ABSTRACT: Based on a project establishing school gardens in Chiapas, Mexico, this thesis explores the potential of garden based science education to foster collaboration and communication between traditional models of knowledge and western science education. By virtue of its standardization, contemporary education is unable to meet the needs of students from every background. This thesis explores the challenges that students from rural and indigenous communities face in reconciling their own experiences of the natural world with western science as it is taught in schools, as well as the strengths with which they meet these challenges. Drawing from multiple disciplines this thesis offers insight into the components necessary to build a culturally and ecologically resilient garden education program.

KEYWORDS: Chiapas, Mexico, Garden Education, Traditional Ecological Knowledge, Contextualized Curriculum, Maya
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The sun set on my first day in Chiapas, Mexico and the golden light glowed among the bent stalks of maize on the balding hillsides. The bus swung around hairpin turns on its haphazard way to the mountain town of San Cristobal de Las Casas where I would make my home for the next three months. I carried with me an overstuffed backpack and, though I didn’t know it yet, stow-away cultural baggage that I would later unpack. I had arrived to help with a school garden project, which would build gardens in an alternative urban school, a semi-rural school and a rural indigenous school while offering teacher trainings in how to use these gardens as an effective teaching tool. Since I would be working with a team of three researchers with training in the fields of biology and anthropology, the project would include an evaluation of the effects of school gardens on students’ attitudes towards agriculture, science and nutrition. I was looking forward to exploring the connection between traditional agricultural knowledge and school gardens, however all of the questions, surveys and activities that I devised only seemed to reveal my own cultural biases. For instance, I expected the rural and indigenous students to resemble the urban students who were eager to ask and answer direct questions. Rather than leading me to believe that they had nothing to say, their reticence led me to question the cultural blinders that were obscuring a clearer vision of these students and teachers. I began looking critically at the cultural misunderstandings inherent to the standardized mass education system. In this paper I will examine the potential of school gardens to create space for a more culturally sensitive curriculum.
This paper is the fruit of much research and reflection, all of which would not be possible without the encouragement and support of so many people. I’d like to thank Helda Morales PhD for capturing my imagination with her curiosity and passion, and keeping me at the edge of my seat with her thoughtful perspective on the world. I have so much gratitude for Bruce Ferguson PhD for his wit and commitment, Marcos for good games of squash and Dona Lily for her generosity. Big thanks to Ron PhD and Kippy Nigh for their unending inspiration and generosity during my time in San Cristobal. Steve Gliessman PhD, thank you so much for igniting in me a passion for putting “culture” back into agriculture and Robbie Jaffee, your incredible wisdom and support around garden education has been amazing. Ultimately none of this would have come to fruition without Flora Lu PhD, whose commitment to the success of her students is unparralleled, I am so grateful to her for her patience in revising my many drafts and her guidance when I was lost. Through thick and thin there are those people who are there for you no matter what, I would like to recognize all of the family, friends and neighbors that have shaped me through the years. I would especially like to thank Loren Mueller who has loved me through my freak-outs and reminded me of the importance of celebrating life. Finally, thank you Suzanne Mills and Michael Price, you know me better than any one in the world since you brought me into it! I am so fortunate to have such loving and supportive parents.
INTRODUCTION

The Mayan people are heir to a rich agricultural history, which draws upon extensive ecological knowledge. Over 7,000 years ago in Central and Southern Mexico, corn or maize (*Zea mays*) was domesticated from its wild relative Teosite (*Zea sp.*) (Simpson et. al. 2001). Today maize exists as a dietary and cultural staple of Mayan people. Maize is traditionally cultivated as the centerpiece in the ecologically complex polyculture called *milpa*, which includes beans, squash and several other medicinal and edible greens. Recent research conducted by agroecologists, entomologists and geneticists have revealed the considerable ecological wisdom informing Mayan agricultural practices.

