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Integrating Gardening as a Tool to Teach the Concept of Sustainability to Elementary School Students

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Integrating Gardening as a Tool to Teach the Concept of Sustainability to Elementary School Students

By

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LS 400: Liberal Studies Senior Capstone

California State University Monterey Bay

Seaside, California

December 17, 2015

Senior Capstone Binder

Submitted to:
Dr. Paoze Thao

Liberal Studies Department
College of Education

In Partial Fulfilment for
LS 400: *Liberal Studies Senior Capstone*

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December 17, 2015

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Sustainability is becoming an increasingly important topic in today's society, as temperatures reach an all-time high and as fresh water levels reach an all-time low. "The word "sustainability" evokes concerns about conservation, stewardship of the earth's resources, and public policy aimed at ensuring clean air and water for generations to come" (Peterson, 2015, pg.15). At this point, global warming is becoming undeniable, while our natural resources are depleting at an alarming rate. Without conservation, environmental awareness, and sustainability methods, our planet is a ticking time bomb which, when destroyed, will take humans and all other lifeforms with it. "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Bruntland, 1980, p. 41). If we wish to leave this Earth a healthy planet for our children, grandchildren, and countless generations to come, sustainable lifestyles must be adopted by all before it is too late.

I am interested in the topic of sustainability because I realize the importance of the Earth's environmental issues; I also have a passion for educating younger generations. I thoroughly believe that if we wish to make a change in this world, the most successful way to do this is through our youth. The youth hold the future of Earth in their hands; long after you and I are gone, and I hope that the world will be a safer, cleaner, more

peaceful place where our grandchildren can respect our home and still appreciate the beauty of nature. Whether in the past the topic was too controversial, the teachers didn't have the resources or time to address these topics, or that our past generations just didn't care about our environment, today this has become an urgent topic to be addressed with our youth.

My area of emphasis is literature, but my interest and inspiration for my capstone topic is in the environmental studies. In my research, I will look into the importance of sustainability, as well as educational resources and approaches for teaching sustainability. This will satisfy LD MLO #3: Natural Sciences through research of environmental issues, MLO #9: Physical Development and Health by observing and hopefully implementing school gardens for hands-on classroom learning, and MLO #2: Social Foundations of Education by providing resources for teaching sustainability in the classroom.

As educators, it is our responsibility to provide students with the knowledge and skills necessary so that they can live more sustainable lifestyles. "The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones" (Adkins & Simmons, 2003-2004, p.2). I believe the most effective way to spread awareness and knowledge about environmental and sustainability issues is by educating elementary school children on the environment while exposing them to sustainability practices. As

teachers, it is our responsibility to provide our students with the knowledge, skills, and motivations to contribute towards creating a better earth. In my capstone, I propose that school gardens can effectively be used in the classroom to improve students understanding of the importance of sustainability. I plan to prove the effectiveness of school gardens in teaching sustainability through literature review, first-hand observation, an interview with Tanja Roos from the MEarth garden, and a survey for 6th grade teachers at Carmel Middle School who utilize the MEarth garden both for sustainability and educational purposes. My primary research question is: *How can teachers integrate gardening as a tool to teach the concepts of sustainability to elementary school students in the classroom?*

“[Supporters] of [garden] programs hope that these children will develop a “sense of kinship and respect for the natural world that they will still have when they are adults” (Lewis as cited in Lohr & Pearson-Mims, 2005, p.1). I believe that school gardens are a powerful tool which can be used to educate elementary school students on both environmental issues and sustainability practices. “Nature education and outdoor experiences help children gain a respect for living things, stimulate their curiosity, and provide them with meaningful life experiences” (Cooper Marcus as cited in Lohr & Pearson-Mims, 2005, p.1). Through research of literature on sustainability and school gardens, we can conclude that there are many environmental and student benefits in teaching elementary school children using gardens.

A school garden is the ideal environment to incorporate experiential education and outdoor learning into the elementary school classroom. I will look into specific benefits

that Carmel Middle School students have experienced through my survey questions: *Do you think that your students have benefited from a school garden? Can you share a few benefits of using the MEarth habitat to educate students?* My corresponding secondary question goes beyond just the student benefits and asks: *Are there benefits for teachers using gardening as a tool to teach the concept of sustainability to students in the classroom, and if so, what are they?* Using my survey of Middle School teachers utilizing MEarth, I will also discover which classroom subjects are integrated into the MEarth garden and ask: *Was integrating MEarth's hands-on activities into your lessons plans difficult?*

When I enter my own classroom as an elementary school teacher, I hope that by integrating sustainability into my lessons and utilizing a school garden, my students will develop into environmentally conscious citizens who are able to make an informed impact on social issues involving natural resources. As a future teacher focusing on attaining a position within the Monterey Peninsula Unified School District, I must first understand the ways teachers in the Monterey Bay area are currently teaching the concept of sustainability in their classrooms. I will assess if students in the Monterey Bay area understand sustainability by posing the survey question: *Do you think that 6th grade students at Carmel Middle School know what sustainability is?* In order to understand how to potentially improve sustainability education my community, the Monterey Bay, I will use further research to answer the secondary question: *Currently, are there sustainability education programs that are being implemented in the school districts in the Monterey Bay area?*

In hopes of learning about other sustainability programs that I cannot discover through my literature, I also plan to ask the following question in my survey as well: *Are there any other sustainability/ environmental education programs being implemented in Carmel Middle school, besides MEarth?* Through literature, I will find out: *How teachers are currently teaching the concept of sustainability in their classrooms,* and in my survey I will also ask Carmel Middle School teachers how [they] educate students on sustainability/ environmental issues.

In order for teachers to be able to make a change amongst younger generations, there must first be a change within the educators themselves. I suggest that before an elementary school teacher can confidently integrate garden and sustainability activities into their classrooms, they must first receive proper training and education on the topics. My next secondary question is: *how do higher education institutes prepare our educators for the important responsibility of integrating sustainability into lesson plans? How can training insure that our future elementary school teachers graduate college with the confidence to integrate outdoor education into their lesson plans?*

In my research, I am specifically looking into resources available for teachers who wish to successfully teach the concepts of sustainability to the elementary school students in their classrooms. Through review of the literature along with my teacher survey results, I will answer the question: *Are there resources available to teachers who wish to integrate school gardens into their classrooms and teach the concept of sustainability to their elementary school students?*

To answer these questions, I will research literature on the topics of sustainability in the classroom and integration of school gardens into curriculum. I have begun compiling scholarly articles using the CSUMB library database and other web resources, and I plan to observe current sustainability efforts in the Monterey Peninsula Unified School District and conduct a questionnaire for teachers currently utilizing school gardens. Through this literary review, I will also answer the questions: *What is sustainability? What do California state standards say about bringing sustainability awareness to elementary school students in the classroom? What does research say about the importance of environmental and outdoor education for elementary school students?* I will also pose the survey question to Carmel Middle School teachers: *Do you believe that teaching students about sustainability is important?* I will next answer the questions: *What does research say about the advantages of a school garden? What are the different ways that school gardens can be used to teach sustainability to elementary school students?*

I plan to complete my literature review section by Friday, October 16th, so that I am able to begin my own on-site observation of successful school gardens in the Monterey Bay area with a full understanding of current research being done on the topic of using gardens for sustainability.

I will then observe and conduct a teacher questionnaire at the Carmel Middle School garden, MEarth. "MEarth is an environmental education nonprofit with roots in Carmel Valley, California, that is growing the next generation of environmental leaders through education, collaboration, partnerships and community action. We educate and inspire

through environmental stewardship” (MEarth, 2015). In my final paper, I will use the successful strategies I observe at MEarth as a model for bringing gardens into other schools in the area. On Friday, October 16th I will be visiting and observing the ways in which Carmel middle school utilizes their school garden to educate students on the topic of sustainability. On Friday the 23, I plan on returning to MEarth to conduct a survey with teachers in Carmel Middle School who actively integrate the school garden into their lesson plans and school days, while I created using Google Forms. (Appendix A) I also plan to interview the MEarth Habitat Director, Tanja Roos, so I can get an understanding of ways in which they integrate lessons into the garden, along with other successes and student growth they have observed.

In contrast, I plan to conduct a similar survey with elementary teachers at JC Crumpton Elementary school in Marina, which has a small school garden with minimal or no funding and school support. I wish to get an idea of the resources available to them, to understand why the students do or do not benefit in using the school garden for educational purposes (Appendix B). I am collaborating with Madisen Hasenauer, who is posing the primary question: *How does integrating gardening into outdoor education benefit elementary students?* She is conducting a questionnaire with 6th grade students from Carmel Middle School who visit the MEarth garden as well. (Appendix C) We will be sharing our results and collaborating on our final capstone presentation, so that we can get a full understanding of both the teacher and student benefits and viewpoints of utilizing school gardens.

In the end, I plan to produce a 20-25 page paper that contains environmental and sustainability research, resources for teaching sustainability, and identifies the benefits of school gardens, which I will achieve in the CSUMB library and present at the Capstone Festival on December 17, 2015. I plan to achieve this capstone in the CSUMB Library by December 18, 2015. Using all of the information I have gathered through my literary research, teacher surveys and firsthand observations, my final capstone research paper will answer the primary question: *How can teachers integrate gardening as a tool to teach the concepts of sustainability to elementary school students in the classroom?* In the completing of my capstone essay, I would like to bring all the resources that I have discovered together in one place so that it is simpler for future educators to access resources on sustainability methods as well as lesson plans integrating school gardens.

This paper will be of interest to all teachers in the Monterey Bay area, as well as other California regions. I would like to make the resources available to teachers, schools, districts, and parents interested on educating children on sustainability practices.

Sustainability is important and relevant to all, both in the classroom and at home, and I believe that education is the first and most important step. The more people that my research can help educate on the importance of integrating school gardens and sustainability into the classroom, the better off our students, communities, and environment will be!

A partial list of references consulted to date:

Adkins, C., Simmons, B. (2003-2004) *Outdoor, Experiential, and Environmental Education: Converging or Diverging Approaches*. ERIC Digest. Retrieved October, 2015.

This article explores the terms "outdoor," "experiential," and "environmental education" as they pertain to educators. All three topics trace their roots back to the educational philosophy and methods of John Dewey (1938). This article critiqued in the literature concerning each of these topics, with the goal of identifying the similarities and differences between the three terms.

Brundtland, Harlem (March 20, 1980). Report of the World Commission on Environment and Development: Our Common Future. Retrieved October, 2015.

This article outlines an urgent call by the General Assembly of the United Nations to investigate environmental issues and propose strategies for achieving sustainable development by the year 2000. This article recommend ways to conserve resources which pertain to economical and social development. Specifically, this article looks to define long-term environmental issues and the appropriate efforts needed to deal successfully with the problems of protecting and enhancing the environment.

Common Core Math and English Language Arts Standards We Can Frequently Reinforce in Gardening, Cooking and Tasting Activities. (2003). Retrieved September 9, 2015.

This web page aligns Common Core Math and Language Arts Standards with Gardening activities, a useful resource for teachers wishing to use gardens to meet state standards.

