Environmental Education and Education for Sustainability Projects: Inspiring and
Facilitating Implementation

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Abstract

Our world is faced with a vast array of environmental catastrophes ranging everywhere from climate change, to air and water pollution, to mass extinction of species which all threaten the environment and human existence. As of now, students are not being informed on the sustainability issues, or engaged in the change process at school. Rote memorization occurring in schools does not create critical thinkers that could help make the changes needed for the environment.

The purpose of this study is to present ways in which these topics can be implemented in schools; specifically through local environmental action projects. Previous literature is presented which describes the need for environmental education and education for sustainable development, as well as the background of the movements. An exemplary model project, the STRAW Project, is presented through an interview with the creator of the project and personal observations of the project. The research has shown that when students are taught the skills they need to make a change for the environment and are engaged in environmental project based learning projects, they feel empowered and more ready to make a change. Other benefits and implementation methods are also presented.

Chapter 1 Introduction

During my undergraduate studies I became very aware of many global environmental issues that we are facing and we will begin to see more and more of in the future. Issues ranging from the changing climate, the extinction of many different plant and animal species, landfills and garbage starting to amass into huge quantities, overpopulation, and a lack of clean water for a huge part of the world, are going to create a very challenging and complex future for us and future generations. These issues need to be addressed immediately to create a more sustainable future if humans are to continue their existence on this planet.

Although there is a huge movement of people and companies "going green," there are not any structural or larger scale changes being made here in the United States or even in the world to address the problems. In order to make these kinds of changes, people need to be educated on the issues to be better informed and prepared to be change agents. Change agents in the context of this study, are people who are prepared to make structural changes (both in their own lives and for society) in order to help the environment, to protect it and also to find more sustainable ways of life for humans. Most importantly, youth need to be educated and prepared to deal with the problems and make some changes.

In my, admittedly short, experience as a classroom teacher, I have been amazed by how little time is spent teaching students about the current environmental state of our

planet. In some progressive schools you may see parent initiated programs to promote "Green Ways to School," or school recycling programs, which are all great, but there is a lack of education for the students or the teachers surrounding the changing global environment. Not only are they not learning about the forecasted challenges that lay ahead, but they typically are not engaged in any work to make a change, let alone involved in learning how to make those changes that are going to be needed on a larger level. The young students we are teaching right now are the key to our future. If we, as humans, want our existence to continue, we need to prepare them to meet the challenges ahead and engage them in education for a more sustainable present and future.

Statement of Problem

We are faced with various complex environmental issues that will necessitate a large number of educated, critical thinking, change agents, acting to protect the environment and the existence of humans, and create a more sustainable future. There is not enough environmental and sustainability education in schools today to prepare students with the skills they need to meet the demands of the planet.

Purpose Statement

The purpose of my study is to inform education professionals and the general public about the following: the lack of sustainability education; the benefits of providing students with practical skills for protecting and restoring the environment in the school curriculum; and highlight specific local programs to demonstrate effective ways environmental education can be implemented, mostly through local, environmental

projects. This education will benefit the students, teachers, and the community. We are facing some very complex challenges in the future due to environmental changes, and the intent of this research is to prepare our students to address these challenges.

Research Questions

1. How can we prepare students to become change agents to help the environment recover from the damage caused by humans and make our society more sustainable for the future?

2. How can the implementation of environmental education and education for sustainability be facilitated?

3. How can we empower students to make a change?

4. Are there effective programs that could be highlighted to help inspire other projects?

Theoretical Rationale

There are several theories that have inspired my research questions. First there are project based learning theories, and secondly, UNESCO's theories on global environmental education. I feel as though students are eager to get involved in projects and make a change in their own lives and also for their communities. If they do not have any education about the current state of our world, then they will feel no sense of urgency to make a change. Once they learn that information, they can start centering their attention on how to make a change. I will be focusing on project based learning theories and social action projects which I believe are the most likely to produce real change.

These models can also potentially empower students and teachers, which will carry that change even further. The knowledge they learn and experience will prepare them for dealing with the challenges ahead.  The students can then take the information they learned and share it with their communities to inspire more projects and hopefully create lasting societal change.

This education which students could be receiving on how to make a change is based on two theoretical concepts: Education for Sustainable Development (also called Education for Sustainability) and Environmental Education. These are two contemporary concepts, created and defined by the United Nations Educational Scientific and Cultural Organization, UNESCO. Environmental Education was first thoroughly and officially discussed in 1977 at the Intergovernmental Conference on Environmental Education which was organized by UNESCO (UNESCO, 1978).  As stated in their final report from the conference in Tbilisi (UNESCO, 1978), the goals of the conference were to discuss current environmental issues, what role education should play in creating changes for the environment, and developing strategies for making changes in education to address the environmental issues previously discussed. The main focus was clearly on environmental issues and how they should be addressed in education, whereas the more recent conference on Education for Sustainable Development has a broader focus. According to UNESCO's website (2010b):

> Sustainable development is a vision of development that encompasses
> populations, animal and plant species, ecosystems, natural resources and that

integrates concerns such as the fight against poverty, gender equality, human rights, education for all, health, human security, intercultural dialogue, etc.

This concept is much more inclusive of many other global issues that may be indirectly tied to environmental issues. UNESCO and a group called The United Nations Decade of Education for Sustainable Development (UNDESD), claim that education will help to inform people and offer them the knowledge necessary to make the changes needed for our future (UNESCO, 2010a).

Although these are two different theories, one being slightly more modern and inclusive of other global issues and not just the environment, I believe both are essential to making any substantial changes, and less time should be spent deciding between which would be the most effective. So for this reason I will include the discussion of both to a certain extent; discussing the challenges and benefits of both will provide us with more possibilities for creating a change.

Assumptions

I have made several assumptions, which are guiding my research. My first assumption is that we are in an environmental crisis and have created an unsustainable global society. Second, based on limited personal experience, I have noticed that students are not receiving enough education on sustainability and environmental change. I think that students will be open-minded and excited to become change agents for the environment. They will be innovative and creative in coming up with fresh ideas to address the issue of sustainability. I am also assuming that if students are engaged in local environmental projects, they will learn to think more critically, which will eventually lead

to larger scale changes. Lastly, environmental education could be incorporated into many different subject areas and will not only help the earth, but provide many different benefits for students and teachers.

Background and Need

At the UNESCO World Conference on Education for Sustainable Development the participants defined a "call for action" detailing the necessity of education for sustainable development in order to meet our "lifestyle challenges and problems" (Bonn Declaration, 2009, p. 1). In the same report they give recommendations on how to solve some of these problems. They state, "Engage the commitment, solidarity and potential of youth and their organizations and networks enhancing ESD" (Bonn Declaration, 2009, p. 4). Now we just need to figure out the best strategies to do this. Astronomist Martin Rees (2003) has claimed that without some sort of change, human exticntion has a 50% chance of occuring in the twenty first century. Clearly, we need to start making changes right away and involving our youth and future leaders to have the greatest outcome.

Chapter 2 Review of the Literature

Our global environment is in dire need of a change. In our search for a higher quality of life, we have established a society that is inherently unsustainable. Although there have been global calls for change and, specifically to educate the world on sustainability (UNESCO, 2010a), we are not seeing the amount of fundamental, innovative changes or implementation of environmental education that is necessary to continue human existence into the next century. There is a hope that engaging youth in local environmental and sustainability projects and educating students to make a change will be an effective method of transformation. "Students are hungry for the material and are ready to jump on board" (Zargar, 2010), so now it is just a matter of making this education available to students.