Just as in an ecosystem, agricultural diversity maximizes species interactions and creates greater stability. Mayan agriculturalists have utilized ecological principals to provide a stable and productive food source. Mutualistic interactions between the three principal crops of the milpa have been documented to increase the yield of corn (Amador and Gliessman, 1990). Nitrogen a limiting nutrient in many agroecosystems, is fixed by the *Rizobium* bacteria, which makes its home in the root nodules of all members of the Legume family (*Fabacea*). Fixed nitrogen is made available to maize through mycorrhizal relationships between the root systems, thus allowing for greater maize productivity (Bethlenfalvay et al. 1991). Squash contributes to the system by controlling weeds. Its broad spiny leaves block sunlight from reaching the weed’s germinating seeds, while allelopathic compounds found in the same leaves chemically discourage weed germination (Gliessman, 1983).
Research by entomologist Dr. Helda Morales and her colleagues (2000, 2002) have illuminated the sophisticated understanding of insect-crop dynamics held by Mayan farmers in Guatemala. Rather than subscribing to the conventional paradigm, which deems any insect a potential pest, the perspective taken by traditional Mayan farmers is that only insects that cause economic damage are pests. This view aligns closely with the doctrine of integrated pest management (IPM). As a result, Mayan farmers’ approach to pest control is preventative rather than curative. Practices such as crop rotation, appropriate site selection, soil fertility management, the use of weeds as trap crops and careful timing in planting and harvesting so as to avoid pest population peaks, reflect the careful observation and experimentation of traditional Mayan farmers.

The observational skills and experimental bent of Mayan agriculturalists is also evident in the distribution of different maize landraces. Though ecological factors provide the dominant force in determining the distribution of landraces, Brush and Perales (2007) observe that the active selection of maize varieties and seed sharing within communities reflect the cultural preferences of that community. These cultural preferences have resulted in a high diversity of cultivars adapted to a range of different local climates and preferences. Just as higher biodiversity provides greater ecosystem stability high cultivar diversity provides greater agricultural stability for that individual crop.

Given the active role Mayan agriculturalists have been shown to play in observing and exploiting ecological relationships, one would expect the knowledge of their children to reflect this ecological attentiveness. The underlying assumption is that a child’s exposure and experiences with the natural world should correlate positively with their
scientific ability. This is an assumption that we had the opportunity to test. The project is aimed at building school garden programs in three culturally and economically distinct schools in Chiapas, Mexico: Vincente Guerrero, a school servicing a Mayan Tzotzil speaking community of subsistence agriculturalists; Enrique Rebsamine, a school set in a community of mestizo market farmers; and Peqeno Sol, an alternative upper middle class school enrolling urban students from San Cristobal. In our initial surveys, we gave the students colored pencils and paper an asked them to draw what they would like to see in their dream garden. Paradoxically we found that the drawings made by the urban students of Peqeno Sol display far more ecological awareness than the drawings of rural Mayan and Meztizo students who had considerably more direct experience with the natural world.

The majority of the drawings penned by the urban students show a connectedness between the elements of the garden reflecting an ecological understanding of these interactions. There are plants rooted in the earth, bugs crawling on the plants, birds eating bugs, sunshine smiling in the corners and sometimes rain clouds. On the other hand, the majority of the drawings made by the rural students display individual vegetables floating in the air—not rooted in the ground or in relationship to other elements of the picture—and although there are occasionally birds, bugs and suns included in the picture, they are not interacting with the vegetables.

I seek to explore whether these patterns are truly a reflection of these students knowledge or a symptom of a school system, which does not provide the tools for students to build off of their existing knowledge. Instead of building off of student’s existing experiential and cultural knowledge, standardized schooling often enforces a curriculum that is not always culturally or ecologically relevant. It has been shown in other parts of
the world such as Africa and North America that the edge which indigenous students have in their experiential relationship to the natural world is not reflected in their scores in school science (Jegede 1995; Aikenhead 1995). This paper seeks to explore the ways in which standardized education understands science and utilizes the strengths endemic to indigenous and rural students. I will also examine the potential of school gardens to provide a tool for more contextualized curricula so as to benefit from and reinforce the existing cultural and ecological knowledge of rural and indigenous students.

