM principles and environmental education in a non-formal setting. This article explores the influence this program had on at-risk students in science, technology, mathematics, geography, and basic job readiness skills during the first year of the STEM Corps program. By completing the program, the students were exposed to various activities that combined environmental citizenship with water conservation practices. The authors found significant positive short-term effects. Significant gains were found mostly in activities involving thesurrounding environment and the importance of water and water conservation.

Keywords: STEM, Jobs Corps, water education, water conservation, environmental education

1. Introduction

STEM Corps is a joint project of the Gary Job Corps program in San Marcos, Texas, The Meadows Center for Water and the Environment at Texas State University, and the Gilbert M. Grosvenor Center for Geographic Education. Beginning in October of 2012, Gary Job Corps, funded by the U.S. Department of Labor, began sending cohorts of students from their home base in San Marcos to The Meadows Center located six miles away on the Texas State University campus, where they received exposure to a specifically designed curriculum covering basic science, technology use, mathematics, water and environmental education, and geography. For two and a half hours, approximately 15 students engaged in activities facilitated by two specialized Texas State geography graduate student instructors and staff of the Grosvenor Center. During the two and a half hour period, the students embarked on a glass bottom boat ride to learn about artesian springs and the habitat of Spring Lake, spent time in the environmental center learning about water issues, discussed making good decisions about the environment, and used math and technology to enhance their understanding of these concepts. The objectives of this cooperative program include 1) learning about the importance of water, 2) developing basic skills to help in the job search after graduation from Job Corps, 3) developing a basic level of geography and STEM skill set, and 4) cultivating positive attitudes and behaviors towards the environment and self. The outcomes showed that there was an increase in knowledge gained, especially in the topics about the environment visited that day and about water and water conservation concepts. Students also reflected a positive change in their attitude and behavior towards the environment after the program.

The research is based upon various programs that promote a non-formal educational setting to a group of students to increase their knowledge and induce lifelong learning. The concept of lifelong learning is important because as individuals we are constantly learning during our interaction with the world around us, however some need to learn how to cultivate this skill to be useful. Currently the environment is a concern of many citizens, and STEM has become an educational priority ordered from the White House. This research tries to tie the two together by offering at-risk students an opportunity to attend a non-formal educational program and grow into lifelong learners.

The students that the program is intended to reach are those who have low self-esteem and low- educational attainment. Therefore they already have a negative outlook on school and learning. Bringing them to an out of classroom experience to learn about the environment through hands-on experiences can help increase their attitude toward learning, their self, and the environment. The curriculum is based upon a constructivist approach allowing students to come in with their existing knowledge and throughout each lesson they adapt,

modify, and add to that prior knowledge. Through a constructivist approach the students learning is self-directed and hands on. The facilitator guides them along the path, and in this instance, numerous opportunities to reflect out loud what is being learned.

For learning to take place effectively, a student must be interested. Fortunately, if the student volunteered to come to the STEM Corps program they showed the first sign of interest. Once they arrive it is a matter of keeping their interests and keep them engaged. The hands on experiments is one way of keeping them engaged, however, as a whole it can be a lot trickier, especially with the diverse background of the students. In order to overcome that obstacle the curriculum was taught in a way that pertains directly to their selves. Making the learning as personal as possible increased the levels of interest and productivity of the group as a whole.

2. Literature Review

2.1. At-Risk Students

America's youth were at a great disadvantage growing up during the time of the Great Recession, which lasted from 2007 to 2009. Despite numerous initiatives and bills to reboot the economy, progress has been lackluster and slow, as many Americans still reap the consequences. The Federal Reserve Bank of St. Louis: Annual Report (2012), found that "younger, less-educated, and African- American and Hispanic families lost the most." Given this information, it is plausible that these two minority groups represent a large percentage of high school dropouts within the nation. Of the 7.4 percent of students who dropped out of high school in 2010, 13.8 percent came from families in the low quartile of total family income; 18.7 percent are unemployed while 35.5 percent are not in the labor force; and fewer than 50 percent completed grade 11 or 12. African American and Hispanic have the lowest graduation rates, 60 percent and 58 percent, compared to Asian and Caucasian, 79 percent and 76 percent, respectively(Huffington Post, 2012).