Marcus, C. (1992) Environmental memories, p. 87–112. New York. Retrieved October, 2015.

This article provides insight to the benefits of environmental education and interaction for children. Identifying factors on environmental education reveals benefits for students, outlined in this article.

K-8 Next Generation Science Standards in the Garden A list of NGSS that are well suited for Garden-Based Learning. (2013). Retrieved September 9, 2015.

This web page connects Next Generation Science Standards (core concepts) to garden activities, a useful resource for teachers wishing to use gardens to meet state standards.

Lewis, C.A. 1996. Green nature/human nature: The meaning of plants in our lives. Univ. of Illinois Press, Urbana

Charles A. Lewis outlines the psychological, sociological, and physiological responses of people to the outdoors. Human-plant interactions are presented and analyzed. Lewis provides new and important research on plant/human interaction to understand how interaction with plants can enhanced well-being and an appreciation of the environment.

Peterson, Wood. (March, 2015). Sustainability: Higher Education's New Fundamentalism. National Association of Scholars. Retrieved November 2, 2015

Our Common Future: Report of the World Commission on Environment and Development. This report is an in-depth study of the sustainability movement in higher education setting, colleges.. Peterson's report defined sustainability on many levels and provides a deep understanding of the sustainability concepts and efforts.

Common Core Math and English Language Arts Standards We Can Frequently Reinforce in Gardening, Cooking and Tasting Activities. (2013). Retrieved October, 2015

Growing Minds helps individuals, such as educators, establish Farm to School gardens and integrates gardening into state and national curriculum. This web source focuses on how to sustain a garden program by involving community partners, such as parents, farmers, college students, and agricultural professionals. This website provides us with resources need to establish, fund, and integrate a school garden.

World Commission on Environment and Development, Our Common Future. United Nations, 1987. Retrieved October, 2015.

This article outlines the United Nations' report, Our Common Future, which proposes that nations of the world should seek a "sustainable development path". Sustainability and sustainable development are defined in this article, released in 1987.

Benefits of a School Garden. North Carolina Cooperative Extension. Guilford County Center News. Retrieved October, 2015.

This website outlines an array of benefits associated with school gardens for students, teachers, schools, and communities. It also provides links to other information regarding benefits of school gardens along with resources for funding, starting and integrating school gardens.

The Benefits of Farm to School. (n.d.). Retrieved October, 2015,
<http://www.farmtoschool.org/Resources/BenefitsFactSheet.pdf>

This fact sheet provides a complete understanding of the benefits of farm to school programs. This article is useful because it outlines benefits of growing food for students, teachers, and the community.

Getting Started: A Guide for Creating School Gardens as Outdoor Classrooms. (2007). Retrieved October, 2015.
<http://www.ecoliteracy.org/sites/default/files/uploads/getting-started-2009.pdf>

This online resource provides a step-by-step guide for creating a school garden. Teachers can read this resource and then understand how they can build their own garden.

Lohr, V. & Pearson-Mims, C. (2014). Children's Active and Passive Interactions with Plants Influence Their Attitudes and Actions toward Trees and Gardening as Adults. Retrieved October, 2015

This journal researches how interactions with nature as a child, such as through a gardens, influences appreciation for the environment in adults. Lohr investigates the human- outdoor relationship in children and how it corresponds to adult opinions on environmental conservation.

Green, Somerville, Sustainability education: researching practice in primary schools (2013). Retrieved Nov. 11, 2015

This report outlines the reasons why teachers struggle to integrate gardens into their classrooms. "Teachers report that they do not understand the concept and cannot integrate sustainability into an already overcrowded curriculum" Through identifying how teachers successfully integrate sustainability education into their teaching practice, this article offers insights on how to overcome these issues.

Appendix A

Questionnaire for teachers at Carmel Middle School utilizing MEarth

2015 Capstone Project: Benefits of school gardens and teaching sustainability

1. Do you think that 6th grade students at Carmel Middle School know what sustainability is? (ex. water conservation, composting, growing own food, recycling, etc.)
 - Most students know what sustainability is.
 - Some of the students know what sustainability is.
 - None of the students know what sustainability is.
 - I don't know.
2. Do you believe that teaching students about sustainability is important? (ex. water conservation, composting, growing own food, recycling, etc.)
 - Yes
 - No
 - What is sustainability?
3. How do you educate students on sustainability/ environmental issues? (check all that apply)
 - Class discussion
 - Textbooks
 - Hands on activities in class (recycling, etc.)
 - MEarth handles all sustainability education
 - Other:
4. Are there any other sustainability/ environmental education programs being implemented in Carmel Middle school, besides MEarth? If yes, can you tell me what the program is called in the "other" box?
 - Yes
 - No
 - Other:
5. Which classroom subjects are integrated into the MEarth garden?(check all that apply)
 - Science
 - Math
 - Art
 - Literature
 - Other:
 -

6. Do your students enjoy their time spent working in the MEarth habitat?
 - Yes, they all enjoy it.
 - A majority of them enjoy it.
 - Only certain students enjoy it.
 - No, they don't enjoy it.
7. Was integrating MEarth's hands-on activities into your lessons plans difficult? *
 - Yes, it was difficult.
 - At first it was difficult.
 - Not hard, with support from Tanja.
 - Not difficult at all.
 - Other:
8. Do you think that your students have benefited from a school garden? *
 - Yes
 - No
 - Other:
9. Can you share a few benefits of using the MEarth habitat to educate students?
10. Any other comments on teaching sustainability or integrating school gardens into classroom lessons?

Appendix B

Questionnaire for third grade teachers at JC Crumpton Elementary School

- 1) Do you know what sustainability is? Do your students?
- 2) Do you feel comfortable teaching your students about sustainability? (recycling, water conservation, composting, growing own food, etc.)
- 3) Do you feel that it is important to educate our students about sustainability? Why or why not?
- 4) Do you utilize the school garden for educational purposes? How so? Why or why not?
- 5) Do you believe that school gardens are beneficial resources for elementary teachers and students?
- 6) Do you feel that your students would benefit from and learn successfully in a school garden?
- 7) Are there any sustainability/ environmental education programs that you know of being implemented in Monterey Peninsula School District?
- 8) Are there resources available to you if you wish to utilize the school garden? (garden lesson plans, school support, etc.)
- 9) What are the the factors keeping you from teaching sustainability lessons and using the school garden as a resource? (lack of funding, no time, not comfortable, not enough resources, etc.)

Appendix C

Students 3rd-6th Grade Survey

MEarth: Using school gardens to teach children about the environment

1. What grade are you in?
 - a. 3rd
 - b. 4th
 - c. 5th
 - d. 6th
 - e. Other:
2. Do you enjoy going to MEarth Habitat? Why or why not?
3. What is the most interesting thing you have learned at MEarth Habitat?
4. What is your favorite thing to do at MEarth?
5. What is your favorite thing to plant in the MEarth garden?
6. What have you learned about being green or sustainable? (recycling, composting, water saving, etc.)
7. Do you think you could teach your family and friends about being green? (How?)
8. After going to MEarth, do you plan to live a more environmentally friendly life?
9. Are you more interested in learning more about nature after going to MEarth?
(Why?)
10. What would you like to do when you grow up?

Synthesis Paper

My educational and personal experiences at California State University Monterey Bay (CSUMB) have helped me grow in many ways, as a responsible young adult, as a global citizen, and as an educator with a passion to give back to my community. After taking liberal studies courses, and spending numerous service learning hours in classrooms in the Monterey Bay community, I discovered that I was destined to become an educator. What began as a requirement grew into an interest and then sparked a passion within me to devote my life to educating the youth. That fire was lit by the most important aspects of my education which went well beyond the classroom walls and are more than can be learned through a presentation or lecture. The life experiences and the professional experiences that CSUMB has given me are priceless. With newly acquired knowledge, invaluable experiences, graduation just around the corner, and a teaching credential in my near future, I would like to reflect on the various experiences in and out of the classroom during my time at California State Monterey Bay that have led me to the final semester of my undergraduate experience.

When I began my academic journey at California State Monterey Bay in 2011, I did not yet know what to expect from my educational experiences. Like most young scholars, I had no idea where my life and career were going. My first goal was to figure out what career path would best suit my interests and skills, which eventually led me to the Liberal Studies department. Although I originally hoped to graduate in 4 years with a BA in Liberal Studies, my educational journey led me along a few twists and turns. Here I am in my 5th year, in the last semester of my undergraduate work with graduation right

on the horizon, and I wouldn't change a single thing. The time I spent at CSUMB majoring in Liberal Studies has inspired me to continue my studies and work towards a teaching credential in the Department of Education at CSUMB. My educational opportunities at California State University Monterey Bay have provided me with a strong foundation to build on as a future teacher. The experiences and knowledge I have gained have given me the tools I need to confidently embark on my journey as an educator.

What I have learned and how I have learned it...

CSUMB has given me field-based experiences working with my community, along with the knowledge needed so that I may confidently graduate and enter the professional world. Additionally, the Liberal Studies major learning outcomes (MLOs) have prepared me for my future endeavors as a future educator. I believe that living in the Monterey Bay area and attending California State University Monterey Bay have given me a unique education that I could not have gotten elsewhere. I value the culture of diversity that this university cultivates, and the environmental awareness that comes along with living near a liberal, coastal university. Both of these areas have helped me grow into the globally aware future educator that I am today.

Growing up, I spent a majority of my time at elementary schools surrounded by teachers. My mother, since I was young, has always worked in childcare, and by spending time with her and her work I too developed a passion for working with children. As I got older and entered elementary school, my mom started working as a special education teacher in the elementary school I attended. This resulted in early

mornings, late afternoons, and long summers spent at the school while my mom worked. I saw the long hours she put into her job as an educator, and the passion she had for her students was something that I always admired. Education has always been a large part of my life, although I did not know that I too would go on to become an educator.

Fast forward 10 years, I was applying for a higher education at California State Monterey Bay. Originally, I came into the school as a Human Communications (HCOM) major, which could prepare me to become an educator of older children and young adults. After my first year and numerous writing classes, I realized that HCOM was not the major for me, and I should switch into the Liberal Studies department so that I could pursue my interest in working with elementary school students. During my second year at CSUMB, in spring of 2013, I took the first class that really pertained to my major and future career, child development. Child development, or HDEV 260, satisfied my lower division MLO IV: Human Development. This course took the students through the developmental stages of children, physically, mentally, and emotionally and it really sparked my interest in the childcare field. At this point it became clear that I had a future in teaching younger children.

The following school year, Fall 2013, I took two courses which really inspired me to commit to teaching elementary school students. Geology 210, Introduction to Earth Science, fulfilled my lower division MLO III: Natural Sciences, while focusing on ways to teach these subjects to students. This was the first class that not only taught me the subject but also gave me the skills and resources to teach these subjects to others.