Following the genesis of a garden, this paper begins with a rich soil built from the hummus of history. Planted into this soil are the seeds of theory. This intellectual framework looks at the cultural context that Mayan students bring to the classroom, the tension between traditional knowledge systems and western science, the complementary aspects of these two epistemologies, and how space can be made for a diversity of epistemologies and learning styles through contextualized curriculum. This theory germinates through my experiences, which I frame in my methodology. I harvest insights that have ripened through reflection on these experiences. Finally, just as a good gardener saves seed from her favorite plants, I distill the lessons I have learned into suggestions for creating a resilient and self-sufficient garden education program for future cultivation.
BACKGROUND

Preparing the Soil: A Brief History of Education in Mexico

Western education was initially introduced to the indigenous populations of Latin America and other colonies as an extension of the missionary agenda. “Teaching skills such as literacy was accompanied by insistence on the cultural practices and values of the missionaries, including obedience, punctuality, settled life and private property...in addition to Christianity” (Rogoff et al. 2005). Later with the rise of nationalism, the standardization of education became a tool for fostering a national identity. In Mexico, the struggle between Spanish conquistadores and indigenous populations became the historical backdrop of the Mexican revolution (1910-1920) as the country’s intellectuals sought to define a national identity (Ruiz 2008). The politically peripheral and economically marginalized Indian population and rural peasants played a critical role in defining national identity. Since colonial times, there has been tension between indigenous people and the people of Spanish descent who identify as Ladino. Those who were of both indigenous and Ladino descent were considered mestizo, however after centuries of intermarriage the majority of Mexicans are of mixed heritage. Van Der Haar explains,

There is rather general agreement amongst scholars that the difference between Indian and mestizo people is not so much racial as it is a matter of socio-economic position. In the case of Chiapas... the main characteristics mentioned [in reference to indigenous people] are the importance of the community, the limited role of money and the involvement in subsistence agriculture...These characteristics are contrasted with the mestizo individualism and capitalistic orientation. (1993: 22).
This distinction has put indigenous people in a compromising position, where seeking out education and economic advancement puts individuals outside of the definition of indigenous. Though many supporters of the indigenous cause were intellectuals and artists with an idealistic view of what it meant to be Indian, practical Indianistas in the 1930s and 40s, sought to raise the economic standards of living for Indians. Education was at the heart of this reform. Ideally the function of a rural school was to build a bridge between the modern and indigenous worldview as well as give indigenous people a sense of their own value “erasing the myth of inferiority” (Ruiz 2008). The most notable and longstanding success of this movement was the establishment of bilingual schools under President Cárdenas 1934-1940 (Ruiz 2008). In 1951, Mexico’s National Indigenist Institute (INI) manifestation of Cárdenas’ reform, set up its first coordinating center in Chiapas where it worked closely with indigenous brokers or “cultural promoters” to establish bilingual schools (Van Der Haar 1993). However, for the most part this reform fell short of implementing a curriculum that simultaneously empowered local knowledge while providing modern tools for elevating economic standards.

In the decades following the Cárdenas administration, socialist policies were increasingly replaced by neoliberal reforms, which promoted a market driven approach to economic and social policy. These reforms culminated in 1994 when the North American Free Trade Agreement (NAFTA) came into effect. As a result of these policies, many small farmers were displaced from their land, either bought out by corporate agribusiness or out competed by imported crops subsidized by the US government. In Chiapas, a rich agricultural state in southern Mexico, neoliberal policies were responsible for the widening gap between rich and poor. On January 1st, 1994, a group of indigenous revolutionaries,
taking the name of the agrarian reformer and freedom fighter of the Mexican Revolution Emiliano Zapata, seized control of government buildings across Chiapas in protest of NAFTA. To this day Zapatistas have engaged in a primarily non-violent struggle to recognize the rights of indigenous people and raise the living standards of the poor. In many ways the Zapatistas have inspired a cultural renaissance, central to which is their focus on education that promotes cultural and ecological continuity.