Students that exhibit particular characteristics which hinder their school attendance or motivation, generally have a lack of self-confidence and self-esteem, experience behavioral issues, and often come from less-educated and low-socioeconomic families, are termed at-risk (Nelson & Eckstein, 2008; Meyers, 1999; Batsche, 1985). At-risk students are at the risk of dropping out of school without any additional support. These students, ranging from age 16 through 24, usually have a difficult time finding a job and provide a good enough standard of living for themselves. Many at-risk children have low self-esteem issues stemming from either neglect, a disorder of some sort, or being a non-native speaker, which affects their civic duty to their community resulting in societal value as being low or negative.

Educating at-risk students also differs because many of the students may have behavioral problems, attention deficit disorders, and a lower educational ability than most; therefore, teaching these groups of young adults requires much more preparation, patience, and perseverance.

2.2. STEM and Environmental Education

In a growing, competitive, and ever more globalized world, it is important our youth be properly educated in science, technology, engineering, and math (STEM disciplines). According to the STEM Education Coalition, they believe that STEM education should be a national priority providing good jobs and American competiveness. It is in the fields of science, technology, engineering, and mathematics from which the future scientists of the nation will come. These fields require immense dedication and determination throughout schooling, but the benefits in the work force are tremendous and highly recognized. This is also important so

that the U.S. remains a global leader. Barack Obama stated at the Announcement of the "Change the Equation" Initiative in 2010, "… leadership tomorrow depends on how we educate our students today." With proficiency levels ranked 25th for math and 17th in science among other industrialized nations, President Obama made STEM education a clear priority for all educational institutions as part of his "Educate to Innovate" campaign through the White House(White House, 2009). The continued increase of the job potential related to STEM education nationwide is encouraging for students who wish to pursue these subjects after high school or in college.

Recent concerns over environmental protection and climate change issues have put environmental education initiatives at the forefront. Established environmental education (EE) programs are being offered in order to increase youth's awareness about the importance of critical environmental issues and concerns (Ferreira, 2012;Kudryavtsev, Krasny& Stedman, 2012; Clarke &Agyeman, 2011; D'Amato &Krasny, 2011; Stern, Powell &Ardoin, 2011; Hungerford, 2010; Larson, Castleberry & Green, 2010; Potter, 2010; Strife, 2010;Tidball&Krasny, 2010;Whitmarsh& O'Neill, 2010; Carrier, 2009;Ballantyne, 2004). Many EE programs also examine how one's attitudes and behaviors towards the environment and environmental stewardship can change after involvement in an after school or non-formal educational setting.

3. STEM Corps Partners

The Gary Job Corps is a no-cost education and career technical training program administered by the U.S. Department of Labor. The program helps young people ages 16 through 24 improve the quality of their lives through career, technical and academic training. The Job Corps supports teaching eligible young people the skills they need to become employable and independent while also assisting in placing them in meaningful jobs or encouraging them to further their education upon graduation. Many students who attend and enroll in the Job Corps have no other place to live, want to get their GED, have a desire to learn about a job or skill, or chose Job Corps as an alternative to incarceration. Job Corps provides at-risk students a second chance.

The Meadows Center for Water and the Environment, located at Texas State University, is dedicated to developing and promoting programs and techniques to ensure water resources are sustainable for human needs, ecosystem health, and economic development. Texas State is home to a distinguished array of departments and research centers engaged in critical scholarly work on water management issues. The Meadows Center's projects create new opportunities to disseminate significant knowledge and information to the community at large related to environmental education, stewardship, civic responsibility, and science and technology education. They are committed to helping protect and conserve water resources by 1) advancing scientific and technical knowledge through research on aquatic resources, 2) identifying and analyzing socio-economic and political issues affecting water use, 3) guiding the development of environmentally sustainable public water policy in Texas, and, 4) cultivating public awareness and education about water resource issues.

The Gilbert M. Grosvenor Center for Geographic Education, also located at Texas State, is dedicated to encouraging research and providing leadership in the movement to increase the quality of geography and science education. Named after the former Board Chairman of National Geographic Society, the Center pays close attention to 1) student and public learning, 2) teaching methods, 3) curriculum, 4) assessment, 5) cognitive mapping, and, 6) the uses of technology.