This research examines ways to implement Environmental Education (EE) in the classroom. In order to do so I will present the research that has been found, organized into three subcategories: 1) the environmental state of the world and looking at factors that may be creating an unsustainable future for humans; 2) the background of the Environmental Education (EE) and Education for Sustainable Development (ESD) movements, including some of the challenges that they are faced with; and 3) a look at why students should get involved, and the best ways to do so.

Environmental and Human Need

In humans search for an increased standard of living and advances in modern technology, a disconnect has occurred between humans and the environment. There is

often a belief in the business world that "there are no limits to growth," which causes us to "marginalize natural systems and fragment social systems" (Davis, 1998, p. 141). Any growth that occurs tends to use up more of the world's resources or creates some sort of negative effect on the environment. One of the greatest and most complex effects we are seeing on the environment due to the modern day world is climate change. Human's generation of greenhouse gases such as $CO_2$ is changing the composition of the atmosphere, which is starting to create drastic changes around the world (Hansen, et al., 2008). One of the world's leading climatologists, James Hansen, and a group of leading researchers (Hansen, et al., 2008) claimed that the earth's atmosphere should only contain 350 parts per million (ppm) of $CO_2$ if we want to preserve the earth as it is and want to continue to inhabit it. Until 200 years ago, the earth contained 275 ppm of $CO_2$, and currently, our atmosphere contains about 391ppm of $CO_2$ molecules in the air, which is causing a wide range of damages upon our environment (350.org, 2010).

One of the most problematic changes taking place is the rising temperatures or the earth's atmosphere. According to the Intergovernmental Panel on Climate Change (2007) the earth's surface temperature has increased by about 1°F since the 1970s, and the eight warmest years since 1880 have been in the last nine years. A one degree increase does not seem like a lot, but when you look at the bigger picture of the changes it is causing, you can get a better idea of how drastic a shift this is. Some of the most detrimental effects are the melting of the glaciers which has the possibility of flooding many coastal and agricultural lands and is releasing high amounts of acid in to the ocean which kills

many animal species that live or rely on the ocean (350.org, 2010); the occurrence of extreme storms and natural disasters like the ones we are already starting to see like Hurricane Katrina in New Orleans, and also droughts which can affect many species (McKibben, 2010); and struggling ecosystems and degrading biodiversity due to species adaptive pattern changes to deal with climate changes (EPA, 2010).

Aside from climate change, there are also devastating global changes happening due to human consumption and waste. Mass production and consumerism has caused us to pollute our air and water, two of the most needed resources in the world, and we have "reduced the capacity of the biosphere to cleanse itself" (Davis, 1998, p.143) by creating so much pollution. It is also presented by many (i.e. Journey of a Plastic Bottle, 2010) that there are two entire islands the size of Texas, floating, stuck in the middle of the pacific ocean, made up entirely of plastic bottles. This has terrible effects on the life of the ocean as birds and fish begin to eat it, and the chemicals from the plastic start to pollute the ocean's water which the whole world survives on.

*Unsustainable Path for Humans*

Like state previously, it is believed that there is only around a 50% chance of humans existing past the twenty first century due to changes in the environment and modern technology (Rees, 2003). Our consumerist economy and our "addiction to avoiding the environment" (McKibben, 2010) has put us in a place where it is extremely difficult to try and comprehend what kind of future we are making for ourselves. First off, humans are going to have just as difficult a time dealing with climate change as the

environment is. The previously noted extreme storms could make it extremely difficult to live on earth, not to mention if the storms come as droughts than our food supply could be cut off.

This instability for humans will also stand to create even more injustices in the world than we are already seeing. With the rapid population growth of the last two centuries, resource availability is starting to become an issue (McKibben, 2010). We are already dealing with wide spread poverty around the world, and the trends will only become exagerated with time if we continue to follow the same trends. As of right now, not only are the affluent countries the ones using the most resources, but they are also exploiting  poorer countries to use up their resources and expoit the people of the poorer nations to create material goods for themselves (Davis, 1998); resources as basic as drinking water. Conkin (2007) has presented that almost 700 million people in Asia, almost 300 million people in Africa, and almost 100 million people in Latin America go without safe drinking water everyday.  With the depletion of even more resources, we also run the risk of causing serious security issues when people have to start fighting for their basic needs (350.org, 2010). If we don't stop consuming and wasting on a massive level, we are going to run very low on basic resources, more inequalities will be created, and humans will no longer have the basic essentials which they need to survive.

Besides having a lack of resources to aid human's life on earth, there are also some serious health concerns that we are going to be faced with, and already have started facing. UNESCO (2010a) has outlined some of the major concerns we should start

preparing for: "hunger, malnutrition, malaria, water-borne diseases, drug and alcohol

abuse, violence and injury, unplanned pregnancy, HIV and AIDS and other sexually

transmitted infections." These maladies are all quite terrible, and when they are spread

throughout the world, without educated people prepared to handle them, humans run the

risk of fading off the planet. These are all extremely complex problems that are being

passed down to the next generation, as many stay in denial about the effects of our way of

life on our planet. Are we preparing our students for these kinds of disasters?

Historical Background

*Environmental Education and Education for Sustainable Development*

The leading organization in Environmental Education (EE) and Education for

Sustainable Development (ESD) is the United Nations Educational Scientific and

Cultural Organization (UNESCO). Predecessors to these two terms are "nature study,

outdoor education, and conservation education" (Marcinkowski, 2010, p. 34). EE was

first globally discussed at the Intergovernmental Conference on Environmental Education

(UNESCO, 1978).  The major problems of interest in EE were the environment

including: natural resources, environmental quality, biodiversity, potable water,

sanitation, and food and energy resources (Marcinkowski, 2010). In the final report from

the aforementioned conference (UNESCO, 1978, p. 12) the authors state:

> The role of education in the face of environmental problems and opportunities is
> therefore a crucial one. Environmental education should be integrated into the
> whole system of formal education at all levels to provide the necessary
> knowledge, understand, values and skills needed by the general public and many

occupational groups, for their participation in devising solutions to environmental questions.

Then in 1987, there was the World Commission on Environment and Development where Education for Sustainable Development was first introduced. The focus of ESD started to shift towards educating people to create a more sustainable world for humans; dealing with such issues as poverty, development, peace and violence, and the environment (World Commission on Environment and Development, 1987). Some worry that the focus of ESD on humans is "just another rationale to continue the lengthy tradition of value trade-offs that favor humans over other species, environmental conditions, and ecosystems on planet earth" (Marcinkowski, 2010, p. 34).

*Definitions of EE and ESD*

The fact that EE and ESD do not have clear definitions can create some confusion. Some even believe that the lack of a clear definition can lead to people making whatever they want out of the terms which causes it to not be well respected (Nagel, 2005). In the context of this research, the terms are defined in these ways:

ESD: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p.8)

ESD: "Sustainable development (SD) may be understood as a continuous process that requires a balance between (the emergence of) problems and our capacities  and capabilities to solve these problems" (Lehmann, Christensen, Du & Thrane, 2008).

EE: "In essence, environmental education involves children, teachers, and communities working collectively and democratically, towards the resolution of environmental questions, issues, and problems...it is interdisciplinary...[and is] a positive contribution to counteract the 'doom and gloom' and helplessness" (Davis, 1998, p. 146).

Spork and Jickling (1998, p. 315) have created a list of "defining characteristics of 'education for the environment.'"