Mexican public education today, is characterized by the increasing standardization of state and nationally mandated curricula (Martin 2008). These standards are often geared towards the needs of majority middle class students and fall short of meeting the needs of indigenous and rural students. Neoliberal policies have resulted in low pay for teachers and deficient educational resources provided to rural public schools. Such difficult circumstances have catalyzed the development of many educational innovations among creative and dedicated teachers, communities and NGOs seeking to counter these problems. The most well known among these educational innovations in Chiapas are the community schools inspired by the Zapatista movement. Designed to promote indigenous language and culture through locally designed curricula, these schools are taught by community members and besides basic academic skills provide students with the opportunity to learn about their cultural history, music and agricultural practices.

Though international agencies such as UNESCO and PREAL have been taking an interest in grass roots educational reform by utilizing these user generated solutions to

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1 UNESCO the United Nations Educational Scientific and Cultural Organization works world wide to promote peace and security through education among other things. PREAL or Programa de Promoción de la Reforma Educativa de América Latina is an NGO that works to promote educational reform in Latin America.
create new policies, the Mexican government has jealously maintained centralized control of the educational system. Examples of intolerance to dissent abound. In the teachers strike in Oaxaca (2005-2006), teachers demanding better resources such as books and free school lunches for rural poor schools in order to improve learning conditions were met with police violence. Just this winter, while I was staying in San Cristobal, teachers were camped out in the main square with similar demands. Nonetheless small-scale innovative education solutions continue to crop up in the periphery of this vehemently centralized system; however, very few of these projects have been documented. Documentation of these educational experiments could provide experiences and reflections that would inform policy and advise grassroots organizers. In this paper I seek to provide reflections on an innovative educational project setting up school gardens in three different communities.

**Study Site: Chiapas**

Chiapas, the southern most state of Mexico, is bordered to the east by Guatemala, to the south by the Pacific Ocean, to the West by the state of Oaxaca, to the North by the state of Tabasco and to the Northeast by Veracruz. The highly varied geography of the state makes for a diversity of different climates and ecosystems. This geographical diversity is paralleled by a great diversity of indigenous culture. Forty-one indigenous dialects have been recorded in this state alone, and indigenous language is spoken by 24.6% of the state’s population (Chiapas.com). Chiapas also boasts the highest percentage of monolingual indigenous speakers in all of Mexico: of the indigenous language speaking population 36.5% only speak their native tongue. Agriculture is the mainstay of the state’s
economy. The agricultural sector employs 53.3% of the state’s population, representing the largest percentage of employment (Chiapas.com).

This study took place in San Cristobal de las Casas and the surrounding region. San Cristobal is a small city located in the central highlands, one and a half hours from the state capital of Tuxla Gutierrez. The city’s population according to the 2005 census is 142,364 people, making it the third largest community in the state (Chiapas.com). The valley that holds the city used to be characterized by wetland ecosystems; unfortunately, much of this wetland has been paved over and polluted. However ecological preserves in the surrounding hills protect the biodiversity in the Cloud forests of Holm Oak and Pine, which are hung with a menagerie of epiphytes and house a diversity of plant and animal species. The indigenous dialects endemic to this area include Tzotzil and Tzeltal. The colonial facades and cobbled streets are a reminder of the Spaniard’s harsh occupation.

**THEORY**

**Creating Space for Diversity in the School Curriculum**

This century has witnessed the global spread of compulsory mass education and with it the ethnocentrism of western education's universal value. Rogoff et al. (2005) observes that the curricula, resources and methods of the modern educational system are designed for middle class contexts where school prepares students for occupations that differ from those of their parents. Curricula are often based around western middle class values and learning styles. In rural and indigenous settings, cultural values are quite different, children are often expected to take up the family trade, the values and method of transmitting this knowledge are often in stark contrast to western schooling environments.
In the next two sections we will be looking at the cultural context of indigenous and rural students as well as the content of standardized science curriculum and how it falls short of meeting the needs of indigenous and rural students.

**Weeding out Ethnocentrism**

“Education is, at its essence, learning about life through participation and relationship with the community including not only people but plants, animals and the whole of nature...this ideal of education directly contrasts with the dominant orientation of American education that continues to emphasize objective content and experience detached from primary sources and community” (Cajete 1994: 26).