4. Research Questions

Despite the wealth of knowledge regarding the impacts of environmental education, a lack of information regarding how to reach at-risk students in similar non-formal settings still exists. While much of the literature describes programs that offer multiple day experiences or daylong trips including various activities about the environment, STEM Corps consists of a two and a half hour session aimed at projecting the importance of environmental stewardship and the relationship to job readiness skills. Within this limited time, the goal is to maximize impact and knowledge these students gain about these issues as much as possible.

Therefore, theresearch questionsinclude1) does exposure to the STEM Corps program increase student awareness of environmental and water issues in any way, and, 2) can an increase in environmental awareness determine whether students choose a career field related to "green" jobs and what should be done to monitor these students after graduation? In addition, from a teaching perspective, a project partner wanted to determine if these strategies used are effective for teaching at-risk students, and, isthis short session an ample amount of time to reach these students and make a significant impact regarding knowledge gains pertaining to environmental awareness?

4.1. The Learning Site

The Meadows Center for Water and the Environment, formerly the Aquarena Center, is a leadership initiative designed to coordinate and further university-wide efforts in the field of aquatic resource management. The Meadows Center is located at the headwaters of the San Marcos River, where over 200 springs from the Edwards Aquifer discharge over 123 million gallons of water daily. An archaeological dig discovered that Spring Lake, a manmade lake, is the one of the oldest continuously inhabited places in North America dating back to over 12,000 years ago. The Meadows Center offers glass bottom boat tours of Spring Lake to view the springs and natural beauty of the lake, including the various flora and fauna. An educational wetlands boardwalk is available for visitors to enjoy the beauty of the habitat. Discovery Hall includes a 5,000-gallon aquarium with native species found in Spring Lake along with endangered species aquariums housing rare native species. A turtle tank also on display, houses five native turtle species, in addition with interactive video displays and a video wall. The Meadows Center offers educational and public tours of the freshwater ecosystem with interpretive interactive experiences that engage the audience in an exploration of interconnections between all living things and water.

The Meadows Center provides the ideal site for providing a non-formal educational setting for bringing at-risk students to learn. It allows the Job Corps students the chance to leave home base for three hours and experience a local, significant natural ecosystem. Of all the students that participated in the program, none visited the Center prior to this excursion, providing each with a novel experience.

The development of the STEM Corps curriculum was based upon the newly established Gary Job Corps 360 outline and the basics of STEM and geography. From the 360 requirements, the main focus was on technology and decision making/choices. The overall objectives of the program include 1) learning about the importance of water, 2) developing basic skills to help in the job search after graduation from Job Corps, 3) developing a basic level of geography and STEM skill set, and 4) cultivating positive attitudes and behaviors towards the environment and self. Each of these objectives is addressed within the curriculum and presentation of activities. Therefore, this provided an incentive to participate in the program as students received credit toward their graduation requirement plan. Overall, Job Corps curriculum requirements were

developed alongside already existing activities carried out at The Meadows Center which includes a short map literacy component, and a discussion about water conservation with a mathematics supplement. Each student receives a guide to follow along with and reflect on each activity during the visit. Reflection proves to be an important aspect in service learning activities for at-risk students (Nelson & Eckstein, 2008; Meyers, 1999).

4.2. Curriculum/Student Visit

To begin the session, an introduction of Spring Lake is given beginning with the question, "*Has anyone ever been here before?*" and "*Does anyone know what is special about this particular area?*" The majority of the time, the response is "no" to both questions which leads to a description of Spring Lake and the Edwards Aquifer. On the second page of the guide two aerial photographs of the area are depicted. Using these maps, students identify their current location and the course of the river through town, addressing the geographic map literacy component of the curriculum.

The first activity continues with a thirty-minute boat tour of Spring Lake. Students are asked to pay close attention to features of the lake, which are covered on page three and four of the guide. Two photos, one of a low-pressure spring and another of a high-pressure spring are presented on page three. The students must label the picture correctly based upon what they see through the glass bottom of the boat. As well as, provide a simple description. Various flora and fauna found in their natural environment in Spring Lake are listed on page four of the guide. Students observe and identify these different species on the boat tour. In addition to these features, the boat tour includes information on the history, physical features, and various facts about Spring Lake. All of these activities address the science component of STEM, including the basics of observation skills.