1.  to develop critical thinking and enable problem solving;

2.  to examine ideologies which underlie human-environment relationships;

3.  to criticize conventional wisdom

4.  to explore material and ideological bases of conventional wisdom;

5.  to analyze power relationships within a particular society;

6.  to engage students in cultural criticism and reconstruction;

7.  to foster political literacy;

8.  to focus on real-world problems and participate in real issues;

9.  to open students' minds to alternative world views;

10. to work and live cooperatively;

*11*. to realize that humans can act collectively to shape society

*Environmental Education in California*

In 2003, California passed the bill AB 1548 in an effort to include environmental education into California science and social-science curriculums; they call it "Education and the Environment Initiative (EEI)" (California Environmental Protection Agency,

2010). The new bill calls for creating 85 units, which can be implemented in to the California classroom, and covers many environmental and sustainability issues. The units are in their final draft stage and have started to be implemented into the classroom in pilot programs. They do stress however that the curriculums are "environment-based," not environmental education, and "the curriculum is designed to teach students about their relationship with the environment and how humans interact with natural systems" (California Environmental Protection Agency, 2010). Although the state prefers not to use the term EE or ESD, most likely due to political reasons, their goals seem to be quite similar to what this research presents as EE and ESD; simply creating a connection between students and the world to prepare for a better future.

This is a monumental movement for California and will put the state in the forefront of the nation for preparing "students to become future scientists, economists, and green technology leaders" (California Environmental Protection Agency, 2010). The only setback will be that the content will still not be tested on, or included in school policy, so teachers will not be required to teach it (McKibben, 2010). Teachers are already overwhelmed by the amount of content they are supposed to teach to students to prepare them to perform well on standardized tests, so I find it hard to believe that they will be able to find the time to implement these units into the classroom but we shall see in the future.

*International Progress*

Since this is an international movement, research on how EE and ESD are being implemented, or not, around the world has been included. Starting locally, in the U.S., there are some enterprising schools that are incorporating EE and ESD into their curriculum, for example Eastside Preparatory School in Kirkland, Washington (Henry & Olsen, 2009). The goal of their school is to "enable students to face what will surely be an increasingly urgent need: to integrate connections to both physical environments and diverse human communities in their everyday and professional lives" (Henry & Olsen, 2009, p. 31). The classes at this school form partnerships with different businesses or governmental groups to take part in environmental projects around the community. These projects might look like watershed restorations, or researching and creating presentations for sustainable practices to give to people in the community, for example green roofs. These students are taking action and will be better prepared for their futures.

Just south of us in Central America, Costa Rica is leading the way to implementing EE into education. According to Locke (2009) they have been including EE in their science and social studies curriculums since 1983. He also found that the inclusion of EE into the curriculums "did promote environmental sensitivity and, to a lesser extent, democratic values and social justice" (Locke, 2009, p. 97). Across the Pacific in New Zealand, while interviewing a few teachers who had involved their students in environmental education, Eames, Cowie, and Bolstad (2008) found that the EE really helped students who had learning and social issues. They also found that when

students partake in "action competence approaches" (p.44), as in they were taking action on an issue of their community, they took immense pride in their work, felt they learned how to actually do something instead of just talk about things, and they made many more links between their school and the community. Near there, in Australia there is a big push to get EE more incorporated into early childhood education. Davis (2005) has presented a rare example of a kindergarten class who have created an entire school environment around environmental and community issues. She notes that this is not just an "add-on" (p. 47) subject for the teachers, and the students, even very young ones, are capable of making changes for their community.

Although the examples discussed above do offer some hope, we still have a ways to go. The participants at the UNESCO World Conference on Education for Sustainable Development (Bonn Declaration, 2009, p. 1) claim that, "During the first five years of the UN Decade of Education for Sustainable Development (DESD)...many countries have made progress in implementing ESD and have designed innovative policy frameworks," but as a call to action they also say, "The progress of ESD remains unevenly distributed...." and proceed to describe many ways in which ESD still needs to be implemented around the world. Below some of the challenges facing EE and ESD will be described to try and show why there has been a lack of headway.

*Challenges of EE and ESD*

A major obstacle to implementing EE and ESD into education is that it is not addressed in educational policies or teaching standards (ex., Davis, 1998; Munson, 1997;

Marcinkowski, 2010). Wooltorton (2004, p. 598) has stated that "barriers to sustainability in schools include: a perceived systematic orientation towards literacy and numeracy" and also limits to teachers time, which makes EE and ESD a "low status subject at school" (Wooltorton, p. 598). So, just like with California's 1548 initiative, in this time of accountability and testing, if students are not being tested on something, teachers will not have the time to teach it. Some even argue though, that creating standards surrounding environmental education might actually limit the kind of education that needs to be taking place, by confining teachers and students to specific standards, which may not meet their community's needs (Spork & Jickling, 1998). However, there has also been evidence (Tali Tal, 2004) that there are programs (specifically one presented in Israel), which take it upon themselves to recognize the needs of the local community and incorporate those into their education system, which teaches students about place. It seems as though this would be sufficient enough to meet the needs of the community, but may lack in making global connections and making changes on a broader level.

Another major hindrance to EE and ESD in education is the lack of training for educators (Munson, 1997; Marcinkowski, 2010). In order for a teacher to be able to teach her/his students and change their attitudes and behaviors towards environmental and sustainability issues, they must be aware of those issues, and trained in how to teach them (Davis, 1998). Marcinkowski (2010) also makes the point that teacher education needs to be focused on the facts of the sciences so that teaching does not become about advocacy, but about education, to make the field more professional. But when dealing with

problems like climate change, it becomes very difficult for educators to know all the facts

because they can change daily and are complex and multi-faceted. Davis (2005, p. 54)

has presented a case where, "together, both formal and informal approaches to

professional development have generated a 'grass roots' collaborative learning culture

which supports learning for everyone-the children, teachers, families, and the community

at large."

*Critiques*

There are quite a lot of critiques of EE and ESD, which if analyzed, may lead us

to understanding better ways of implementing them into education. One argument that is

often made by supporters of EE is that any actions taking place right now are typically

only taking place to save resources for human consumption, not for the environment

(Locke, 2009). It is often times hard for humans to forget about their own egos and worry

solely about the environment, and it will be a challenge for environmental educators to do

so.

Concerns have also been expressed (Berryman, 1999; Spork & Jickling, 1998)

that this drive for a global education initiative only represents one perspective of the

world, yet it is being pushed upon every human being. Berryman (1999, p. 51) argues

that:

> ...my hypothesis is that the UNESCO's single vision of a global and total
> education for a sustainable future, in all nations, for all people, for all ages, in
> every context and every curricula is a form of totalitarian omnipotent
> hypermodernity. It would seem to exacerbate some of the most debilitating

aspects of western capitalist and industrial modernity and export them everywhere on earth.

What he makes us question then is, how do we educate the world about the problems of the environment and sustainability without enforcing one, specifically western viewpoint, especially when it is the "western" countries which are causing the most damage to the environment? Spork and Jickling (1998) also felt that enforcing this perspective that UNESCO has outlined will limit critical thinking and can possibly indoctrinate teachers and students to behave and act in certain ways. We cannot forget that "social inequality and imbalances of power are at the heart of environmental pollution and resource depletion" (Locke, 2009), so in order to implement EE and ESD, we must always be open to critically analyzing the material and making sure to see both sides of all arguments (Spork & Jickling, 1998).