Specifically, the focus was on elementary school students. Along with that, Introduction to Earth Science worked closely with the CSUMB garden and watershed institute, which introduced me to sustainability efforts on campus. This was the first introduction that I had to these two resources and I became inspired to not only educate children but to find creative ways to integrate outdoor education and gardens in the classroom. This course really opened the door for me to discover my true passion as an educator. I learned that there was not one way to teach children and run a classroom. I then realized I have a unique opportunity to give my future students a more hands on learning experience and it felt like I was truly on the path that was meant for me.

At the same time, I was also taking the course LS 233, Arts in Schools and Community. This course satisfied the lower division MLO I: Creative Arts, and I had my first experience in creating lesson plans. I was introduced to a whole other teaching strategy, bringing arts into the classroom to teach and spark the students' interests. I gained experience in integrating the core concepts into my art lesson plans, as well as finding my own creative ways to reach students in ways other than reading and lecturing. I believe that these two courses introduced me to alternate forms of educating students and really got me excited about my future as an educator.

Throughout my time at California State University Monterey Bay, I have served over 70 hours of community service in classrooms in the tri-county area. As reflected on the CSUMB webpage, "California State University, Monterey Bay is envisioned as a comprehensive state university which values service through high quality education. The campus will be distinctive in serving the diverse people of California, especially the

working class and historically undereducated and low-income populations” (Vision Statement, 1994). I consider these service learning opportunities to be the most valuable aspects of my education here at CSUMB. The real life, in classroom experiences I gained in the Monterey Bay area is something I could never learn in a classroom. My introduction into service learning began in Spring 2014 with the Liberal Studies course 298S, Introduction to Public Education. This course fulfilled my lower division MLO II: Service learning and gave me the opportunity to observe and research actual classrooms in the community. Through my own experiences in the classroom, and our research on schools in the Monterey Peninsula, it became clear to me that I would like to teach in the Monterey Bay area after I graduated with my degree.

That then led me into my upper level Liberal Studies MLO 2: Social Foundations of Multicultural Education in Fall 2014. LS 398S provided me with an insight into what teachers really experience in classrooms and in the school districts. We compared a number of schools and districts in the Monterey Bay area, as well as researched the pros and cons of the profession. This course introduced me to the core concepts the teachers must follow, as well as the textbooks and other resources that teachers must integrate into the classroom. It enabled me to take a deep look at the educational system, starting with education during early colonial America in comparison to how far we have come in the 2000’s. Most importantly, it showed me how far we have yet to go. During our work, we conducted research and observations of different schools in the Monterey communities, while specifically focusing on lower income students and families.

I had the pleasure to work closely with a seasoned teacher at Martin Luther King Elementary School in Seaside. While working with those inspirational second graders my passion to educate the young minds grew. Not only did I learn about the Social Foundations of Education, in this course we focused on multicultural education, which left a long lasting impact on me. I believe that the education that I received at CSUMB has prepared me to educate students from all backgrounds and cultures free of stereotypes or assumptions.

After taking HCOM 335 in Spring 2015, I finalized my emphasis in Literature. This course, American ethnic literature and culture focused on exposing students to multicultural readings. It taught me the importance of choosing literature that pertains to all my students and their diverse backgrounds. Literature is a very important aspect of the students' education, and this course provided me with the knowledge and resources to appropriately choose readings that will reach all of my students from different cultures and backgrounds. Now, in my last semester of my undergraduate work, I am enrolled in the course LS 394s, Multicultural Literature for Children and Young Adults. While satisfying MLO 5: Literature analysis and criticism, I am learning how to not only choose multicultural literature for my classroom, but strategies to teach these lessons effectively to children.

How do I plan to apply what I have learned to my personal and professional life...

As my final semester at California State Monterey Bay comes to a close, I reflect on the ways in which I can apply these valuable lessons into my career as an educator.

“The identity of the university will be framed by substantive commitment to multilingual, multicultural, gender-equitable learning” (Vision Statement, 1994). This excerpt from the CSUMB webpage has been reflected in courses throughout my education. While satisfying my MLO 3: Cross Cultural Competency, I took the course LS 362 in Spring 2015. In this course, Immigrants and Equity in Education, we took a deeper look into the various cultures and backgrounds of multicultural Americans. This experience of studying various cultures has been incredibly valuable to me as we advance as a society and strive for equality in the classroom. This is only one of the many courses that go hand in hand with the theme of our mission statement here at CSUMB; to build a multicultural, equal learning environment, which I as a future educator will also be responsible for doing.

As a future educator, the importance of providing a multilingual, multicultural learning experience to my students is a lesson I have learned during my time in the Liberal Studies Department. These lessons will be integrated into my classroom and stay with me throughout my career. The various courses I have taken throughout my five years at California State Monterey Bay have provided me with the skills necessarily to look deep into multicultural texts and push my students to have deeper discussions and insight into these stories. These courses have prepared me to provide my students with a well-rounded, valuable learning experience.

In-classroom experiences are irreplaceable and without these first hand experiences in my community, I would not have known with all certainty that teaching is the career for me. I have also realized that education is a great way to overcome

adversity. If I have the opportunity to spark an interest for learning in my future students, then I have the chance to change lives. Service learning gave me confidence, and experience, as well as networking and relationships within the schools, which will help me succeed as I embark on my own career in the Monterey Bay area.

The class that left the biggest impression on future teaching strategies is a course I took in Spring 2015 at CSUMB which met MLO 7: Histories and social sciences. This course introduced me to the issues of conservation and sustainability that are relevant to us as educators as well as the youth hoping to thrive on planet earth. The importance of sustainability efforts had a long lasting impression on me and is something I will apply in my future classrooms. Environmental History of California woke me up to my true passion as an educator, to integrate sustainability and outdoor lessons into my future classroom, and lead me to my capstone topic of “Integrating Gardening as a Tool to Teach the Concept of Sustainability to Elementary School Students”. In my capstone, I propose that school gardens can effectively be used in the classroom to improve students understanding of the importance of sustainability. The research and resources I have compiled through my capstone will be carried with me throughout my career as an educator. I believe that it is my responsibility to educate future generations while integrating sustainability lessons into the classroom.

The Liberal Studies major has provided me with the building blocks of the Major Learning Outcomes, along with priceless in-class experiences within the Monterey Bay area and important life lessons. Together these elements of my education have made it possible for me to grow into the confident future educator I am today. The personal and

professional growth I achieved during my five years of education at CSUMB has led me to this point, and as my final semester and capstone comes to a close, I feel nothing but inspired. Before I graduate with my undergraduate degree in Liberal Studies and begin on the path of receiving my teaching credential, I want to thank the faculty, staff, and teachers I have had the pleasure of working with during my education at California State Monterey Bay. I am beyond grateful for my learning experiences and I am excited to begin my career as a future educator in the Monterey Bay Area.

Integrating Gardening as a Tool to Teach the Concept
of Sustainability to Elementary School Students

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Abstract

Sustainability is becoming an increasingly important topic in today's society. Society as a whole benefits from having an environmentally conscious citizen who can make an informed impact on social issues involving natural resources. As future educators, it is our responsibility to provide learners with the knowledge and skills required to become an active part of repairing our planet. Research suggests that school gardens can be a powerful tool in promoting outdoor education, encouraging positive peer relationships, and building strong communities, while teaching sustainability concepts. I propose teachers who receive school support, collaborate with committed volunteers, and acquire access to the appropriate resources are prepared to confidently educate students on ecological conservation through school gardens.

Integrating Gardening as a Tool to Teach the Concept of Sustainability to Elementary School Students

Sustainability is becoming an increasingly important topic in today's society, as temperatures reach an all-time high and as fresh water levels reach an all-time low. At this point, global warming is becoming undeniable, and our natural resources are depleting at an alarming rate. Without conservation, environmental awareness, and sustainability methods, our planet is a ticking time bomb which, when destroyed, will take humans and all other lifeforms with it. Long after you and I are gone, the youth will hold the future of Earth in their hands. I hope that the world will be a safer, cleaner, more peaceful place where our children and grandchildren respect our home and appreciate the beauty of nature.

Society as a whole benefits from having an environmentally conscious citizen who can make an informed impact on social issues involving natural resources. As educators, it is our responsibility to provide our students with the knowledge, skills, and motivations necessary to become environmentally literate and contribute to help create a sustainable future. "The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones" (Adkins & Simmons, 2003-2004, p.2).

State Superintendent of Public Instruction Torlakson's blueprint (2014) expresses that, "Through lived experiences and education programs that include classroom-based lessons, experiential education, and outdoor learning, students will

become environmentally literate, developing the knowledge, skills, and understanding of environmental principles to analyze environmental issues and make informed decisions” (Environmental Literacy Task Force Report, 2014, p. 11). A school garden is the ideal environment to incorporate experiential education and outdoor learning into the elementary school classroom.

Lessons taught in the school garden which incorporate conservation techniques encourage students to integrate sustainability into their daily lives. “Environmental education and outdoor experiences help children gain a respect for living things, stimulate their curiosity, and provide them with meaningful life experiences” (Marcus, & Bullock as cited in Lohr & Pearson-Mims, 2005, p.1). Environmental education program supporters hope that children will develop a “sense of kinship and respect for the natural world” which will stay with them into their adult lives (Lewis as cited in Lohr & Pearson-Mims, 2005, p.1).

A garden can be a powerful tool in promoting outdoor education, positive peer relationships, strong communities, environmental restoration, as well as sustainability. “These programs also offer opportunities for hands-on, or active, learning experiences that encourage higher-order thinking and problem solving” (Athman & Monroe as cited in Lohr & Pearson-Mims, 2005, p.1). Through my literature review, I will use my secondary questions to frame my research, which in the end will answer my primary question: *how can teachers integrate gardening as a tool to teach the concepts of sustainability to elementary school students in the classroom?*

My secondary questions provide me with the framework to understand the ways in which educators can integrate gardening as a tool to teach the concept of sustainability to elementary school students. My secondary questions are as follow: *Are there benefits for both students and teachers in using gardening as a tool to teach the concept of sustainability to students in the classroom? What do California state standards say about bringing sustainability awareness to elementary school students in the classroom? Currently, are there sustainability education programs that are being implemented in the school districts in the Monterey Bay area? If so, how do the teachers/schools implement them?*

A school garden can be great in theory, but actually integrating and sustaining it is another issue. If elementary school teachers wish to successfully educate their students on sustainability and impart environmental understanding to their pupils, the importance of sustainability must be instilled into educators themselves. I will also answer the secondary questions, *how do higher education institutes prepare our educators for the important responsibility of integrating sustainability into lesson plans? How can training insure that our future elementary school teachers graduate college with the confidence to integrate outdoor education into their lesson plans?* Lastly, I will answer the secondary question, *Are there resources available to teachers who wish to integrate school gardens into their classrooms and teach the concept of sustainability to their elementary school students?* In completion, this capstone research project answers my primary research question and provides resources to teachers who aspire to integrate school gardens into their elementary school curriculums.

Literature Review

This section addresses the importance of environmental education, outdoor interaction, and resource conservation in the elementary school setting. Secondly, it addresses the need for teacher education regarding sustainability concepts prior to the introduction of sustainability in their classrooms. Lastly, this section addresses techniques that educators can use to teach sustainability in the classroom and provides resources to assist in the integration of a school garden at the elementary school level.