The second activity is a small group effort called "All the Water in the World." Each group is given a cup filled with water labeled *all the water in the world*, and seven empty cups each labeled with various places water can be found: *ocean*, *rivers*, *lake*s, *groundwater*, *ice caps and glaciers*, *atmosphere,* and *soil moisture*. Students work collaboratively in groups to determine how much water is in each from greatest to least, as well as, distribute the water to each cup. This activity promotes job readiness skills, such as collaboration, listening, staying on task, and organizational skills. Each group provides reasoning for their decision prior to the correct answers which are discussed by the instructor. Because there has been little success in the groups determining the correct allocation amounts, a discussion on the availability of water ensues. Therefore, the activity presents the issue and the comparison of ocean water/saltwater and freshwater resource availability. Because of the activity, students learn that 97 percent of all the water in the world is ocean water, which is unusable by humans. Freshwater accounts for 3 percent, however, approximately 2 percent of that is locked up in solid form in ice caps and glaciers, leaving less than 1 percent of freshwater available for the entire world. In follow up discussions, most students believe filtering ocean water is the solution to this problem, unaware of the costs of desalination. Occasionally, however, a student mentions the notion of water conservation as an alternative.

Next, a critical component in the curriculum focuses on a discussion of water use and conservation while addressing objectives one and four. In activity three, "Water in our Everyday Lives," students use math calculations to determine the amount of water in gallons wasted during one necessary aspect of our day, bathing. The math begins with basic two-digit multiplication then slowly increases to multiplication of 2 million, and the instructors introduce some hints students may find useful in making their calculations easier

to equate. The last math problem questions, divided into two-parts, require the students to read the problem and determine what information they need in order to determine the answer. These questions provide an idea of the amount of water, in gallons, that is wasted in this geographic area during showers, which has a direct impact on water levels in the Edwards Aquifer. The math section is done entirely by pen and pencil, enforcing the importance of knowing how to calculate basic math without the help of a calculator.

Discussion dominates the next activity as students usually provide a substantial list of various ways in which water is used. Often, the instructors, who challenge the students to think about how often and how much water they use, give input and guidance during the discussion. A supplemental math problem shows how much water could be saved if people decreased the length of their showers, leading to other suggestions about water conservation. Students brainstorm and come up with the most obvious ways to conserve (i.e., turning off the faucet when you brush your teeth or wash your hands). Aside from these, the students tend to hit a wall.The instructors, using guiding questions, encourage the students to think outside the box. The instructors also add a few more examples of conservation that everyone can practice almost immediately. Next, Apple iPads© are used by the students in order to research other ways to conserve water. Since many students have never used an iPad prior to this experience, this provides an ample opportunity for them to become familiar with new technology they may encounter in the work force. The students perform a Google© search for 'water conservation' and link to the first website listed. The students peruse the website that provides over 100 different ways to conserve water. Students must read the list and write down suggestions they felt were especially important for conserving water in their guide, as well as, suggestions they can personally implement. To ensure the activity is completed, each student shares one tip of choice aloud. To make a connection to the students and the work they will do in the field, the instructor asks students to think how they can apply conservation strategies at the job they are training for by thinking of the different tools, methods, and technologies they have learned about. To conclude the topic of water conservation a brief summary is provided about the importance of water and water conservation including personal connections that we all have with water.

The final activity in the packet allows the student to enter Discovery Hall and explore the aquariums and information provided. An interactive online quiz accompanies the exploration so students must stay on task rather than stroll aimlessly around the area. After ten minutes in the hall, the students rejoin in the conference room to go over the answers and ask any final questions. Prior to the students' departure from The Meadows Center, a brief presentation about job professionalism is given and they complete a survey about the program.

5. Methods

This article reports the results from the final two months of the STEM Corps program in 2013. In those two months, STEM Corps serviced 131 students mostly from Texas, but some students had relocated from other states or countries. For the statistical analysis, only 126 surveys were used because of missing and/or incomplete information. The initial instrument was developed by a small group of researchers who worked on the project. This instrument, used for the majority of the course of the project, was a pre- and post-questionnaire. After months of running the program, the same group of researchers reconvened to analyze the evaluation instrument. The current surveys did not answer the desired questions and purposes of the study in the desired depth. So, a modified instrument was used in the final two months of the program. Once revised, the new instrument was tested on two groups to determine readability and reliability, before full implementation on the remaining two months.