Arguments are also made about how appropriate it is to teach children about these frightening problems facing humankind. Berryman (1999, p. 57) states that, "...I just wish to point out that global sustainable development seems to depend on these contradictory qualities: a fear of the actual world and an omnipotent belief that we can build a better one to our own image and desires." There has been great concern that students will become overwhelmed by the massive burden and complexity of these problems. Nagel (2005) has completed a study where he showed that ever since the 1970s there has been a growing sense of pessimism towards making changes for the environment, and more specifically he claimed that environmental education can cause learned helplessness and

cause children to feel apathetic towards the environment. But, he also pointed out that students were not taught any skills to deal with the problems they were being presented with and "seemed to be constructing apathy pertaining to the students' sense of agency or ability to do anything in the present for the benefit of their futures" (Nagel, 2005, p. 75). This research has led to the realization about the importance of engaging students in activities where they act as change agents in order to give them hope for the future and empower them to make changes. These trends will be discussed further in the next section.

Why and How Students Should be Involved

When looking at research such as Nagel's (2005), one might make the assumption that environmental issues such as climate change, should be left up to adults to try and solve, especially since they are the ones who have created the problem. But many have taken a different opinion, realizing that the youth of our world are going to be the ones most affected by the problems (Davis, 1998) and we should prepare them to overcome those challenges. Many have taken the stance that adults should take on the responsibility of preparing the next generation, and act as good role models as students will tend to mimic the culture of the adults around them (i.e., Davis, 1998; Wooltorton, 2004). Davis (2005) shows that even very young children (ages 4-6) are capable of acting as change agents for their community when lead by inspiring and enthusiastic teachers. It has been said that by advancing and expanding knowledge of sustainable development, we can be

lead to more ideas for solutions (Lehman, et al., 2008). So if we can educate the next generation they will possibly come up with solutions that at this point are lacking.

Young people have also been seen as "the greatest driving force behind the sustainability movement" (Gutter, 2009, p. 40). McKibben (2010) has also said that young people around the world are joining together in support of the 350.org organization, and said that they are the greatest mobilizers. McKibben (2010) stated that he believes students may feel such empowerment to make a change because they "have a visceral sense of connection through things like Facebook" and may gain a lot of power through feeling like they are connected to people around the world. With the use of the Internet, youth make connections between local environmental projects and other projects going on around the world, and they can start to see change on a more global level. Similarly, they could post a YouTube video to share their environmental project and inspire someone across the world to start a similar project in their hometown. It could be very inspiring for youth to make those connections and see how their small actions, or projects can have great ripple effects.

*Different Educational Approach*

As discussed previously, the problems of the environment are vast and complex. Many (i.e., Houser, 2005; Wooltorton, 2004) have argued that as of right now, we are not providing students with enough education to deal with such complex problems. This argument is made clear by Houser (2005, p. 127) when she says "students feel pressure to perform well on standardized measures of achievement, so their teachers focus on

increased attention to decontextualized facts and skills rather than on enlightened ways of thinking and being." This type of traditional education, of being lectured to about "decontextualized facts" (Houser, 2005, p.127) was started during the industrial revolution when students were being trained to be workers on an industrial line (Munson, 1997). The education system was quite successful back when it was created, but the difficulties of today's society are much more complex and demand much more critical thinking, analysis, and problem solving (Spork & Jickling, 1998). Furthermore, many others have claimed that students need to be engaged in real life, community situations (Tali Tal, 2004).

In this different educational model where students are being engaged in real life situations, and acting as change agents for their community, teachers play a very different role. Lehmann et. al. (2008, p. 286) have noted that "...the task of the teacher is altered from transferring knowledge into facilitating the learning process of the students." So in this model, teachers are no longer standing in front of the class lecturing about specific subjects that are unrelated to students' lives and real world problems, but providing opportunities for students to engage in the real world and supporting them to be change agents. In relation to this, Munson (1997) has said that teachers need to help their students question such cultural norms as consumerism, and so that they don't go unquestioned and the status quo of harming the environment will never be changed. Munson (1997, p. 1) has stated that we specifically need to question the belief that is often instilled in education that the environment is seen as an "outside source to be

managed by humans," which is another point of view that comes with our technological growth. So, in order for environmental education to be successful, students must start to question the norm and start to conceptualize nature in a different way. This is discussed in the next section.

*Reconnecting With Nature*

Davis (1998, p. 142) has made the strong statement that, "the only way we can get off our destructive path is to develop a radically different perspective on our place in nature." She hypothesizes that this perspective has happened because of the education system, which tells us that we can simply manage the environment, and also the modern phenomenon of children always being in supervised activities, without any free time out in nature. Munson (1997, p. 1) has also argued that there is an "alienation" and "isolation" from the natural world, which is fortified by the current education system, which causes many Americans to feel that the environment is something completely separate than themselves, and for this reason, they will feel no desire to make any changes for the environment. With this type of mentality and education, no one will ever be willing to make any changes.

As an environmental scientist and educator, McKibben (2010) always loves to take students outside to look up into the sky, or look at the ocean for the first time, and they start to get a sense that there is something bigger than themselves in the world. McKibben (2010) states that, "this goes completely against our culture which tells us we are the most important thing on earth." But he found that once people realized the

vastness of the world, they started to fall in love with nature and were more ready to make a change. Rogers (1994, p. 29) has said that "Many of us feel guilty about what has been done and is being done to the environment. In realigning ourselves with nature we may heal and thrive." Education must start to utilize this concept and the idea of getting children reconnected with nature to get them prepared and excited to make some changes for the environment, otherwise EE and ESD movements may continue to fail.

*Simple Instruction Alone May Not Help*

There is a traditional belief that if you give someone the facts about a problem, they will automatically be inclined to make a change, but many researchers have realized that this is not always the case (Munson, 1997). For example, many people know the terrible effects of smoking cigarettes, yet they still smoke a pack a day. It has even been found that there is a positive correlation between education levels and $CO_2$ emission levels (Shallcross & Robinson, 2007). This tells us that even the educated people are not making a change, or maybe that they aren't receiving the right kind of education to make successful changes for the environment. Davis (1998, p. 149) makes the point that, "we need to teach these ideas to children and to demonstrate their meaning through practical application." With young children she recommended doing projects like gardening and composting. Munson (1997) has also concluded that the only way one can get people to act on the information they are receiving is to provide them with activities that will help facilitate their agency.

The National Environmental Education and Training Foundation (NEETF) has conducted eight surveys over the period of 1992-1999 which documented the nation's "attitudes, knowledge, and behavior" (NEETF, 1999, p. 1) and in 1999 described the nation's "environmental readiness for the 21st century" (NEETF, p. 1). This report showed many things about how people across the country think and act towards the environment. When questioning people on their knowledge of about ten different environmental dilemmas (areas such as water pollution, climate change, and waste disposal), people answered the question about the reason for animals going extinct, correctly at a higher rate than any other question: 70% of the participants knew the main cause of species extinction (NEETF, 1999). Also, 84% of the participants said that species extinction was at least "somewhat serious" and about 50% of the 84% even claimed that that it was a "very serious" issue (NEETF, p. 28). To add to that, 70% people the people surveyed said that they would "favor" helping the environment over economic "development when compromise is impossible" (NEETF, p. 16).

Looking at this data would lead one to believe that most people know about the animal extinction problems, find it to be a serious problem, and would be willing to make a change because the problem has become so serious. On the contrary, researchers found that only a very minimal 42% of respondents felt that "regulation for species protection should go farther" (NEETF, 1999, p. 25). Regulative support for extinct species was also found to be supported the least out of all the categories surveyed. That means that out of all the environmental subjects studied, people know the most about the extinction of

animals, yet are least likely to support animal protection. The extinction of animals is just one issue out of many that we are faced with and seem to have a hard time dealing with, even when we are aware of it. The environmental education we provide for students does not just need to teach students about the issues, but also instill a desire to make a change. This desire can be ignited by reconnecting students with nature and teaching students the skills they need to make a change. Based on this data, we can gather that without giving people the skills they will need to make a change, the knowledge becomes useless in terms of making positive changes, and wasted.