The first step in answering my primary research question is to define and understand the meaning of sustainability as it pertains to classroom students and teachers. The term “Sustainability” is a loaded term that refers to conservation of Earth’s resources, such as clean air and water, for future generations. The sustainability movement is much more than a call for environmental responsibility, it requires a change in human lifestyle, a shift towards more sustainable energy sources, water conservation, and waste management. “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Bruntland, 1980, p. 41).

In the elementary school classroom, environmental education introduces sustainability methods and encourages conservation of earth’s nature resources. “At the classroom level, teachers are using sustainability as a context within which to teach core subjects, as well as teaching sustainability as its own subject. At the school level, a great variety of schools are focused on sustainability-centered learning themes. In some cases, school districts also have a stated emphasis on our ongoing commitment to

sustainability” (Church & Skelton, 2010, p.2). Examples of sustainability which should be introduced and practiced in the elementary school setting include water and energy conservation, recycling and reusing materials, and composting, at the least. School gardens provide the perfect setting for application of all mentioned sustainability efforts.

The Importance of environmental and outdoor education and the advantages of a school garden. “The goal of environmental education is to instill in learners knowledge about the environment, positive attitudes toward the environment, competence in citizen action skills, and a sense of empowerment” (Athman & Monroe, 2001, p.3). In the recent years, children are not interacting with nature in the same way that past generations have, as technology advances and sedentary lifestyles are becoming more prevalent in today’s elementary school children. In the past, before the modern human culture with revolves around technology, children spent a majority of their time playing in the outdoors, building forts, observing plant life, catching bugs, engaging in discovery and imaginative role, and playing games with other children. This resulted in a bond with nature, a sense of responsibility for and wonder of the world around us (Plye, 2008). Pyle's research titled *No Child Left Inside: Nature Study as a Radical Act* (2008), discusses the importance of children building a relationship with nature. Time spent outdoors in our natural world provides hands-on experience which goes far beyond what children could learn through reading a book.

In the past, “Nature Study” was a component of everyday primary education in schools across America, children’s relationship and experience with the local environment was valuable and commonly encouraged in schools (Plye, 2002). Pyles

states that while schools were making attempts at human inclusiveness in K-12 studies with the “No Child Left Behind Act” environmental education was placed to the side. During the No Child Left Behind era, environmental and outdoor education was considered non-academic and not connected to the core curriculum. As a result, elementary school children continue to be left inside, and introduced to our natural environment [local plant and animal life] through books, stories, and pictures on projectors. Plyes and others have argued that a loss of experience in the diverse environment can result in “alienation, apathy, inaction, and further extinction” (Plys, 2008, pg. 157). It is necessary to provide children the opportunity to bond with the natural world through outdoor interaction in their communities (Plys, 2008).

In the book, *Last Child in the Woods*, Louv (2005) argues if we experienced the outdoors at young age, “then we were bound to the natural world” and remain so as adults (Louv, 2005, p. 158). In interviewing 3,000 children and parents, Louv (2005) found an alarming amount of “outdoor abandonment” which has been replaced with sedentary, virtual lifestyles. Louv concludes that newer generations of students face a dangerous syndrome he calls “nature deficit disorder” (Louv, 2005, p. 158). Computer-mediated and indoor recreation is becoming increasingly common, one of the main drivers of experience loss. On top of this, population growth and industrialization within communities has majorly decreased the amount of natural areas, such as fields, parks, and woodlands, that children have access to for exploration and hands-on learning experiences, which results in less opportunities for children to bond with develop respect and responsibility for the natural world (Louv, 2005).

Lohr and Pearson-Mims' (2005) conducted a study on the effects of children's active and passive interactions with plants and how it influence their attitudes and actions toward trees and gardening as adults. This study found that childhood experiences with nature influenced positive adult relationship with the natural world. Lohr and Pearson-Mims (2005) conducted a nationwide phone survey of "attitudes toward urban trees, participation in civic or educational activities, and memories of childhood experiences with gardening and nature" with adults in large urban areas in 2004. They discovered that growing up next to and interacting with the natural world, such as flower beds, visiting parks, taking environmental classes, and gardening, resulted in positive relationships with as well as a sense of responsibility for protecting the outside world. Childhood experiences with nature, such as picking vegetables and living next to a garden, had positive influences on their adult lives. The strongest influence came from active gardening, and both passive and active interactions with plants during childhood were associated with positive adult values about nature. Participation in active gardening during childhood was consistently the most important influence in explaining adult attitudes and actions (Lohr & Pearson-Mims, 2005).

While teachers cannot change computer habits and regulate student's outdoor interactions outside the classroom, they do have the unique opportunity during the school day to provide students with hands-on experience in our natural world. "In the post- Nature Study era, it is possible for an individual, gifted, and risky teacher to re-create either the pedagogical basis for knowing something of nature or the rich possibility of outdoor discovery" (Louv, 2005, p. 162). Interaction with the outdoors is

essential in building a relationship with our environment; students must develop a sense of responsibility for and connection with nature if future educators want their students to be actively interested and involved in sustainability issues.

Benefits for both students and teachers in using gardening as a tool to teach the concept of sustainability in the classroom. In order to motivate elementary school teachers to integrate garden activities into their classroom lessons, the various benefits that gardens have on both students and teachers must be explored and understood. The benefits of a school garden include opportunities to model a healthier lifestyle for students, as well as improvement in students relationships with staff, one another, their community, and the environment as a whole. In the “Effects of school gardens on students and schools: Conceptualization and considerations for maximizing healthy development”, Ozer (2007) suggests integrating school gardens in elementary schools has potential to promote the health and well- being of students as well as strengthen the school environment as a setting for positive youth development.

As obesity rates rise in America, districts move towards healthier food options and encourage a more active lifestyle amongst students. School gardens are an interactive way to integrate a healthy lifestyle into the classroom setting. Outdoor learning in a schools gardens “promote the consumption of fresh produce among a youth population with markedly elevated rates of obesity and type 2 diabetes” (Hedley as cited in Ozer, 2007, p.846). As students are learning they improve their physical health, gardening requires students to move their bodies and integrate anaerobic exercise into the school day. Edible gardens increase the appeal of eating vegetables

while allowing students the opportunity to become familiar with and eat produce that they have grown themselves (Ozer, 2007). Increasing the consumption of fruits and vegetables is a goal of the USDA's "5-A-Day" campaign, which encourages the importance of increasing fruit and vegetable consumption (Produce for Better Health Foundation, 2003). In order to effectively improve student nutrition, teachers must encourage a positive attitude towards fresh produce through hands-on growing and consuming experiences. Additionally, school gardens provide students with knowledge and examples of how to live a healthy lifestyle through related conversation on the health benefits of eating more nutritiously. (Ozer, 2007).

Garden coordinators and teachers who have integrated school gardens into their curriculum report positive changes in their students relationship with their school, their environment, and one another. When observation the effects of school gardens on elementary student's relationships, it was reported that students experienced feelings of attachment, pride, and belonging to their school, as well as a sense of bonding with adults and peers in the school setting. Students develop a deep relationship with the garden space in which they feel responsibility and pride. School gardens also provide opportunities to improve student relationships amongst one another. Garden activities often requires group work, opportunities for student to work together to achieve tasks such as planting, weeding, or building. Group work in the school garden may also allow students work and interact with different students than they normally do when they are grouped together in the classroom based on academic achievement. "Physical strength, visual-spatial skills, and experience in building" (p. 854) are also valuable skills and

interests that school gardens expose student to, experience that are not necessarily included in the regular classroom. “Garden teachers comment that some students who struggle with classroom learning “shine” in the garden” (Ozer, 2007 p. 854).

Gardens on campuses improve the school’s physical environment by represents a new physical setting within the school setting. Schools are often limited in the availability of spaces containing vegetation in which children can play or sit, many urban school sites have only a concrete blacktop space available for elementary school students. School gardens should not be limited to planter boxes with vegetables growing, they should be interactive, outdoor “learning laboratories” (Ozer, 2007, p. 846).

Ideally, school gardens sites provide opportunities to grow and study plants which are native to the outside environment in which the school is placed. By bringing native plants into the school environment, students will learn about the surrounding natural habitats in their own community and discover ways in which they can improve their relationship with the wildlife in their areas. Planting of native plants will also improve the school’s environmental relationship with their surrounding natural community and encourage natural bug and animal life to interact with the garden, which mirrors their own natural habitat. One of the most promising aspects of gardens is the opportunities they provide to promote sustainable practices which will strengthen the school environment as a whole, beyond the health behavior of individual students (Ozer, 2007).

California state standards, requirements on sustainability awareness to elementary school students in the classroom. As a society, the importance of

sustainability and conservation is becoming undeniable, and the Literacy Task Force Report (2014) reveals that the California Department of Education is in support of sustainability efforts. According to a Report by State Superintendent of Public Instruction Tom Torlakson's Environmental Literacy Task Force, "Californians rely on the environment for both our economic prosperity and our quality of life. Our state history is in many ways a tale of Californians striving, and at times struggling, to balance competing demands related to the environment. We recognize that our state's environmental challenges are not just local, or even national issues, but require Californians to understand the deep connection between human societies and natural systems on a global level" (Environmental Literacy Task Force Report, 2014, p.11).

The California State Superintendent of Public Instruction agrees that growing environmental issues affecting both Californians and the world population, "require an educated population with the skills to understand, analyze, and take part in complex decisions regarding issues such as water use, climate change, and preservation of natural places" (Environmental Literacy Task Force Report, 2014, p. 11). The California Department of Education supports the notion that, as educators, we must effectively prepare the future generation to address environmental challenges and participate in state and nation-wide environmental decisions. In order to ensure our students are prepared for the future, "all California's students need to have access to classroom, hands-on, and outdoor opportunities to learn about the environment and achieve environmental literacy as a core component of a 21st century education" (Environmental Literacy Task Force Report, 2014, p. 12).

In 2003-2005, the California's Environmental Principles and Concepts (EP&C) were approved through California Assembly Bills 1548 and 1721. The EP&C's (Appendix B) "set in motion the Education and the Environment Initiative (EEI) by: (1) creating the Office of Education and the Environment within the California Department of Resources Recycling and Recovery (CalRecycle); (2) mandating the creation of California's adopted Environmental Principles and Concepts (EP&Cs) to complement existing standards; and (3) requiring the creation of an environment-based "model" curriculum driven by the state's science and history-social sciences standards" (Environmental Literacy Task Force Report, 2014, p. 14).

Since then, by law, The EP&Cs require that environmental education must be included in all science and history-social sciences, mathematics, and English language-arts textbooks. The EP&Cs are a potential guide for the development and implementation of environmental education relating to sustainability. Unfortunately, in a recent survey of the 520 California public school principals who chose to participate "Only 13% indicated that their schools had successfully integrated environmental education into their curricula" (Environmental Literacy Task Force Report, 2014, p. 12).