5.1. Data Collection

During the final two months of the program, the STEM Corps staff administered evaluation surveys to the students at the end of each session. This sample (n=126) provides an accurate representation of the entire population that came through the program; 52 percent male and 48 percent female attendees. The racial/ethnic profile of the respondents included: African American (29%), Hispanic (20%), Caucasian (14%), Asian (2%), mixed (4%), unanswered (31%).

5.2. Questionnaire Design

The modified survey instrument used for data collection provides quantitative data based upon the objectives of the program and alignment with each activity. In order to measure what the students learned the items are based on a 5-point Likert scale ranging from *nothing* (1) to *a lot* (5). The questions were developed to measure how much the students learned from their visit to The Meadows Center by asking them to complete the statements. It was agreed that the reading level of the words used was to be as simplistic as possible because of the low education level of many of the students. The survey also contained an open-ended question which provided qualitative data. In this question, students were asked to write two or three sentences about the most important thing they learned during the visit, which allowed students to voice their opinions.

6. Results

Overall, students expressed a high level of knowledge gained during the STEM Corps program.By examining the results in Table 1, a large percentage of students answered that they learned “quite a bit” or “a lot” about the topics discussed during the session. To show the combination of these two responses, a sixth column was created. These percentages show that a significantly high amount of the students learned something during their time spent at The Meadows Center. For half of the questions, more than 80 percent of the 126 students learned a good portion of the material, followed by three questions in the 70 percent range. The only concept that students seemed to have difficulty with was the use of aerial photographs. This is understandable, however, because it was a very small part of the entire session.

As seen in Table 2, the students’ responses ranged from a mean value of 3.90 to 4.47, showing that students on average answered they learned “quite a bit” concerning each question. The standard deviation shows the dispersion of the answers from the mean value, representing the majority of the percentage to be within one standard deviation of the mean, possessing strength in the program execution. Significant strength was seen in questions asking about water and endangered species. Student verbal responses evoked the same result with numerous students recording that the most important thing they learned was the need to conserve and save water. A couple of students were able to recall the bigger picture of water conservation, which entails conserving water for future generations:

> “*I’ve learned that the water you use in your life could affect you in the future.*”

> “*I learned today how important saving water is, and that we need to preserve it so coming generations will be able to enjoy the water as do we.*”

In order to determine if certain questions produced similar student responses, Kendall’s Tau test was performed to test whether there is sufficient evidence for correlations between and among survey questions (Table 3). The first set of questions deal with the natural habitat and environment the students explored that

day: question 2, the San Marcos Springs, and question 3, endangered plants and animals. The null hypothesis states that the two questions are independent; with n=126, we can reject the null hypothesis at the .05 level, with a calculated $\hat{\tau}$ = .439. We conclude that there is a direct relationship between student responses to question 2 and question 3 in terms of how much they learned. We compute the same statistical test forthe combinations of questions 5, 6, and 7. These three questions deal with the importance of water and how to conserve water resources. All combinations reject the null hypothesis at α= 0.05 and $\hat{\tau}$= .567 (question 5 and 6), $\hat{\tau}$ = .497 (question 5 and 7), and $\hat{\tau}$ = .442 (question 6 and 7), concluding that student responses to the three questions are directly correlated. This is significant because it shows that students who learned a lot about the importance of freshwater resources were statistically likely to learn a lot about what citizens can do to protect water resources and how to use technology to enrich their learning about water.