By examining the cultural values and expectations of indigenous and rural students, we can begin to understand the learning styles that these students bring to the classroom. Increasing hours spent in age graded western schools segregates students from adult communities, giving children fewer opportunities to learn through participation and make meaningful contributions to their community. Gaskins (1999) in an observational study of Yucatec Mayan children found that children were integrated into the world of adult work and expected to participate either by active observation or completing tasks given to them by their parents. Parents seldom gave explicit oral explanations, and children were discouraged from asking explicit questions. Since children were expected to learn through paying close attention to what was going on, questions are interpreted as inattention. Other studies by Silva et al. (2010) and Chavez et al. (2002) corroborate this information, finding that Mexican-American and indigenous children are far more adept at learning and participating through observation. In classroom settings where students are expected to
engage through asking and answering questions, this sort of observational learning style can be misunderstood as passive. However, far from being a passive way of learning, the observational behavior Mayan children engage in is a form of participation. Gaskins (1999) also observed that though parents made many direct requests and demands, the children were given the freedom to accomplish those tasks in whatever manner they saw fit. This sort of freedom is seldom seen in the classroom where teachers directly guide the processes and outcomes of activities. A study conducted by Chavez et al. (2002) compares the problem solving strategies of Mayan family groups (a mother and three children) with varying experience with western education. Chavez and her colleagues found that mothers with more western education would directly guide the process by dividing and delegating the task amongst her children, while mothers with little western education would work collaboratively with her children. This study illustrates the contrast between the collaborative traditional model and the hierarchical western educational model, which not only seeks to control the outcome but the process as well. In the Mayan system of parenting and mentoring, children are given responsibility over themselves and others at a young age and are able to make a positive economic contribution to the family by the time they reach adolescence (Gaskins 1999). Children are included in a collaborative family effort to maintain their livelihood. The parenting and educational values held by indigenous cultures is often misunderstood and children with this kind of upbringing are seen as disadvantaged. The western paradigm which maintains children should inhabit their own world of play often looks with pity on scenes of 5 year old girls walking around with babies on their hips and little boys hauling firewood. Though overworking children cannot be justified, allowing children to make meaningful contributions to the community
can be beneficial. Gaskins reminds us to be self reflective in our judgments by drawing a cross cultural comparison which illuminates certain shortcomings of the western educational paradigm that are not as prevalent in indigenous communities:

In addition to certain benefits, there might also be some costs incurred by our own [western] children engaging in the sort of child-oriented world of play and nonresponsibility that we construct for them and reward them for, including such things as identity crises, social isolation or selfishness, erosion of intrinsic motivation for real-world tasks and low self-esteem (Gaskins 1999: 58).

Discrepancies between indigenous and western educational paradigms often put students in the difficult position of having to reconcile and navigate two different systems. The result is often lower academic performance by indigenous and rural students as well as the stress of shifting identity (Jegede, 1999). The pressure of creating a bridge between these worlds should not fall to the student but rather the teachers, parents and curriculum. Educational innovations, which unite these spheres, can foster tolerance, diversity and culture.

Western schooling also affects the greater social and economic organization of a community. In a longitudinal study of three generations of students in a Guatemalan Mayan community, Rogoff et al (2005), finds that increasing enrollment in western schools corresponds with shifts in employment from subsistence milpa agriculture and market coffee cultivation to tourist driven economic opportunities as well as other more specialized occupations. While acknowledging the importance of giving indigenous communities resources to accomplish their own goals of economic development, Rogoff et
al. highlight some negative implications of the naturalization of western schooling on the child development and community structure of indigenous Mayans. Time spent in the classroom infringes upon time engaged in learning practical skills at home. These opportunity costs along with the limited nature of specialized positions mean that many students leave school without a job or the necessary skills to provide for themselves and their families. This phenomenon is not isolated to Mayan communities. Taylor and Mulhall’s study of rural education reports the feedback of one Indian parent who observed that “those who come back [from school] after 7 years are sometimes more dumb than those that never went” (Taylor & Mulhall 2001: 142). Because of the lack of culturally contextualized curriculum some students are not well served by standardized curriculum.