Currently, support for environmental education is high in California and the California Educational Department is undergoing a groundbreaking transformation, thanks to the leadership of State Superintendent of Public Instruction (SSPI) Tom Torlakson, the Governor, the State Board of Education, and support of California voters and legislators. "Now is the moment to elevate environmental literacy as an essential element of a 21st century education in California, and to establish the leadership,

collaboration, strategic partnerships, and necessary funding to ensure environmental literacy for all California students” (Environmental Literacy Task Force Report, 2014, p. 3). It is noted that the California Standards, which refer to all standards that describe the state’s learning goals for students including the Common Core State Standards, offer a unique opportunity to integrate environmental education into everyday classroom instruction. The Common Core State Standards require complex thinking and problem solving abilities from students, which are precisely the type of skills that outdoor education cultivate (Environmental Literacy Task Force Report, 2014, p. 3).

Sustainable educational programs that are being implemented in the school districts in the Monterey Bay area. The Monterey Peninsula Unified School District [MPUSD] webpage provided insight into the ways in which teachers are implementing sustainability programs. In MPUSD, teachers are implementing sustainability practices in the Monterey Bay area by means of modeling energy and water saving in their classrooms.

On the MPUSD webpage, I discovered the Monterey Peninsula Unified School District Operations Department: Energy and Water Conservation’s Guidelines (Appendix C). The organization’s guidelines state that: “Every person is expected to become an “energy saver” as well as an ‘energy consumer”, the staff member is responsible for implementing the guidelines during the time that he/she is present in the instructional room or office, and the organization is committed to and responsible for a safe and healthy learning environment” (MPUSD, 2015, p. 1). David Chandler, the

Energy Specialist, works with staff at each site in creating plans to conserve energy and water.

For teachers, the energy saving guidelines include shutting off lights when not present, switching from overhead light to natural light when possible, turning off computers and thermostats at end of day, closing door while using heater and turning off A/C if classroom doors are open. To insure that schools facilities are making an effort for a more sustainable campus, the Energy Specialist provides monthly energy saving reports to facility administrators detailing performance results. They track how well all schools in the Monterey Peninsula Unified School District are conserving energy and water, which can be accessed on their website. This is an important step in demonstrating sustainable efforts to elementary school children. All schools and classrooms are involved in this friendly energy saving competition, and the winning school each month is posted on the Monterey Peninsula Unified School District website.

Besides just relying on teachers to bring environmental and sustainability education into their classroom lessons and discussions, Monterey Peninsula Unified School District has also made efforts to partner with outside sustainability education programs in the area. At J.C. Crumpton Elementary School in Marina California, I observed an interactive, in-school assembly addressing water conservation presented by the performance group "Zun Zun." The Water Awareness Committee of Monterey County sponsors the program throughout Monterey County, and the California American Water and MPWMD support the in-school water conservation educational assembly. The performances cover topics such as the water cycle, watershed, indoor

conservation and conservation tips, including fixing leaks, and presentations are bilingual. This program included interactive songs, activities and games which cover important water conservation techniques that students in the Monterey county should practice. Through this performance, children are able to see the way in which sustainability does not end in the classroom setting. Water conservation is important, and the in-school water conservation assembly teaches students that sustainability must be practiced at home as well.

Although the techniques currently being implemented in classrooms within the Monterey Peninsula Unified School District are a good first step to introduce sustainability education, in order to instill environmental responsibility in our future generations, all prospective teachers must receive environmental education and sustainability courses during their higher education. Higher education campuses can better serve their students and help create a thriving, environmentally aware society by addressing the climate challenge and reducing global warming emissions while integrating sustainability into their curriculum (Peterson, 2015). A report by the National Association of Scholars titled *Sustainability: Higher Education's New Fundamentalism* (2015), reports that higher education institutions across the country are moving towards more sustainable efforts. "On campus, students sign sustainability pledges, learn about sustainability during orientation, absorb sustainability in their courses, take mandatory sustainability training in residence life programs, and come to see sustainability as the norm for responsible, virtuous human life and political citizenship" (Peterson, 2015, p. 25).

Changing the habits and lifestyles of college students is a valuable way to encourage sustainable lifestyles among younger generations. For future teachers, exposure to sustainability efforts in college is important, but not enough to prepare them to integrate sustainability efforts into their future classrooms. In the higher education setting, future teachers are exposed to environmental issues through courses such as biology, ecology, and geography, which often do not go beyond acquiring academic knowledge (Zachariou & Valanides, 2006). Teachers reported that although they most likely took an environmental studies or biology class in college, “they do not understand the concept and cannot integrate sustainability into an already overcrowded curriculum” (Green & Somerville, 2014, p. 1). One teacher reported “Through my studies, I didn't have the opportunity to have an in- depth learning in environmental issues. Most of the time, we were talking in general about environmental issues and in a way that I couldn't understand my contribution to the preservation of the environment” (Zachariou & Valanides, 2006, p. 196).

Although universities are exposing future educators to environmental issues and sustainability practices, there is a difference between being aware of sustainability, practicing sustainability, and feeling confident in educating others on sustainability. In a study that explores the challenges teachers face in bringing back outdoor education and sustainability lessons back into classrooms, the abstract states that “many teachers are keen to implement sustainability education in primary schools but are lacking the confidence, skills and knowledge to do so” (Green & Somerville, 2014, p. 1).

Preparation of educators for the Concepts of Sustainability and Training. In order to effectively bring sustainability into the classroom and cultivate student relationships with our natural world, elementary school teachers need the education, experience, and resources necessary to integrate sustainability into the classroom.

The journal *Education for Sustainable Development: The impact of an outdoor program on future teachers* (2006) discusses the benefits of outdoor education and suggests that a sustainability education program should be implemented into the future educator's college curriculum before they are sent into classrooms and expected to confidently integrate sustainability lessons. Parallel to my own ideals, Zachariou and Valanides' (2006) study from the University of Cypress stresses that "education is the driving force for the change needed" and that sustainability education should be integrated into all educational levels. An Education for Sustainable Development (EDS) program offered in higher education would provide prospective teachers the opportunity to cultivate a strong personal understanding of the environment, and prepare teachers to integrate gardens into their lesson plans. If universities are not giving future educators the experience, knowledge, and tools necessary to teach sustainability education, it becomes very difficult for educators to confidently integrate these topics into future elementary school classrooms (Zachariou & Valanides, 2006).

Zachariou and Valanides' (2006) study investigated primary school teacher's attitudes and knowledge about sustainability prior to an Education for Sustainable Development program. Fifteen fourth year students from the Educational Department at the University of Cypress were involved in this program. The Education of Sustainable

Development program training lasted two months, and the students were first introduced to the concept of sustainability and various relevant environmental issues. Next, the students grouped together and worked to design outdoor learning activities for elementary school students which were consistent with the environmental issues discussed. The student teachers then worked hands-on with elementary school students, in order to gain valuable experience actually discussing and addressing environmental issues though in class sustainability lessons and outdoor education experiences (Zachariou & Valanides, 2006).

The program allowed students to gain an increased sense of personal responsibility as professionals for improving their environment and communicating these values to their students (Zachariou & Valanides, 2006). The students who participated in the study also said that the program empowered them as professionals to take action, “The program motivated me as a future teacher... helped me to understand the importance of my role for making my students aware.... it was the first time I felt responsible for the environment” (Zachariou & Valanides, 2006, p. 196). These prospective teachers realized, through their active participation in the planning and teaching process, how important their role is in cultivating environmentally literate citizens (Zachariou & Valanides, 2006).

The program also allowed participants the opportunities to learn ways in which to integrate environmental education into their lessons and promoted their active involvement in planning relevant activities for their students to implement sustainability. This training integrated topics from not only the natural sciences but from social

sciences and humanities. The educators integrated history, language lessons, art, citizenship education, and health education as ways to examine environmental issues, and realized that different subject areas can contribute to an effective understanding of environmental issues. Aside from the education on environmental issues and integration of sustainability lessons, the students in this program were given the opportunity to practice techniques in outdoor education. The program helped them to learn to use the outdoor environment as a place for providing educational experiences, which are important for moving students toward sustainable actions. One student in the program reflected, “I learned how to organize my teaching outside the school setting, to clarify my tasks, and try to implement them through various types of outdoor activities” (Zachariou & Valanides, 2006, p. 198).

Strategies for integrating sustainability in the classroom. School gardens are a promising approach to integrating important sustainability practices into elementary student’s lives. There are an array of other strategies that teachers can use to integrate sustainability lessons into their classrooms. Church and Skelton’s (2010) article *Sustainability Education in K-12 Classrooms* outlines four different strategies for integrating sustainability into elementary school classrooms.

Church and Skelton’s (2010) article suggests that the most basic way to introduce students to the topic of sustainability is to simply teach sustainability as its own subject, not necessarily tied to particular core content learning standards. For teachers who do not feel confident integrating sustainability lessons into multiple different lessons and subjects, this first strategy is a way to discuss environmental

issues with and introduce sustainability concepts to elementary school students (Church & Skelton, 2010, p. 7).

The second strategy involves using sustainability as a context to teach one of the core subjects (literature, math, history, science, etc.). Sustainability provides an engaging approach to teach core subject which are, traditionally, taught from textbooks. This approach is most often taken in teaching science and social studies. “For example, when teaching about chemical bonds, a chemistry teacher might discuss how carbon’s chemical structure is connected to global climate change. Contextual and personal connections make up a portion of most educational science standards, and sustainability issues such as climate change provide a great backdrop for linking science to its compelling social issues” (Church & Skelton, 2010, p. 9-10).

The third strategy involves incorporating project-based learning into the classroom. Integrating a school garden into the curriculum is an example of project based learning which also incorporates sustainability lessons along the way. Students in can grow vegetables in a school garden, learn about photosynthesis outside of the classroom setting, and practice water saving techniques all in one lesson.

Strategy four reads, “Sustainability at the school-wide or district level to guide institutional and curricular innovation - thematic In a handful of schools and districts around the country, sustainability is becoming an integrating context for “greening” the facilities and curriculum across subjects and grades” (p.10). This strategy goes beyond just the teacher and classroom, it involves participation from the schools and often includes a district wide “sustainability goal” (Church & Skelton, 2010).

There are many different ways an educator can teach sustainability concepts, and that is one of the many reasons sustainability lessons are an incredibly valuable in the elementary school classroom. Gardens not only integrate examples of sustainability, but the vast array of other benefits for students, teachers, schools, and communities make school gardens the ideal setting to improve student understanding of sustainability.

Resources available to teachers who wish to integrate school gardens into their classrooms and teach the concept of sustainability to their elementary school students

A number of sustainability education resources for teachers are available online. These resources provide links and information on professional development, covering everything from environmental seminars for teachers to different organization which fund garden programs in elementary schools. Online resources are available regarding curricula linking outdoor activities to core concepts, garden activities for elementary school students, whether it be for inserting a few lessons into the curricula or establishing sustainability as a thematic context for a district. (Appendix E)

Through a review of literature related to sustainability and environmental education, we are able to gain a better understanding of all factors involved when integrating a school garden in the elementary school classroom.