7. Discussion

Our results show that STEM Corps is achieving positive results with regard to immediate feedback about STEM and geography skills and the importance of water and conservation. Follow-up surveys can determine whether participants continue to practice water conservation. The students who partake in this program were students earning their GED and/or a license within a technical field. As a part of President Obama's goal of increasing the number of students seeking STEM education and pursue a STEM-related job, it is important that all ethnic and diversities be reached, which is the bulk of Job Corps students. These students need to be able to realize that they can add to the global economy and push American to the forefront of science and mathematics by becoming familiarized with the advantages of STEM. Teaching the foundations of STEM is difficult to do within a two and half hour session, but planting the seed of what kind of experiences STEM can provide these students can fruit a new crop of STEM professionals and enthusiasts. The experience the program sought to achieve was a hands-on environment to engage the students and grab their interests, which can be difficult with at-risk students. By providing real life situations into the curriculum and discussion was important to spark interest, as well as providing direct circumstances they could benefit in their workforce from a STEM education.

Because of the lack of participation by students at times and behavioral issues that would surface, teaching strategies varied during each session. For each session, the teaching style was altered in order to properly reflect the group of students for that day. Therefore, the instructors were constantly reflecting on their own teaching and adapted as each activity and lesson proceeded. If during activity three, the math lesson, students showed signs of difficulty on the first problem, instruction was changed to do the math problems together as a group aloud rather than individually. If students were not making an effort during this same activity, it was strictly enforced that each student write the equations down. In order to keep everyone on task, it was important to continually walk around the table and monitor the students. It was important to keep them from doing distracting tasks, such as talking or on their cell phone in order to establish a level of authority. Disciplinary actions were addressed when needed, but for the majority of the time it was not an issue.

From observations of the program, it became clear that in order to make a lasting impact on the students, explicit connections between students and the information learned must be a priority(Stern, Powell, & Ardoin, 2011). In sessions when it was not explicitly made clear that how we use water directly affects us, family, friends, and future generations, many students scoffed at the idea of water conservation and made it clear that it was irrelevant to their life. This response was common in multiple groups, until the discussion of water conservation was furthered. By opening the conversation with a personal question the response to

water conservation improved, "*How many of you plan on being in Texas five years from now? How many of you will still have family or friends living in Texas? What about those of you who have children, where will your children be in twenty years?*" By asking these simple questions and then stating the fact that water is in short supply in Texas and only becoming more critical in future years gives the students a reason to listen and feel the impact of personal water decisions.

8. Conclusions

Overall, it seems as if the students arrived at The Meadows Center knowing very little, if any information at all, about water and environmental issues. By the end of the day, students gained some valuable knowledge about the issues and left with intentions to carry this knowledge throughout the rest of their lives and potentially into a new career path. This outcome aligns with similar studies that showed an immediate increase in the students' attitudes and knowledge toward the environment. It is clear to this research team that this "at-risk environmental experiential" program satisfies, in a positive manner, research question one. It is less clear how the program has affected students in the longer term and whether there is a change in their behaviors. Research question two will need to be addressed in a future study. Only time and continued monitoring of these students will determine the lasting effects of this water education program on the students. We can report that, students exhibited a positive increase in the desired objectives of the program: 1) learning about the importance of water, 2) developing basic skills to help in the job search after graduation from Job Corps, 3) developing a basic level of geography and STEM skill set, and 4) cultivating positive attitudes and behaviors towards the environment and self.

References

Ballantyne, R. (2004). Young students' conceptions of the marine environment and their role in the development of aquaria exhibits. *GeoJournal, 60(2)*, 159-163.

Batsche, C. (1985). *The high school drop out: Vocational education can help.* Normal, IL: Illinois State University: Retrieved from the ERIC database. (ED 262 213).

Boshara, R., & Emmons, W. (2013). *Annual Report 2012: After the Fall Rebuilding Family Balance Sheets, Rebuilding The Economy.* Federal Reserve Bank of St. Louis.

Carrier, S. (2009). Environmental Education in the Schoolyard: Learning Styles and Gender. *The Journal of Environmental Education, 40(3)*, 2-12.

Clarke, L., & Agyeman, J. (2011). Is there more to environmental participation than meets the eye? Understanding agency, empowerment and disempowerment among black and minority ethnic communities. *Area, 43(1)*, 88-95.

D'Amato, L., & Krasny, M. (2011). Outdoor Adventure Education: Applying Transformative Learning Theory to Understanding Instrumental Learning and Personal Growth in Environmental Education. *The Journal of Environmental Education, 42(4)*, 237-254.

Ferreira, S. (2012). Moulding urban children towards environmental stewardship: the Table Mountain National Park experience. *Environmental Education Research, 18(2)*, 251-270.