A Tale of Two Epistemologies

In order to better understand the utility of culturally sensitive and contextualized curricula, let us look specifically at science education. Paradoxically, indigenous and rural students who are directly dependant upon natural resources for their survival and thus have daily interactions with the natural world often perform poorly in the subject of science. This is evidence of a disconnection between the personal and cultural experiences of the student as well as the transmission and content of science curriculum. When taken from an anthropological perspective, science education is a form of cultural transmission. Science is taught in the majority of schools without acknowledging or incorporating other cultural paradigms for understanding the natural world (Reyes-Garcia 2010). When taught in this way science education marginalizes and de-values traditional knowledge disconnecting students from their own experiences. Far from being in opposition
traditional ecological knowledge and scientific knowledge can be complementary. Creating a science curriculum that integrates a diversity of approaches to knowing the natural world has implications that extend beyond the classroom. By mending the rift between seemingly divergent epistemologies we can create an understanding of the natural world that includes very personal experiences and very generalized predictive models.

There exists a fundamentally human urge to make sense of the natural world. Western science and traditional ecological knowledge systems are two approaches to the same, “intellectual process of creating order out of disorder” (Berkes 1999). Both epistemologies are based in protracted observation of the natural world. However Western science and traditional epistemologies diverge in a crucial way, as anthropologist Levi-Strauss (1962: 269) explains, “the physical world is approached from opposite ends in the two cases: one is supremely concrete, the other supremely abstract.”

For the sake of comparison I will make generalizations in this section about the nature of western science and indigenous epistemologies. It is important to acknowledge the diversity of fields within western science as well as the plurality of traditional cultures and epistemologies. Though generalizations belie this diversity, they are useful in examining the fundamental similarities and differences between these two systems of knowledge. In order to understand the commonly held dichotomy between these two systems as well as the complementary nature of these sciences we must take the risk of oversimplification here.

The epistemology of Western science is characterized by the belief that the physical world is ultimately knowable through empirical and rational inquiry. Western Science takes a materialistic approach to gaining this knowledge by isolating, deconstructing and
decontextualizing the parts of the natural world. Built into the paradigm of western science are dichotomies between subject and object, nature and culture, which abstract knowledge from any ethical context (Berkes 1999). Knowledge is generated for its own sake and not for the greater community. Increased specialization in the scientific community is often accompanied by prohibitive jargon, which further isolates knowledge generated by western science.

There is a growing academic interest in reconciling the western science of ecology with traditional and indigenous knowledge systems. Fikret Berkes, pioneer in this burgeoning field, defines traditional ecological knowledge as

A cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment (Berkes 1999:8).

Though there exists a diversity of cultures each with its own system of knowledge, traditional knowledge systems tend to be integrated into the local culture and ecosystems. There is not the same dichotomy between subject and object, nature and culture as you see in the “unbiased” observer of the western scientific tradition. Because of this integration, traditional systems tend to have a larger moral and ethical context (Berkes 1999). The natural world is often imbued with the sacred and intimate personal relationships, which are formed between observer and environment. Intimate knowledge of the landscape is gathered through the protracted observations of generations with the intention of using that knowledge for the on-going survival of the community.
Companion Planting: How Different Epistemologies Can Co-exist.

There is a growing consensus among the global community that humans must find a way live more sustainably on this earth. Local knowledge systems provide a resource for local community based sustainability. Where Western science prides itself on distilling knowledge to theories that can be generalized and applied on large scales, traditional ecological knowledge provides knowledge endemic to the specific ecosystem. Atran et al. (2004) observe that “paradoxically, in the same cultures that have seen large advances in biological science, practical knowledge of nature has dramatically diminished.” In a study of folk taxonomy, Atran et al. (2004) found that the majority of American undergraduates interviewed were only able to classify organisms at the life form level (ex. bird, tree) whereas lowland Mayans were far more species specific. This discrepancy in place-based knowledge is no surprise when we consider how little time American students spend in nature compared to indigenous Mayans. Loss of practical knowledge is in part due to a reduced interface with the natural world or as some call it “extinction of experience” (Atran et al. 2004). Whether this “extinction of experience” is due to a reduced dependence upon knowledge of the natural world for survival or a scientific paradigm that distances nature from culture the effects are clear,

This impairment affects people’s practical ability to interact sustainably with the environment: a person who cannot distinguish one kind of bird or tree from another cannot respond appropriately to changes in the ecological balance among these living kinds (Atran et al. 2004: 402).