Methods and Procedures

To gain a deeper understanding of the ways in which teachers use gardening as a tool to teach the concepts of sustainability to elementary school students, I first took to analyzing academic studies and journals published on the topics of sustainability and

environmental education. Using my secondary questions as a basis for my Google Scholar searches, I found a number of the articles which I referenced in my literature review. Using the CSUMB Library database, I searched the terms “sustainability”, “school gardens”, and “benefits of outdoor education”. This research was a good start, but not enough evidence to conclude that school gardens are plausible and successful for elementary schools across the Monterey Bay area, so I then searched sustainability programs in the Monterey Peninsula Unified School District.

The Monterey Peninsula Unified School District webpage provided me with information on current sustainability efforts in the Monterey Peninsula Unified School District. Identifying ways in which teachers have successfully integrated sustainability education into their classrooms in the Monterey Bay area, provided important insights on how to overcome problems. I researched a successful school garden in Carmel Valley, MEarth habitat. After visiting their website to get an idea of their mission statement, I visited the 10 acre garden which is attached to Carmel Middle School, and an interview was conducted with the Executive Director of the site, Tanja Roos. I questioned Tanja on topics that pertain to my research, including the strategies for integrating MEarth into the Carmel Middle School educational experience. Next, Tanja emailed a survey to 6th grade teachers at Carmel Middle School, which I created using google forms (Appendix A). The survey was emailed to five teachers, four of whom responded promptly. This survey gave me a teacher’s perspective on the benefits and setbacks of integrating the school garden into the classroom. Using the resources, articles, and information I found through my online research, combined with my

interview with Roos and teacher survey responses, I have compiled a number of insightful results relating to my primary research question.

Results and Findings

Using my secondary questions as a means to organize my findings, I will now analyze articles related to the topics of sustainability education and integration of school gardens, which I outlined in my literature review. The interview with Executive Director of MEarth Tanja Roos, along with survey results from five 6th grade Carmel Middle School teachers (Appendix A) provide insight from the Monterey Bay community regarding the integration of school gardens. Through analysis of the numerous research articles which relate to my secondary questions, along with survey data and observation, I will outline the results and discuss how educators can effectively integrate a school garden into lesson activities with the goal of teaching sustainability.

Sustainability can be defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Bruntland, 1980, p. 41). “At the classroom level, teachers are using sustainability as a context within which to teach core subjects, as well as teaching sustainability as its own subject. At the school level, a great variety of schools are focused on sustainability centered learning themes” (Church & Skelton, 2010, p. 2).

In the 21st century, industrial and technological advances have resulted in a loss of connection to our natural world. Outdoor education and study of nature are important educational aspects for elementary students, but since the No Child Left Behind Act, these teaching and experience have been removed from the classroom curriculum.

Once educators understand the correlation between environmental education, outdoor learning and student- nature relationships, they must commit to engage students in interactions with the nature so they may form valuable bonds with the outside world (Plye, 2008).

Are there benefits for both students and teachers in using gardening as a tool to teach the concept of sustainability to students in the classroom?

Garden coordinators and teachers who have integrated school gardens into their curriculum report positive changes in their students relationship with their school, their environment, and one another (Ozer, 2007). Childhood interactions with plants along with participation in environmental education results in adult relationships with the outdoors. Outdoor recreation programs such as gardening for children raised in urban surroundings lacking plant life can be effective in encouraging an appreciation for the outdoors in adults. There is an important correlation between childhood nature experience and adult attitudes towards the environment, which shows that garden programs are a valuable way to instill an appreciation for our natural world in our adult citizens. (Lohr & Pearson-Mims, 2004).

Childhood experiences with nature, such as picking vegetables and living next to a garden, had positive influences on their adult lives. The strongest influence came from active gardening, and both passive and active interactions with plants during childhood were associated with positive adult values about nature. Participation in active gardening during childhood was consistently the most important influence in explaining adult attitudes and actions (Lohr & Pearson-Mims, 2004).

The developmental benefits for students who have access to a school garden include opportunities to practice problem solving skills as well as fine motor skills. Ozer (2007), suggests integrating a school garden in elementary schools has potential to promote the health and well-being of students, as well as strengthen the school environment as a setting for positive youth development.

Results from the survey conducted with 6th grade teachers at Carmel Middle School (Appendix A) correspond with the benefits shown in research. When asked to share a few benefits of using the MEarth habitat to educate students, one Carmel Middle School teacher responded that the garden “is great for students who are hands on learners, excellent for building a sense of community in a class, provides new perspective on unit topic and cultural lesson such as cooking, making African masks, Egyptian boats, Chinese teas, etc.” (Personal Communication, November 2015). Through this survey, I also learned that each core curriculum unit includes at least one visit to the habitat throughout the school year. In addition, I learned that classroom subjects integrated into the MEarth garden include “Science, Literature, Languages/ History Science, Literature, Social Studies, Core, [and] World language” (Personal Communication, November 2015). Besides being an ideal setting to provide students with outdoor education and sustainability lessons, school gardens also provide the opportunity to teach core concept subjects outside of the classroom setting (Environmental Literacy Task Force Report, 2014).

What do California state standards say about bringing sustainability awareness to elementary school students in the classroom? Since 2004, California’s Environmental

Principles and Concepts (Appendix B) state that, by law, sustainability concepts must be included in all new textbooks. Currently, support for environmental education is high in California and the California Education is undergoing a groundbreaking transformation, thanks to the leadership of State Superintendent of Public Instruction (SSPI) Torlakson, the Governor, and State Board of Education, and support of California voters and legislators. Together, Torlakson and his Environmental Literacy Task Force designed the *Blueprint for Environmental Literacy: Educating Every Student In, About, and For the Environment* (2015) which outline strategies to improve environmental education statewide.

As a society, the importance of sustainability and conservation is becoming undeniable, and by researching what California state standards say in regards to the importance of sustainability, it becomes clear that the California Department of Education is in support of sustainability efforts. The California Department of Education supports the notion that, as educators, we must effectively prepare the future generation to address environmental challenges and participate in and be aware of state and nation-wide environmental decisions. In order to ensure our students are prepared for the future, “all California’s students need to have access to classroom, hands-on, and outdoor opportunities to learn about the environment and achieve environmental literacy as a core component of a 21st century education” (Environmental Literacy Task Force Report, 2014, p. 12).

Currently, are there sustainability education programs that are being implemented in the school districts in the Monterey Bay area? If so, how do the

teachers/schools implement them? As a future teacher interested in sustainability integration, I must first understand the ways teachers in the Monterey Bay area are currently teaching the concept of conservation and environmental issues in their classrooms before I can understand how to improve sustainability lessons in my future classroom. Sustainability is primarily taught in the Monterey Peninsula Unified School District (MPUSD) through the method of “modeling the behavior”. This entails conserving electricity and water in the classroom, which is outlined in Energy & Water Conservation guidelines (Appendix C), released by the MPUSD. Schools and teachers are encouraged to reduce energy use, and teachers are given the opportunity to bring up conversations about sustainability as well as include students in these efforts.

From my survey results (Appendix A), I discovered ways in that teachers at Carmel Middle School, in collaboration with the MEarth garden, educate their students on sustainability. When asked how the teachers at Carmel Middle School currently educate students on sustainability and environmental issues, the survey results revealed that sustainability is taught through “hands on activities in class (recycling, etc.)”, “in class discussion”, and by “reminding students to recycle, conserve water, [when possible]” (Personal Communication, November 2015). Three of the four teachers responded that the MEarth garden program handles almost all sustainability education.

Integrating sustainability efforts into the classroom is a great way to expose and educate students on the ways to conserve our resources. Ideally, this opens the door to conversations about environmental issues and sustainability practices that students can

continue in their homes and futures. In order to instill environmental responsibility and sustainable lifestyles in our future generations that goes beyond discussion, all prospective teachers can benefit from environmental education and sustainability courses during their higher education.

How do higher education institutes prepare our educators for the important responsibility of integrating sustainability into lesson plans? How can training insure that our future elementary school teachers graduate college with the confidence to integrate outdoor education into their lesson plans? The journal *Education for Sustainable Development: The impact of an outdoor program on future teachers* (2006) understands the benefits of outdoor education and suggests that a sustainability education program should be implemented into the future educator's college curriculum before they are sent into classrooms and expected to confidently integrate sustainability lessons (Zachariou & Valanides, 2006).

Prospective teachers report inadequate environmental education in their higher education. In college, they are taught general environmental topics that do not focus on applying sustainable practices and do not provide strategies for teaching these issues. An outdoor education program for future teachers provides various educational experiences and teaching strategies. Teachers involved in Education of Sustainable Development Programs are provided hands on experience with integrating sustainability with students, which includes a deep understanding of environmental issues, strategies for practicing sustainability, and resources such as lesson plans to use in their future classroom (Zachariou & Valanides, 2006).

Are there resources available to teachers who wish to integrate school gardens into their classrooms and teach the concept of sustainability to their elementary school students? Online resources are plentiful and provide information on everything from environmental seminars for teachers, instructions on how to create and integrate school gardens, lesson plans to use in said gardens, lists of core concepts which correlate to garden lessons, and links to different organization which fund garden programs in elementary schools (Appendix D).

Research shows that elementary school teachers can teach sustainability through a number of strategies including: teaching sustainability as its own subject, using sustainability to teach one of the core concepts, incorporating project-based activities into the classroom (such as a school garden) to teach sustainability lessons, or teaching sustainability using a district-wide curriculum which requires collaboration from multiple schools (Church & Skelton, 2010).

Discussion

After studying the positive outcomes of a school garden, we know that by utilizing a school garden in elementary schools, students will experience a wide array of benefits. But without commitment and proper integration into our core concepts, the garden cannot be effective in the long run. We have learned that school, teacher, and parent commitment is essential. Despite all of the benefits associated with school gardens in the school setting, there are also many reasons that school gardens remain unsuccessful. Unfortunately, in many cases, the school garden is seen solely as a

laboratory extension of the classroom, in which teachers bring students out to once or twice during the school year for a one time experiment or science lesson.

Another major factor in whether or not a school garden will be successful is the level of training that teachers receive on environmental issues and sustainability practices. This implication can be avoided if teachers are given the proper environmental and sustainability education in their college or credential courses, as addressed in the literature review.

Schools face multiple challenges in the implementation of garden programs, mainly related to limited resources of funding, personnel, and time. One main reasons that school gardens close is due to lack of time on the part of teachers. Teachers do not have the time to learn something new, nor the time to introduce an idea external to the curriculum. “We’d love to integrate sustainability into our classrooms, but there is little to no room in the curriculum for add-ons” (Church & Skelton, 2010, p. 3).

Programs with only one willing leader at the school site are prone to failure in the event of staff burnout, or lack of commitment. School garden programs require long-term commitment and effort on the part of either the principal, the school community, a willing teacher, or an outside program in order to sustained. During the school year and vacation breaks, parent commitment and involvement is essential to sustainability, and support on the part of parents or volunteers is also one of the major challenges associated with school gardens (Ozer, 2007, p. 849 & p. 859).