Huffington Post. (2012, November 26). *High School Graduation Rates By State: U.S. Department of Education Releases First-Ever National Data.* Retrieved from Huffington Post: Education: http://www.huffingtonpost.com/2012/11/26/high-school-graduation-ra_n_2194378.html

Hungerford, H. (2010). Environmental Education (EE) for the 21st Century: Where Have We Been? Where Are We Now? Where Are We Headed? *The Journal of Environmental Education, 41(1)*, 1-6.

Kudryavtsev, A., Krasny, M., & Stedman, R. (2012). The impact of environmental education on sense of place among urban youth. *Ecosphere 3(4)*, 1-15.

Larson, L., Castleberry, S., & Green, G. (2010). Effects of an Environmental Education Program on the Environmental Orientations of Children from Different Gender, Age, and Ethnic Groups. *Journal of Park and Recreation Administration, 28(3)*, 95-113.

Meyers, S. (1999). Service Learning in Alternative Education Settings. *The Clearing House, 73(2)*, 114-117.

Morales, F. G. (2011). *Geography's role in supporting non-traditional, at-risk student education for the General Educational Development credential.* Texas State University- San Marcos: ProQuest, UMI Dissertations Publishing.

Nelson, J., & Eckstein, D. (2008). A Service-Learning Model for At-Risk Adolescents. *Education and Treatment of Children, 31(2)*, 223-237.

Potter, G. (2010). Environmental Education for the 21st Century: Where Do We Go Now? *The Journal of Environmental Education, 41(1)*, 22-33.

Sansom, A. (2013). *Analysis of an Informal Water Education Program.* Texas State University- San Marcos: ProQuest, UMI Dissertations Publishing.

Stern, M., Powell, R., & Ardoin, N. (2011). Evaluating a Constructivists and Culturally Responsive Approach to Environmental Education for Diverse Audiences. *The Journal of Environmental Education, 42(2)*, 109-122.

Strife, S. (2010). Reflecting on Environmental Education: Where Is Our Place in the Green Movement? *The Journal of Environmental Education, 41(3)*, 179-191.

Tidball, K., & Krasny, M. (2010). Urban Environmental Education From a Social-Ecological Perspective: Conceptual Framework for Civic Ecology Education. *Cities and the Environment, 3(1)*, 1-20.

White House. (2009, November). *Educate to Innovate Initiative.* Retrieved from The White House: http://www.whitehouse.gov/issues/education/k-12/educate-innovate

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determing consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*, 305-314.

Table 1

Survey Results of Students' Responses, percentages (n=126)

Question	Nothing	A little	Some	Quite a bit	A lot	Top 2 Answers
1. Using aerial photos to identify physical surroundings	5.6	7.1	21.4	23.8	42.1	65.9
2. The San Marcos Springs	2.4	2.4	10.3	27.8	57.1	84.9
3. Endangered plants and animals	2.4	3.2	14.3	31.0	49.2	80.2
4. Critically observing our environment	4.8	5.6	13.5	27.8	48.4	76.2
5. Importance of freshwater resources	.8	2.4	13.5	15.9	67.5	83.4
6. What citizens can do to protect water resources	.8	7.9	9.5	19.0	62.7	81.7
7. Using technology to enrich learning about water	2.4	5.6	14.3	23.8	54.0	77.8
8. Basic math calculations	2.4	6.3	20.6	23.0	47.6	70.6

Table 2

Descriptive Statistics of Students' Evaluation Scores

	N	Mean	Std. Deviation
Question 1	126	3.90	1.192
Question 2	126	4.35	.932
Question 3	126	4.21	.968
Question 4	126	4.10	1.127
Question 5	126	4.47	.873
Question 6	126	4.35	.999
Question 7	126	4.21	1.040
Question 8	126	4.07	1.075
Valid N	126		

Table 3

Intercorrelations of Student Responses with Calculated Kendall's Tau Value

Questions	Kendall's Tau Value, $\hat{\tau}$
Question 2 & Question 3	.439*
Question 5 & Question 6	.567*
Question 5 & Question 7	.497*
Question 6 & Question 7	.442*

*Significance: $p < 0.05$