This “extinction of experience” is not limited to western culture, several empirical studies
have documented a negative correlation between schooling and local environmental knowledge among traditional peoples (Quinlan and Quinlan 2007; Voeks and Leony, 2004; Sternberg et al. 2001; Zent, 2001). Sternberg (2001) hypothesizes that this negative correlation maybe a function of opportunity costs; with more time consumed with classroom activity students have less opportunity to interact and observe their environment.

Traditional ecological knowledge has a lot to offer sustainable resource management on a local scale. The research of Atran and his colleagues (1999, 2004) additionally examine the correlation between ecological knowledge and resource use. In a study that looked at the agro-forestry practices of three culturally distinct groups with different “folk ecological models” sharing the same habitat, Atran (2004) found that lack of ecological knowledge correlated with unsustainable agro-forestry practices. Idealizing traditional ecological knowledge is as detrimental to indigenous cultures as it is intellectually confining. Nonetheless traditional ecological knowledge has been an inspiration to the burgeoning academic and practical fields of agro-ecology, natural building, permaculture and restoration ecology. Traditional ecological knowledge systems also have a lot to offer mainstream science curriculums. Science education that promotes practical knowledge of the local environment through reciprocal relationships between students and the landscape provides students estranged from their environment with the opportunity to cultivate the ecological awareness and ethical commitment necessary for environmental stewardship.
Contextualized Learning

*The way students represent the information given in a mathematics or science problem, or in a text they read, depends upon the structure of their existing knowledge these structures enable them to build a representation or mental model that guides problem solution and further learning (Glaser 1991: 132)*

The existing structure of knowledge which Glaser (1991) describes as a tool and filter for organizing new knowledge is very much a product of the student’s environment. Jegede (1999) extends the definition of “environment” to include the student’s social and cultural context. State generated curricula, by virtue of its standardization, does not and cannot encompass the diversity of environmental and cultural contexts, which students hail from. Taylor and Mullenhall (2001) in a review of rural schools quote a Sri Lankan teacher who explains that, science and math textbooks are geared towards urban students with word problems looking at the speed of trains and planes. In rural settings teachers are rarely given the tools to make the mandated curriculum accessible to their students. Teachers are often forced into the role of cultural liaison helping students navigate the border crossing from their home life to the culture of the classroom (Aikenhead 1995). Creative innovations that contextualize curricular content in areas that are familiar to their students have been shown to raise comprehension and retention of material. By leveraging the strengths inherent to the students and building upon their existing knowledge base contextualized education validates existing knowledge while building new knowledge systems. In rural situations, school gardens provide an incredible opportunity for students to build novel concepts in a familiar setting. By deepening their existing understanding of agriculture and the natural world students can retrieve and retain this knowledge more readily.
While acting as an effective teaching tool contextualized curriculum also has the potential to build bridges between community, families and schools. In areas where parents have very little academic experience, curricula based in areas with which parents identify potentially facilitates a greater dialogue between parents and their children on academic subjects. By acknowledging and incorporating the knowledge and agricultural practices of their community into the science curriculum, students are supported in simultaneously reconciling western and traditional ways of knowing and building bridges between the worlds of home and school.