Another part of strengthening students education is helping them to understand the complex connections between different events. Houser (2005) has pointed out that educators must make it clear to students when events in history, and our real life problems are systemic, and not just separately occurring events. This kind of education will help them to build deeper connections and will be more prepared to address the systems underlying global sustainability problems. Once students have a greater sense of the systems underlying problems, and have been provided with opportunities to deal with the real life complex problems, they may start to feel like they can play an active role in crafting a better future (Wooltorton, 2004).

*Project Based Learning Approach*

Project based learning is one way that teachers can start to have students participate in the necessary activities to engage them in real world investigations and solutions. Lehmann, et al, (2008) have demonstrated how a college level engineering

program has been designed using solely project based learning. They (Lehmann, et al, 2008, p. 284) have shown that these projects "provide the students with the possibility of achieving sustainable and transferable skills, while at the same time exposing them to the complexities of global and cultural issues." In the same study they also found that once students were involved in the real world projects, they started to have a voice in their learning and were more active learners. Although this was a college level program, it is believed that the same benefits would apply when doing project based learning with elementary and secondary level students.

While participating in project based learning, students must "collect, synthesize, and analyze information, then conduct targeted research and work with others to employ that newfound knowledge" (Barron & Darling-Hammond, 2008). The skills learned while doing this will be much more valuable than listening to lectures and partaking in rote fact memorization tasks. Rogers (personal communication, June 24, 2010) has also claimed that project based learning approaches in the classroom have endless benefits including figuring out one's own interests, skills, and drives which can lead to the ultimate goal of self-actualization. In her own research (Rogers, 1994, p. 25-35) she found many outcomes of learning, including:

- Students feel empowered
- Students feel dedication and commitment to something that helps the world
- Individualization is possible for students
- Students learn to take risks
- Students learn that life is complex
- Students learn to respect and care for the environment

These kinds of projects also give students a chance to interact with their community and create positive changes for it. Many researchers have found that it is extremely important for students' education to emphasize the importance of place and local communities (Henry & Olsen, 2009; Gutter, 2009; Davis, 2005). The connection of place based education and local communities to regional and global events needs to be made though (Fernandez-Juricic, 2000; Tali Tal, 2004), which can be facilitated through local projects in the community.

*Correlating Projects with California Science Content Standards*

Although there are not any California content standard that are directly related to having students participate in local environmental and sustainability projects, there are many science standards that could be taught through these kinds of projects. There are many potential ways the content standards could be related to the environmental projects being implemented; the following are just a few that demonstrate how easily projects could be linked to grade level standards from Kindergarten through Grade Twelve.

As with all subjects in education, the content that you teach must be age appropriate. Environmental education is no different. In the early elementary grades, one cannot teach the children about all the challenges facing our world and expect them to not feel defeated and unwilling to make a change. In the early elementary classes, teachers should work on helping students create a better relationship with nature and their surrounding environment so that they feel more connected to nature and more willing to make a change. Once that connection is strengthened, then teachers can start introducing

some of the problems we are dealing with and ask them to help to find a solution. Once

students feel the desire to make a change, they should be taught the skills to make a

change and engaged in projects where they are being innovators for the environment.

These topics can be covered through these California content standards (California

Department of Education, 2004, p. 28-277), with some of the researchers ideas on how to

do so in italics:

- Kindergarten: *Students could be introduced to these concepts while exploring in*

  *their community:*

  - **Life Sciences 2** (p. 28)- Different types of plants and animals inhabit the earth.

  - **Earth Sciences 3** (p. 29) - Earth is composed of land, air, and water. **3c** (p. 30)-

    Students know how to identify resources from Earth that are used in everyday

    life and understand that many resources can be conserved.

- First Grade:

  - *Students could start to look at the resources they use like water to see where it*

    *comes from:* **Life Sciences 2b** (p. 33)**-** Students know both plants and animals

    need water, animals need food, and plants need light.

  - **Earth Sciences 3b** (p. 34)**-** Students know that the weather changes from day to

    day but that trends in temperature or rain (or snow) tend to be predictable during

    a season.

- Second Grade:

- **Earth Sciences 3e** (p. 43)**-** Students know rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use. *One could have students start exploring where all of their stuff comes from.*

- Third Grade:

  - **Physical Sciences 1b** (p. 46)**-** Students know sources of stored energy take many forms, such as food, fuel, and batteries. Students can address the melting ice caps and glaciers: **1f** (p. 47)**-** Students know evaporation and melting are changes that occur when the objects are heated. *Students could start to explore other sources of energy and the benefits of them.*

  - **Life Sciences 3c** (p. 51)- Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial. **3d** (p. 52)- Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations. *Extinct and endangered species could be addressed, as well as sustainability and have students plan projects to make a difference for example restoring a habitat for an endangered species.*

- Fourth Grade:

  - **Life Sciences 2a** (p. 60)- Students know plants are the primary source of matter and energy entering most food chains. *Students could learn about where their food comes from, or could plant a vegetable garden to grow their own food.* **3b** (p. 62)- Students know that in any particular environment, some kinds of plants

and animals survive well, some survive less well, and some cannot survive at all.

- Fifth Grade:

    - **Earth Sciences 3d** (p. 74)- Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water. **3e** (p. 74)- Students know the origin of water used by their local communities. *Take students outside to explore a local watershed and to help restore local creeks for fresh water and natural habitats for animals.*

- Sixth Grade:

    - **Earth Sciences 2d** (p. 91)- Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats. *Have students create disaster preparedness plans for their community as extreme natural disasters like floods and landslides are more likely to be happening more often.*

    - **Resources 6b** (p. 100)- Students know the different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable. **6c** (p. 101)- Students know the natural origin of the materials used to make common objects. *Have students explore different energy sources and see if they can use renewable energy sources for their school to decrease the use of nonrenewable energy sources.*

- Seventh Grade:

  - **Evolution 3e** (p. 111)- Students know that extinction occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival. **4g** (p. 114)- Students know how to explain significant developments and extinctions of plant and animal life on the geologic time scale. *Investigate an endangered or extinct species that is local to the area, and help to rebuild their natural habitat.*

- Eighth Grade:

  - *Because there is such a strong focus on Physical Sciences in eighth grade, there are not as many standards obviously related to environmental education or sustainability. A teacher with more of a science background may be able to find more obvious connections.*

- Ninth through Twelfth Grade:

  - Biology/Life Science: **Ecology 6a** (p. 235)- Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats. **6b** (p. 235)- Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size. **6c** (p. 235)- Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death. *A class could conduct a study on there local biodiversity over time in relation to population and climate*

*changes.* **Physiology 10e** (p. 249)- Students know why an individual with a

compromised immune system (for example, a person with AIDS) may be

unable to fight off and survive infections by microorganisms that are usually

benign. *Students could study the AIDS epidemic around the world and come up*

*with ways of getting people informed about AIDS and the prevention methods of*

*it.*

- Earth Sciences: **Energy in the Earth System 4b** (p. 264)- Students know the

  fate of incoming solar radiation in terms of reflection, absorption, and

  photosynthesis. **4c** (p. 264)- Students know the different atmospheric gases that

  absorb the Earth's thermal radiation and mechanism and significance of the

  greenhouse effect. **5a** (p. 266)- Students know how differential heating of Earth

  results in circulation patterns in the atmosphere and oceans that globally

  distribute the heat. **6c** (p. 271)- Students know how Earth's climate has changed

  over time, corresponding to changes in Earth's geography, atmospheric

  composition, and other factors, such as solar radiation and plate movement.