Funding is also an obvious hurdle that keeps schools from developing large, successful school gardens such as MEarth in Carmel. Carmel is a unique town, with

land and funding available that is not available to other low-income cities in the Monterey Bay area. Without an outside organization to help fund and develop a school garden, elementary schools in low income areas simply do not have the money and resources available to start a school garden on their own. “Not surprisingly, multiple practitioners expressed that having a paid staff person to organize the program is key to a well coordinated and sustainable school garden program” (Ozer, 2007, p. 849). The idea that teacher, student, community, and outside partnership is necessary for sustainability education and school gardens to be integrated and become successful, was reflected in my interview with the Executive Director at MEarth, Tanya Roos. Tanja is not a faculty of the school district, MEarth was established and funded by an outside, non-profit organization.

“MEarth is an environmental education nonprofit with roots in Carmel Valley, California, that is growing the next generation of environmental leaders through education, collaboration, partnerships and community action. We educate and inspire through environmental stewardship” (MEarth, 2015). I learned from Tanja that when MEarth was founded, teachers were interested in utilizing the new school garden but did not have the time or training to successfully integrate garden activities into their lesson plans. Tanja, as a garden coordinator outside the classroom, researched the core concepts and worked hard to develop lesson plans for teachers which both met state standards and incorporated outdoor education.

How can teachers integrate gardening as a tool to teach the concepts of sustainability to elementary school students in the classroom?

There are a number of factors that a teacher must take into account when integrating gardening as a tool to teach the concepts of sustainability to elementary school students. First, teachers themselves must become educated on sustainability practices and understand the important responsibilities of educating their students on the environment and conservation actions. Some teachers may already understand the importance and implement sustainability into their own lifestyles, but there are also courses and workshops available for teachers who require more information (Appendix E). I believe that environmental and sustainability education through college courses is the best way to effectively teach educators how to integrating sustainability.

The next step to integrating a garden into the classroom requires actually creating a school garden. Many schools in California have the garden space set aside, but commitment and resources are not always readily available. Outside funding is available for teachers, schools, and districts interested in utilizing a garden for educational purposes, if resources are sought out.

Teachers must then correspond outdoor garden activities with the California Core Concept standards. Gardens are great ways to teach standards and learning objectives outside of the classroom if properly integrated into the lesson plans. There are a number of websites which have already created lesson plans which do just that (Appendix E). Lastly, commitment from teacher, school, and volunteers is essential for developing a school garden which will last, in order to provide effective sustainability lessons and outdoor education to elementary school students for years to come.

Although integrating gardening as a tool to teach the concept of sustainability to elementary school students can seem like a daunting task for an elementary school teacher already scrambling for time, integrating outdoor education into the classroom will reap many benefits for both students, teachers, school, and communities. Resources and support must be sought out, ideally this research capstone project makes the process for teachers who wish to integrate sustainability and school gardens into their classrooms a bit easier .

Recommendation

The most effective way to spread the concepts environmental awareness and sustainability to the younger generations is to educate the future teachers in the higher education setting. A course in either the upper division level for education majors or in the credential program which focuses solely on sustainability and outdoor education would result in a whole new generation of environmentally conscious educators. When teachers have received training and support on methods for utilizing a school garden, children will experience a vast array of benefits and sustainability practices which will stick with them throughout their adult lives.

Secondly, I recommend that teachers utilize resources found online (Appendix E) and reach out to districts, colleagues, and parents for support when integrating a school garden into the classroom. School gardens are more likely to succeed with committed staff involvement. For teachers who are limited on time, I suggest using online lesson plans which integrate garden activities into the state standards as a basis for outdoor student education.

Problems and Limitations

To get a different perspective, I planned to conduct a survey with 3rd grade teachers at J.C. Crumpton Elementary school. This survey would reveal drawbacks that many, less privileged, schools experience when attempting to integrate school gardens into the learning experience. Unfortunately, due to time limitations and communication problems, the surveys were never sent out to teachers, so I was unable to include the feedback from teachers at J.C. Crumpton into my research.

Conclusion

As educators, it is our responsibility to provide students with the knowledge, skills, and motivations necessary to develop environmentally literate adults who contribute to creating a sustainable future. Teachers who receive school support, collaborate with committed volunteers, and acquire access to the appropriate resources can integrate gardening as a tool to teach the concepts of sustainability to elementary school students in the classroom.

Sustainability can be taught using a number of methods, school gardens being one of the most effective and beneficial strategies. School gardens are the ideal setting to model sustainability for elementary student in a hands-on approach that goes deeper than classroom discussions. Research suggests that school gardens can be a powerful tool in promoting outdoor education, encouraging positive peer relationships, and building strong communities, while teaching sustainability concepts.

“A system that is sustainable should meet today’s needs without compromising the ability of future generations to meet their own needs” (Shilling, 2013). Society as a

whole benefits from having an environmentally conscious citizen who can make an informed impact on social issues involving natural resources. Sustainability does not need to be an ambiguous topic, and with this research I hope to clarify that notion.

References

- Adkins, C., Simmons, B. (2003-2004). Outdoor, Experiential, and Environmental Education: Converging or Diverging Approaches? ERIC Digest. Retrieved October 2015.
- Athman, J.A., Monroe, M.C. (2001). Elements of effective environmental education programs. Eric Document Reproduction Serv. Retrieved November, 2015.
- Brundtland, H. (1980). Report of the World Commission on Environment and Development: Our Common Future. Retrieved October, 2015.
- Bullock, J.R. (1994). Helping children value and appreciate nature. Day Care Early Education. Retrieved October, 2015
- California's Environmental Principles and Concepts. (2015). California Department of Resources Recycling and Recovery. Retrieved October, 2015 from <http://www.californiaeei.org/abouteei/whatastaught/epc/>
- Church, W., Skelton, L. (2010). Sustainability Education in K-12 Classrooms. Retrieved October 15, 2015 from <https://www.facingthefuture.org/Portals/0/Documents/Articles/Informational%20Papers/Sustainability%20Education%20in%20K-12%20Classrooms.pdf>
- Environmental Literacy Task Force Report. (2014). A Blueprint For Environmental Literacy: Educating Every California Student In, About, and For the Environment. Retrieved November, 2015 from <http://www.cde.ca.gov/pd/ca/sc/documents/envronliteracyblueprint.pdf>
- Green, Somerville. (2013). Sustainability education: researching practice in primary schools. Retrieved November 11, 2015 from <http://www.tandfonline.com/doi/abs/10.1080/13504622.2014.923382?journalCode=ceer20>
- Hedley, A., Ogden, C., Johnson, C., Carroll, M., Curtin, L., & Flegal, K. (2004). Overweight and obesity among U.S. children, adolescents, and adults. Retrieved October 2015.
- Lewis, C.A. (1996). Green nature/human nature: The meaning of plants in our lives. Univ. of Illinois Press, Urbana. Retrieved November, 2015.
- Lohr, V. I., Pearson-Mim, C. (2005). Children's Active and Passive Interactions with Plants Influence Their Attitudes and Actions toward Trees and Gardening as Adults, 1-5. Retrieved October 8, 2014 from http://www.researchgate.net/publication/266386468_Children's_Active_and_Pas

[sive Interactions with Plants Influence Their Attitudes and Actions toward Trees and Gardening as Adults](#)

- Louv, R. (2015). *Last Child in the Woods: Saving our children from nature deficit disorder*. Chapel Hill, NC. Algonquin Books. Retrieved November 2, 2015.
- Marcus, C. (1992). Environmental memories, p. 87–112. In: I. Altman and S.M. Low (eds.). *Place attachment*. Plenum Press, New York. Retrieved October, 2015.
- MEarth. (2015). Retrieved September 25, 2015 from <http://mearthcarmel.org/>
- MPUSD. (2015). Retrieved September 25, 2015 from <http://www.mpusd.k12.ca.us/>
- Ozer, PhD. J.E. (2007). The Effects of School Gardens on Students and Schools: Conceptualization and Considerations for Maximizing Healthy (Health Education & Behavior, Vol. 34 (6): 846-863. Retrieved October 15, 2015. <http://heb.sagepub.com/content/34/6/846.full.pdf+html>
- Peterson, Wood. (2015). Sustainability: Higher Education's New Fundamentalism. National Association of Scholars. Retrieved November 2, 2015 from <http://files.eric.ed.gov/fulltext/ED558526.pdf>
- Plye, R.M. (2002). Eden in a vacant lot. *Special places, species, and kids in the neighborhood of life*. Retrieved October 15, 2015.
- Plye, R.M. (2008). *No Child Left Inside: Nature Study as a Radical Act*. Retrieved October 15, 2015.
- Produce for Better Health Foundation. (2003). Retrieved on November, 2015 from <http://www.fns.usda.gov/sites/default/files/wic/pi-30.pdf>
- Shilling, F., Khan, A., Juricich, R., & Fong, V. (2013). Using indicators to measure water resources sustainability in California. Retrieved November, 2015 from <http://ascelibrary.org/doi/pdf/10.1061/9780784412947.268>
- Zachariou, A., Valanides, N. (2006). Education for Sustainable Development: The impact of an outdoor program on future teachers. *Science Education International* Vol 17. No. 3, pp 187-203. Retrieved October. 15, 2015 http://www.icasonline.net/sei/17-03-2006/17-03-2006-187_203.pdf

Appendix A

RESULTS: Questionnaire for teachers at Carmel Middle School utilizing MEarth

2015 Capstone Project: Benefits of school gardens and teaching sustainability

1. Do you think that 6th grade students at Carmel Middle School know what sustainability is?

(ex. water conservation, composting, growing own food, recycling, etc.)

Responses: (2) Most students know what sustainability is.
 (2) Some of the students know what sustainability is.
 (0) None of the students know what sustainability is.
 (0) I don't know.

2. Do you believe that teaching students about sustainability is important? (ex. water conservation, composting, growing own food, recycling, etc.)

Responses: (4) Yes
 (0) No
 (0) What is sustainability?

3. How do you educate students on sustainability/ environmental issues? (check all that apply)

Responses: (2) Class discussion
 (0) Textbooks
 (1) Hands on activities in class (recycling, etc.)
 (2) MEarth handles all sustainability education
 Other: -N/A (language class)
 -Remind students to recycle, conserve water, etc. when it fits in.

4. Are there any other sustainability/ environmental education programs being implemented in Carmel Middle school, besides MEarth?

Responses: (2) Yes
 (1) No
 (1) No response

5. Which classroom subjects are integrated into the MEarth garden? (check all that apply)

Responses: (3) Science
 (2) Literature
 (2) Language/ History

- (1) Social Studies
- (1) Core

6. Do your students enjoy their time spent working in the MEarth habitat?

- Responses:
- (3) Yes, they all enjoy it.
 - (1) Majority of them enjoy it
 - (0) Only certain students enjoy it
 - (0) No, they don't enjoy it

7. Was integrating MEarth's hands-on activities into your lessons plans difficult?

- Responses:
- (0) Yes, it was difficult.
 - (0) At first it was difficult.
 - (1) Not hard, with support from Tanja.
 - (2) Not difficult at all.

Other: It was an absolute pleasure! We got loads of help from the staff to make the habitat lessons fit our units. We are very grateful for the individual attention we have been given.

8. Do you think that your students have benefited from a school garden?

- Responses:
- (4) Yes
 - (0) No

9. Can you share a few benefits of using the MEarth habitat to educate students?

- Great for students how are hands on learners
- Excellent for building a sense of community in a class
- New perspective on unit topic from Katy
- History / cultural lesson and perspective from cooking, making African masks, Egyptian boats, Chinese teas, etc...

The core curriculum has at least one visit to the habitat for each unit as the year goes on:

1. EARly Humans-bury artifacts, plant ancient fava seeds, learn about early irrigation and crop rotation
2. Ancient Egypt and Israel-make tule boats, make flat bread as in the Exodus
3. Ancient India-Make pumpkin chutney and learn about spices
4. Ancient China-Chinese tea tasting, tea growing
5. Ancient Greece-harvest fava beans and make humus two ways and taste test

6. Ancient Rome-goat cheese, fig and honey tasting

Appedix BCalifornia's Environmental Principles and Concepts

Learn more about the EP&C's and the corresponding concepts below.

Principle I - People Depend on Natural Systems**People Depend on Natural Systems**

The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Concept A. Students need to know that the goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.

Concept B. Students need to know that the ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.

Concept C. Students need to know that the quality, quantity, and reliability of the goods and ecosystem services provided by natural systems are directly affected by the health of those systems.

Principle II - People Influence Natural Systems**People Influence Natural Systems**

The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Concept A. Students need to know that direct and indirect changes to natural systems due to the growth of human populations and their consumption rates influence the geographic extent, composition, biological diversity, and viability of natural systems.

Concept B. Students need to know that methods used to extract, harvest, transport, and consume natural resources influence the geographic extent, composition, biological diversity, and viability of natural systems.

Concept C. Students need to know that the expansion and operation of human communities influences the geographic extent, composition, biological diversity, and viability of natural systems.

Concept D. Students need to know that the legal, economic, and political systems that govern the use and management of natural systems directly influence the geographic extent, composition, biological diversity, and viability of natural systems.

Principle III - Natural Systems Change in Ways that People Benefit from and can Influence**Natural Systems Change in Ways that People Benefit from and can Influence**

Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Concept A. Students need to know that natural systems proceed through cycles and processes that are required for their functioning.

Concept B. Students need to know that human practices depend upon and benefit from the cycles and processes that operate within natural systems.

Concept C. Students need to know that human practices can alter the cycles and processes that operate within natural systems.

Principle IV - There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems

There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems

The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Concept A. Students need to know that the effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.

Concept B. Students need to know that the byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.

Concept C. Students need to know that the capacity of natural systems to adjust to human-caused alterations depends on the nature of the system as well as the scope, scale, and duration of the activity and the nature of its byproducts.

Principle V - Decisions Affecting Resources and Natural Systems are Complex and Involve Many Factors

Decisions Affecting Resources and Natural Systems are Complex and Involve Many Factors

Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

Concept A. Students need to know the spectrum of what is considered in making decisions about resources and natural systems and how those factors influence decisions.

Concept B. Students need to know the process of making decisions about resources and natural systems, and how the assessment of social, economic, political, and environmental factors has changed over time.

Appendix C

Energy and Water Conservation Guidelines

Monterey Peninsula Unified School District Operations Department
Daniel Albert Jr., Associate Superintendent of Business Services,
albert@mpusd.k12.ca.us (831) 645-1269
David Chandler, Energy Specialist,
dchandler@mpusd.k12.ca.us, (831) 645-1268, (831)901-7376

Organization:

- Every person is expected to become an “energy saver” as well as an ‘energy consumer”
- The staff member is responsible for implementing the guidelines during the time that he/she is present in the instructional room or office.
- The organization is committed to and responsible for a safe and healthy learning environment

General:

- All unnecessary lighting in unoccupied areas will be turned off. Staff should make certain that lights are turned off when leaving the instruction room or office when empty. Utilize natural lights and fractional switch where appropriate.
- All outside lighting shall be turned off during daylight hours. Gym lights should be not be left on unless the gym is being utilized.
- Room doors shall remain closed when HVAC is operating. Ensure doors between conditioned space and non-conditioned space remain closed at all times.
- All office machines shall be switched off or put on energy saving setting each night and switch off during unoccupied times.
- All computers should be manually shut down each night. Monitor, local printer and speakers should be turned off. (Network equipment is excluded)
- District network will place PC's in sleep mode after 60 minutes of inactivity. To avoid or exit sleep mode move mouse.
- All staff room and classroom refrigerators shall be cleaned out and unplugged during school breaks. Refrigerators should be consolidated during intersession and summer school to maximize energy savings.
- Do not water during the heat of the day. Adjust or turn off watering schedule during wet seasons.

Energy Specialist: The Energy Specialist shall work with staff to create plans to conserve energy and water use at each site, including plans for:

- Reducing energy use during occupied and unoccupied times.
- Shutting down lights and equipment when facilities during breaks and holidays

- Updating each site's preventative maintenance schedule for emergency lighting, generators, exit lighting, and other safety related equipment
- The following operations shall also be reviewed by the Energy Specialist in order to ensure that they further the district's energy and water conservation goals:
 - Educational programs
 - Classroom and building management and maintenance o Food services and equipment maintenance
 - Landscaping selection and irrigation
 - Transportation services and maintenance
 - New construction
 - Administrative operations
 - Use of facilities by outside groups
- The Energy Specialist provides regular (at least semi-annual) program updates to the Board.
- The Energy Specialist performs routine audits of all facilities and communicates the audit results to the appropriate personnel.
- The Energy Specialist is responsible for either directly or indirectly making adjustments to the Organization's Energy Management systems, including temperature settings and run times for Heating, ventilation, night lights, irrigation, and other controlled equipment.
 - Occupied Heating set points 68-72 degrees Unoccupied set point 55 degree (60degrees during extreme weather)
 - Occupied Cooling set points 74-78 degrees Unoccupied set point 85 degrees
- The Energy Specialist provides monthly energy saving reports to facility administrators detailing performance results.
- Proper and thorough utilization of data loggers will be initiated and maintained to monitor relative humidity, temperature, and light levels throughout the organization's facilities to ensure compliance with organization guidelines

Administration: To enlist the support which is essential to achieving the district's energy and water conservation goals, the administration at each site shall:

- Solicit input from staff, students, and parents/guardians related to district energy and water use
- Develop strategies designed to ensure cooperation from students and staff in all conservation efforts
- Recognize those who reduce energy and water use The facilities administrator is responsible for the total usage of his/her facility.
- Administration will regularly communicate the importance and impact of the energy conservation program to its internal and external constituents.

Custodian: The custodian is responsible for control of common areas, i.e. halls, cafeteria, etc.

- Turn off lights if the room is unoccupied.
- Keep room doors closed if heaters are on.
- Since the Custodian is typically the last person to leave a facility in the evening, he/she is responsible for verification of the nighttime shutdown.

- All lights will be turned off when students and staff leave for the day.
- Custodians will turn on lights only in the area in which they are working. All exhaust fans turned off daily. Ensure all plumbing and/or intrusion leaks are reported and repaired immediately.

Nutritional Services:

- All exhaust fans turned off daily All lights turned off when rooms are not occupied.
- Turn non programmable thermostats to 55 degrees or off each night. Verify the programmable thermostats are correct. Report thermostat issues to the Energy Specialist.
- All computers should be manually shut down each night. Monitor, local printer and speakers should be turned off. (Network equipment is excluded)
- Refrigerators and freezers should be consolidated, emptied and turned off during summer break. Milk coolers should be consolidated and turned off during (2 week breaks)

Teachers

- All lights turned off when rooms are not occupied. All computers should be manually shut down each night.
- Monitor, local printer, projector and speakers should be turned off.(Network equipment is excluded)
- Turn non programmable thermostats to 55 degrees or off each night. Verify the programmable thermostats are correct. Report thermostat issues to the Energy Specialist.
- Keep classroom door shut if the heater is on.
- Where cross-ventilation is available during periods of mild/ warm weather, turn off HVAC equipment and adjust temperature with windows and doors. Cross-ventilation is defined as having windows and/or door to the outside on each side of the room.
- Manage your light levels by utilizing natural light and fractional switches.

Office and Library

- All lights turned off when rooms are not occupied.
- All computers should be manually shut down each night. Monitor, local printer and speakers should be turned off.(Network equipment is excluded)
- Turn non programmable thermostats to 55 degrees or off each night. Verify the programmable thermostats are correct. Report thermostat issues to the energy specialist.
- Keep room doors shut if the heater is on. Where cross-ventilation is available during periods of mild/warm weather, turn off HVAC equipment and adjust temperature with windows and doors. Cross-ventilation is defined as having windows and/or door to the outside on each side of the room.
- Manage your light levels by utilizing natural light and fractional switches.
- All office machines shall be switched off or put on energy saving setting each night and switch off during unoccupied times.

Appendix D

Resources available to teachers who wish to integrate school gardens into their classrooms and teach the concept of sustainability to their elementary school students

A number of sustainability education resources are available online. These resources provide links and information on professional development, and consulting, covering everything from environmental seminars for teachers to different organization which fund garden programs in elementary schools. These are online resources are available regarding curricula linking outdoor activities to core concepts, garden activities for elementary school students, whether it be for inserting a few lessons into the curricula or establishing sustainability as a thematic context for a district. All of the sites provided below are good starting points for integrating sustainability and garden programs into the classroom, as most of them also provide lists of additional resources:

1. Bartels, K. (2012). Teaching sustainability, teaching sustainably.
2. Benefits of a school garden: <https://guilford.ces.ncsu.edu/sgn/benefit/>
3. The Benefits of Farm to School:
<http://www.farmtoschool.org/Resources/BenefitsFactSheet.pdf>
4. The Cloud Institute for Sustainability Education: <http://www.sustainabilityed.org/>
5. Common core math and English language arts standards we can frequently reinforce in gardening, cooking and tasting activities (2013):
<http://www.lifelab.org/wp-content/uploads/2013/12/CommonCoreConnections.pdf>
6. Facing the Future: <http://facingthefuture.org/>
7. Getting started: A guide for creating school gardens as outdoor classrooms (2007):
<http://www.ecoliteracy.org/sites/default/files/uploads/getting-started-2009.pdf>
8. K-8 Next generation science standards in the garden a list of NGSS that are well suited for garden-based learning. (2013):
http://www.lifelab.org/wp-content/uploads/2013/12/K-8-NGSS_In_the_Garden.pdf
9. Shelburne Farms: <http://www.shelburnefarms.org/index.htm>
10. U.S. Partnership for Education for Sustainable Development:
<http://www.uspartnership.org>
11. Ways to integrate a school garden into lessons: Growing Minds ASAP's Farm to School Program: <http://growing-minds.org/school-gardens/>