  *Students could conduct a study on climate change; exploring the reasons it is*

  *happening, and what changes they can make in their community to try and*

  *reduce greenhouse gases and waste.* **California Geology 9a** (p. 276)- Students

  know the resources of major economic importance in California and their

  relation to California's geology. **9b** (p. 277)- Students know the importance of

  water to society, the origins of California's fresh water, and the relationship

between supply and need. *Students could find ways to reduce their community's water usage and explore where it comes from.*

*Resources for Educators*

Like previously stated, one of the greatest challenges facing the implementation of environmental education (EE) and education for sustainability (EfS, or ESD) is that teachers are not given any training on how to teach it. There are many who question as to what the most important issues are (what they should teach the students), and how that should be carried out because there are not state or federal standards specifically addressing those areas. Fortunately, some steps are being taken by a couple of different organizations to make this kind of information more readily available. The United States Environmental Protection Agency (EPA) and the California Department of Education (CDE) have both created websites which are designed to help educators figure out what to teach, and how to teach it by presenting collections of, what they find to be, the most valuable resources in environmental education.

The EPA's Environmental Education website has many features that are quite useful when trying to put together an EE program (United States Environmental Protection Agency, 2010a).  The link that I found most practical and convenient was a guide to EE publications and resources, which the EPA believes to be relevant and appropriate. In this section of their website, one can find categorized lists of the most important publications available, for instance there is an "EE Resources" section (United

States Environmental Protection Agency, 2009). In this category, educators can find links to the most prominent publications on implementing EE. There are links to books such as *Still Developing the Toolbox: Making EE Relevant for Culturally Diverse Groups* and *EE Collection: A Review of Resources for Educators*. Along with their publications, there are two other main groups of resources with links to high quality information on EE: "Educational Resources by Environmental Topic" and "EE Websites Developed or Supported by the EPA." One could select "Global Warming" from the "Environmental Topics" area, and she/he would find five different links for possible lessons to teach. All of these links provide a great resource for teachers who feel they don't know what to teach or how to teach it.

The EPA's website also has another page dedicated to "Educator Training" resources, geared towards educators and training for teachers, which is called "National Environmental Education Training Program" (United States Environmental Protection Agency, 2010b). An educator of any kind could come to this website to find links, amongst others, to the major environmental education groups like the North American Association for Environmental Education and the Nation Environmental Education Foundation. There is also easy to find links to the EPA's "Teaching Center Curriculum Resources" which can guide one to finding grants, lesson plans, and assessment tools. Additionally, there is a "Community Service" link where they have an extensive list of projects which students and teachers can get involved in all over the country,

conveniently labeled by grade levels. Even though these are not specific to one local area, they would be a great start to get kids thinking about the environment.

The California Department of Education has also prepared an informative collection of resources on EE for professional development purposes in the science curriculum area. The webpage contains a list of links to different, subject specific, state governmental departments or businesses, as well as the contact information for all of those places (California Department of Education, 2010). For example they have listings for things as broad as the California Environmental Protection Agency and California Air Resources Board, and as specific as Department of Toxic Substances Control and Department of Parks and Recreation. With each listing there is also a link to that group's most valuable EE resource or implementable project. This kind of information could be incredibly helpful to educators when planning EE and ESD projects where they need to find out more information about a subject, find a project to adopt in their classroom locally, or even contact these groups to inform them of one's project to make broader connections and get it publicized.  The link that stood out the most to me was the Education and the Environment Initiative (EEI) link which directs browsers to the California EPA website which contains all the information about the initiative (California Environmental Protection Agency, 2010). This is an extremely exciting initiative, which could have incredible benefits for the environment and students once it is actually implemented.

*Sustainability: 21$^{st}$ Century Higher Education and Job Skills*

Participating in EE and ESD will be advantageous for students as the demand for these skills in higher education and the work force are rapidly growing. As of right now, China is making greater investments in the green movement than the U.S. (McKibben, 2010). Students will be inspired to make changes for the environment and for people around the world, and they will also be in high demand in the work force, if they are given the proper skills. McKibben (2010) claims that with a degree in environmental studies, you are usually given a choice of working wherever you want. There will be many job opportunities in the future including: remodeling the energy infrastructure to not rely on fossil fuels, environmentally friendly construction and manufacturing, and environmental economists, transportation, and scientists (Konopnicki, 2009; Gutter, 2009; Marcinkowski, 2010; McKibben, 2010).

Chapter 3 Method

The purpose of this study is to demonstrate ways in which environmental education (EE) can be implemented into school curriculums and to demonstrate the benefits of it. The researcher has asked: how can we prepare students to deal with current environmental tragedies; how can she facilitate the implementation of EE; and is there an effective program which could be highlighted to inspire and facilitate the implementation of other environmental programs. In response to those questions, the researcher has selected to conduct a qualitative case study of the STRAW project. Data collection for this research included an in-depth study of information about the project, direct personal observation of the project in action with students, and an interview with Laurette Rogers, the educator who initiated the project.

Laurette Rogers was selected, using purposive sampling methods, because of her experience in using project based learning methods to the take students out to help restore and protect nature. Rogers used to be a classroom teacher who created a project based learning curriculum for her class, and has now become the leader of a watershed restoration program that is implemented into different schools across multiple counties. Rogers was contacted by email and was interviewed in person at her place of business. Before being interviewed she was asked to sign a consent form, which explained the research in full, and affirmed that she was participating voluntarily. Rogers also gave her permission to use her name in this piece of research. She was asked questions regarding

her personal experience with creating her first, well known, environmental project based learning curriculum, implementing projects for classes today, and strategies for future implementation. The researcher reviewed the interview data from the interview and analyzed it for recurring themes.

The direct personal observation took place in October of 2009. The researcher partook in an environmental legacy project with a fifth grade class, as a student teacher. The goal of the project was to restore a creek-bed, in order to reduce runoff from a local ranch, preventing it from entering into the watershed. The project was overseen by the STRAW Project organization, the Bay Institute, which planned the project and oversaw the implementation. The researcher worked closely with a small group of students to work on the ranch and help plant different native trees and bushes to make an effort to restore the creek-bed. Personal observations of the process and the outcome of the project were documented and will be reviewed for common themes throughout the project in relation to other research findings. Personal observation of the same students in the regular classroom will also be reviewed in order to compare student behaviors and outcomes.

Chapter 4 Findings

The purpose of this research is to present ways in which environmental education can be easily implemented into the classroom. The researcher has asked if there are any programs that could be presented which could demonstrate an implementation strategy and inspire others. The researcher has found that in Marin County, California, there is a program which exemplifies how environmental education and education for sustainability can be implemented into schools using project based learning. This program is called the STRAW Project (Students and Teachers Restoring a Watershed), which is run by the Bay Institute, a San Francisco Bay conservation group. A regular classroom teacher, Laurette Rogers, started the program. She was showing a video to her fourth grade class back in 1992 about animals that were going extinct. Her students were extremely saddened by the video and started to wonder what they could do about it. Rogers knew that she could not just sit around and talk with the kids more about the problem; she knew she had to get the kids outdoors to make an actual change and help the environment by teaching the students the skills they are going to need to deal with such environmental problems as the extinction of animals (The Bay Institute, 2010).

There was one animal, which lives only in certain parts of the Bay Area that was on the endangered species list, that the fourth graders decided to focus on during that school year: the California fresh water shrimp. Rogers created a partnership with a local environmental firm that trained the class how to restore creek beds to their natural form on ranches to help save the fresh water shrimp. Because this restoration project created a

more natural habitat for the shrimp, it helped the species thrive. It also helped with erosion control for creeks, so within a short amount of time, many other ranchers started requesting that Rogers bring classes to restore their creek-beds in the Marin and Sonoma areas. Rogers eventually ended up leaving her teaching job to work for the Bay Institute. It was there that the STRAW project started to take a new shape and broadened their focus to help entire watersheds, addressing different goals in different areas. Through the STRAW project, more than 20 miles of creek-beds have been restored, and over 25,000 students have planted over 25,000 native plants (The Bay Institute, 2010)!

The three main goals of the STRAW project are ecology, education, and community (The Bay Institute, 2010). They hope that through these watershed restoration projects, working with students, teachers, and parents, they can accomplish all three of those goals. The goals could be accomplished by helping the environment in many different ways, educating people and giving them hands on experience with making a change for the environment, and making connections in the community by creating partnerships and having groups work together to accomplish the first two goals. The STRAW project has a vision of every classroom in the United States taking on an environmental project in their local area and asks us to picture how different education would be, and how different the world could be if they did (The Bay Institute, 2010). They recognize how invigorating these projects can be for students and helps the students in tremendous ways during the restoration, and the benefits can be carried into the rest of

their lives; it now makes them resourceful, active citizens, making a positive change for the world.

The researcher was lucky enough to take part in the STRAW Project with a class she was working with during the last school year. They traveled to a ranch where erosion was starting to fill up the creeks, ruining the habitat for many native species of the creek, and connecting creeks as well. The students were informed about the environmental problems that were taking place, then trained how to help restore the creek-bed. They planted various trees and shrubs along the creek banks in order to control the erosion. The students were absolutely enthralled about being there and to be doing this kind of work. Students that tended to have problems sitting in the classroom for six hours and were often disengaged, became proactive students and even took charge of their groups. They absolutely loved the opportunity to be outside and working with their bodies, and especially loved making a change to help the environment. The project is an ideal model to be replicated in schools across the country.

Interview Report

Laurette Rogers was selected as an interview participant for this research based on her experience of creating an environmental education project for her class (following project based learning methods), and currently "authoring a program" (Rogers, personal communication, June 24, 2010) which engages students in environmental restoration projects. She was asked questions regarding the creation of her own, first project (The

California Fresh Water Shrimp Project), the status of her current project (The STRAW Project), and her advice for classroom teachers on how to engage their students in environmental education. After analyzing the interview responses from Rogers, and personal observations from participating in the STRAW Project, the researcher has recognized three recurring themes in the data: empowerment of students and teachers who are engaging in projects, a lack of trust in teachers and students, and the need for an openness to change the teacher and student roles. All three themes are presented in various ways and are closely related to each other.

*Empowerment*

The most obvious outcome of Roger's work is the empowerment of students and teachers. One of the main events of her life, which lead to her creating the Fresh Water Shrimp Project, was her personal feeling of disempowerment as a student when she was younger. From this personal experience she was able to create a program, which she felt gave students a greater voice in their own education. When the project started, she had a rough outline to follow from the *Adopt-a-Species Program*, but she really let students guide the way in creating the project and constructing their own learning. The project was intertwined with other subjects in the class, and where some students used to struggle, they now shined when completing projects about the shrimp. One of her students, previous to the project, was not able to write a complete paragraph, but when presented with the task of preparing a speech for a public service announcement, was able to write two pages fluently. Students were even working on the project after school and during the

summer time. The researcher also found, during personal observation that students who were normally disengaged in the classroom were stepping up as leaders while participating in the STRAW project. This type of learning was meeting their needs much better than the learning in the regular classroom. All these students felt truly empowered because they knew how to make a change and be active learners, while doing real world tasks.

The experience was also incredibly empowering for Rogers and the students together. She believes that participation in environmental, project based learning experiences are also about finding oneself. She claims (Rogers, personal communication, June 24, 2010):

> Ultimately, it's about self-actualization for teachers and students. It takes guts looking into yourself and seeing what you've got. The potential is so much greater in this kind of learning than regular rote learning because the sky's the limit; you can find out who you are as a person, what your potentials, interests, and drives are; and everything is applied and put together.

If we could get students and teachers to recognize their potentials, much greater learning can occur. If we have any hope for students stepping up and being change agents for the environment, this could be an inspiring way to start. Once students find their voice in their learning, and realize what they are good at, and what they want to do, there is no telling what changes would be seen.

*Trust in Teachers and Students*

When asked what it would take to get more teachers and classes involved in environmental, project based learning activities, the first response Rogers gave was that

we need to take some of the burdens off teachers, and we need to trust them more

(Rogers, personal communication, June 24, 2010). This trust she claims can lead to

teachers having more freedom in their classrooms; not just unrestricted freedom to do

whatever they want, but "freedom with support" (Rogers, personal communication, June

24, 2010). She has said that one of the things that made her first project possible was a

supportive principal who provided professional development, along with a certain

amount of freedom to follow the program wherever the students took it. As of now, many

teachers are bogged down by rigid standards and not trusted by a large part of society to

provide a quality education without those standards. Rogers has recognized that these

restrictions and lack of trust has limited the amount of projects like hers that can be done.

Society must also be willing to trust in students to be able to make the changes necessary

for the environment.

Although not explicitly stated, having trust in oneself to carry out environmental

projects, and trust in others to create partnerships, appears to be incredibly relevant to

Rogers. When asked if she had any advice for teachers wanting to start their own project

or wanting to make a change away from the rote learning taking place today, she states,

"...if you look into your heart you will know what to do" (Rogers, personal

communication, June 24, 2010). There is a certain amount of trust in oneself that is

necessary for this personal learning process to occur which will help to guide one's

process. Trust in others also appears to be essential in her organization, as she says it

would be impossible to run without their partnerships. She recognizes that the growth of

her initial project has evolved in an "organic process" (Rogers, personal communication, June 24, 2010) where no one knows where it will go next, but they trust in each other, and trust in their intuitions about other people, then decide how to further organize themselves and what to do next. The process is a natural one, which relies on trusting oneself to make the right decisions, and trusting in others to help along in the process, including teachers, which can lead to a more empowered level of learning for students while helping to protect the environment.

*Openness to Change of Student and Teacher Roles*

When asked questions about how we could get more classes to get involved with environmental project based learning projects, Rogers claims that one of the major things that needs to change and be more flexible is the teacher and student roles. In order to do honest project based learning, the teacher has to be willing to give up some of the control of the classroom in order to learn along with his or her students; not just pretending to let the students have control, but actually giving it to them. Rogers has said that teachers must ask themselves, "How can I be a learning human being in front of my students to model learning?" (personal communication, June 24, 2010). She modeled this perfectly when conducting the California Fresh Water Shrimp Project. When she started, she did not know exactly what was going to happen, but she trusted the kids to take charge of the project, and she let them direct it. They figured out what needed to be done to help the shrimp, and how those things could be done. Rogers was there for assistance and helped

when the students needed it, but for the most part, she let the students control the project, even if she knew they were going in the wrong direction with certain parts.

The researcher's personal observation of the STRAW project provided a lot of insight in this area. According to Rogers (personal communication, June 24, 2010), one of the downsides of how STRAW is implemented today is that the project based learning part of it has changed. The students are no longer the ones taking control of the project and deciding what to do, but there are still instances in which roles can change while working on the project. The researcher worked side by side with the students to complete the project; learning the background, and actually planting trees in the creek-bed together. The bond built during the process was a much stronger one than from other regular classroom activities. The researcher recognized that the students were just as capable as adults at restoring a natural environment, and felt as though real strong relationships were built, instead of just a teacher/student relationship with a big space created in the middle. Students felt respected and empowered because they were treated like real, valuable people.

Part of dropping one's role as a teacher or lecturer, is trusting in students and believing in them as being capable of making significant choices and changes in the world. Rogers believes that we need to "treat students as people, not potential people" (personal communication, June 24, 2010). Students have the ability to make important decisions and changes for the environment, they just need to be given the opportunity. Once they feel empowered from recognizing their abilities in the classroom and in their

community, they might be more willing to make changes in the world for the environment. Rogers has even had students, who participated in the original California Fresh Water Shrimp Project, contact her to tell her it was one of the greatest experiences they ever had in school. One girl even said she was hoping to do something in graduate school that would be as great and empowering as the Shrimp Project (Rogers, personal communication, June 24, 2010). These kinds of environmental projects have a great amount of potential to inspire students to make changes for the environment if only they were given the opportunity, and engaged as true participants in society. Rogers (Personal communication, June 24, 2010) has said that, "If you look at what's happening, both nature and children are both demeaned in a lot of ways, when they should be on the highest level." Let us put our children and the environment on the highest level by giving students a voice and providing them with the opportunities to learn to respect and help the environment.

Chapter 5 Discussion

Summary of Major Findings

The intent of this research was to demonstrate the need for environmental and sustainability education into classrooms and present ways to do so in order to facilitate implementation. The researcher asked how students could be prepared to deal with current and upcoming environmental catastrophes, and how this could be implemented into the classroom, by providing a model program for others to follow or gain inspiration from. In response to these questions, the researcher conducted a literature review which looked into current and future environmental and sustainability issues that need to be addressed, the history of the Environmental Education (EE) and Education for Sustainable Development (ESD) movements, and how students today should get involved in the movements. The researcher also conducted a case study of the STRAW Project to show an exemplary project that is being conducted which get students involved in real life environmental restoration projects.

Through the literature review and case study of the STRAW Project, it has become clear that the need for EE and ESD is absolutely essential to prepare students for the future, to have students help restore our environment, and set up a more sustainable path for humans if we wish to continue our existence. The environmental catastrophes presented such as climate change and high levels of carbon have been found to be incredibly complex and difficult problems to solve and are being ignored to a large extent. If students are not given the training and education that they will need to deal with

these problems, they are only going to get worse. Not only do they need the information about what is happening to the environment, but also they need to be taught the skills they will need in order to solve these problems or else they are likely to feel defeated by the problems. We need to put our children and the environment on a higher level of respect if we wish to have a more prosperous future.

The investigation of the STRAW project has highlighted many inspiring outcomes. Rogers has shown that with support from her school, she was able to create a phenomenal environmental project based learning program. For, most likely, the first time in her students lives, they were given a voice in their education, and were able to guide their own learning on something they were truly interested in. The students recognized a problem, and figured out a part of the solution all by themselves; deciding which steps to take at every turn. The students were resourceful, creative, knowledgeable about real life tasks by the completion of the Fresh Water Shrimp Project, and they helped to restore a habitat for an endangered species. Therefore, not only were they helping restore the environment, but the students were also empowered by having a voice in their learning and actually learning real life skills, instead participating in typical rote memorization activities. Students were also provided with the opportunity to figure who they are as a people as they realized what they were good at, and what they desired to do for the project. This type of learning about oneself can be incredibly empowering and provides for a transformative learning experience (Rogers, personal communication, June 24, 2010). If this type of learning was happening in classrooms all over the world, we

would be much better prepared for restoring our environment and creating a more sustainable society. Students would be empowered to make a change, and have the experience and critical thinking skills that are needed to address these problems.

The case study of the STRAW Project has also presented some other necessary changes that must take place in order to get EE and ESD projects implemented into the classroom. The first one being our society must cultivate more respect for our teachers and students if we want to create more projects such as STRAW. Standards can be a good thing, and can help to make sure there are no gaps in students' education, but teachers need to be given some space to be creative and provide the type of real life information that students need. And although there are some standards, which can be correlated with environmental projects, there are steps that could be taken to include EE and ESD into education policy that would facilitate implementation. We also need to trust in our students to be able to complete real life tasks like watershed restoration and not treat them as "potential people" (Roger, personal communication, June 24, 2010). Once this trust is cultivated in our teachers in students, there will be more opportunities for teachers and students to work together to be change agents for the environment.

The second change that must occur is that teachers must be willing to give up their roles as lecturers. Considering that teachers, in most parts of the country, are not provided with training on how to implement environmental education, teachers must be willing to learn about the issues along with their students. They also must be willing to give up some of the control of the classroom in order to give students the opportunity to

take charge in their own learning. There are times when direct instruction needs to take place in the classroom, but teachers must be willing to give students chances to step up and be leaders in the classrooms. With students and teachers learning alongside each other about the environment, the circumstances are perfect for creating critical thinkers, who are empowered to make a change for the environment.

Limitations/Gaps in the Literature

This research is limited by a few different factors. The first factors are the time constraints and restrictions. Most of this research was completed during summer months, during which time no actual classrooms could be observed or studied to examine actual outcomes for students. Although personal observations did take place, student perspectives and quantitative outcomes would provide another relevant additional portion of the research to confirm projected outcomes for students. There are also time restrictions for the researcher, which limited the amount of time spent in classrooms observing environmental education taking place in different ways to provide data on different methods of implementation. With more resources, such as time and money, the researcher would have also liked to observe projects that are taking place all over the country, not just in a local area of California as she is aware that this area is quite different than many other parts of the country.

Implications for Future Research

Although the researcher has discovered some prominent findings, there are other areas that need further investigation which have arisen during this research. If time and

financial resources were available, the researcher would like to conduct a longitudinal case study of a class that is participating in a project like the California Fresh Water Shrimp Project. She would then follow these students later into life and see if there were any long term benefits or effects. Students' participation would also be correlated to standardized test scores to see if there is any correlation between participation and higher or lower standardized test scores. Other than that, the researcher would also like to produce a census like report documenting what projects are taking place across the country and see what the actual effects on the environment are. For instance, looking to see if the projects students are conducting are actually helping to restore the environment or create a more sustainable future. Lastly, the research believes the best methods for implementation need to be researched further, possibly in a qualitative fashion; comparing student and environmental outcomes after participating in different methods of teaching.

Overall Significance of the Literature

This piece of research was guided by one goal: to inspire the implementation of environmental education and education for sustainable development and to also help teachers figure out different ways of doing so. Without this kind of education for students, they will not have the skills they will need to deal with the environmental disasters we are facing; they will not be familiar with the environment, and will feel no connection to nature so they will not be empowered to make a change. This research has

shown that participation in EE is essential for our future on Earth, and that there are also many other benefits of participating. This research, along with the growing body of research on EE and ESD will help erase the divide between humans and the environment and will help to create a more prosperous future.

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Appendix

Interview Questions

1. From my understanding of your work, you weren't trained to teach environmental education. Describe how your thinking evolved in putting this project together.
   a. Were you learning at every step?
   b. Were the students coming up with all the ideas? For example, alerting the government, making the stamp.

2. Describe the workload for you and your students on the projects?
   a. Were you ever worried about other subjects falling behind, or were they incorporated into the project?
   b. Did it change how other class sessions were run?

3. What do you think it would take to get more classes involved? How can projects like STRAW become more widespread?

4. It has been around 16 years since the creation of the Fresh Water Shrimp Project. What kinds of changes have you seen within your project, and as society as a whole? What does it looks like today? Curriculum? Engagement? Community building?
   a.Do you think standards based instruction (or NCLB) has helped or hindered the movement? Why or why not?

5. What advice do you have for classroom teachers that could help them start some sort of project like the STRAW project?