**LITERATURE REVIEW**

Examining the value of school gardens through the lens of traditional ecological knowledge and western science has required me to draw from a diversity of different disciplines. Scholars of epistemology have written countless pages on the tension between traditional and scientific ways of knowing, but have spent little time examining how these tensions manifest in rural classrooms. The field of traditional ecological knowledge attempts to conceptually reconcile traditional and scientific ways of knowing, yet does not look practically at how to reconcile the two within the school system. Developmental psychology offers insight into the transmission of knowledge within indigenous cultures but has not been involved in the conversation on contextualized curriculum to make standardized schooling more appropriate for diverse students. Research in the field of education provides an intimate look at the classroom and innovative teaching techniques such as ecologically and culturally contextualized curriculum. However, pedagogical
studies have not been in conversation with that of traditional ecological knowledge. I strive to link these approaches to achieve an interdisciplinary and holistic perspective on garden science education.

Other studies have shown that traditional ecological knowledge has helped indigenous societies develop sustainable agricultural practices such as integrated pest management (Morales and Perfecto 2000), succession management (Irvine 1989), cultivar selection (Bellon 1991; Perales et al. 2005) as well as intercropping (Brush and Perales 2001). Traditional ecological knowledge has also helped households cope with climatic changes (Berkes and Jolly 2002) and improve health and nutrition (McDade et al. 2007). However it is important to acknowledge that traditional ecological knowledge does not always yield sustainable practices. Often conservation practices are integrated into socio-cultural codes of conduct rather than a product of a conservation ethic based on preserving resources in the future (Lu 2001; Alcorn and Toledo 1998). Diamond (1993) documents the impressive and detailed ecological knowledge possessed by native New Guineans, however despite this knowledge they still have a considerable impact upon their environment.

A number of empirical studies have documented a negative correlation between schooling and local environmental knowledge (Quinlan and Quinlan 2007; Voeks and Leony, 2004; Sternberg et al. 2001; Zent, 2001). In a study of Luo students in western Kenya, Sternberg et al. (2001) finds that schooling as measured by the scores on standardized tests is negatively correlated with the ability to identify and name the uses of medicinal plants. Another study looking at practical environmental knowledge of Ameridian students from Brazil, compared the ability of students to identify trees in a plot
with school experience as measured by Spanish fluency. The study showed that students who spent more time in school were unable to identify as many trees as those with less schooling experience (Veoks and Leony, 2004).

Literature from the field of developmental psychology explores the culturally supported learning styles of indigenous students and how they differ from classroom expectations (Silva et al. 2010; Rogoff et al. 2005; Chavey et al. 2002; Greenfield 2003; Gaskins 1999; Delgado-Gaitan 1987). Gaskins (1999), through observation of Mayan family life, outlines parenting values, expectations and techniques and how they effect children’s engagement with the world. Children are expected to participate in important tasks in the adult world, but are given freedom to accomplish them on their own terms. Silva and colleagues (2010) draw comparisons between Mexican-American students of indigenous descent and their western peers in their attention span and observational engagement, finding that Mexican-American students have greater engagement through active observation. Chavey and his colleagues in a study of the problem solving approaches of Mayan mothers and children found that mothers with very little western education tended to work collaboratively with children in problem solving situations. Thus highlighting another strength inherent to traditional Mayan culture.

There is a limited yet growing literature looking at creative educational innovations that contextualize curricular content in the natural world and cultural circumstances (Mallen et. al. 2009; Hammond 2001; Taylor and Mulhall 2001; Aikenhead 1995; Lipka 1994). A contextualized curriculum has been shown to raise test scores. In a study of Yup’ok Eskimo students, Lipka (1994) compared the test results of students taught with a culturally adapted mathematics program against students who learned through
conventional textbooks. Lipka found that students learning from the contextualized math program achieved higher scores in multiple choice and short answer problems. Similarly, in an afterschool environmental education program implemented in Ixtlan de Jaurez, a largely indigenous community in Oaxaca, researchers Ruiz-Mallen et al. (2009) found that student participants had 16.8% higher knowledge of ecological concepts than students who were not a part of the program.

Apart from improving test scores and knowledge retention, contextualized education has the potential to bridge the cultural chasm between standardized schooling and local communities. Taylor and Mulhall (2001) examine agriculture as a context for math, science and language curriculum. They document a math teacher in India using the rice fields across from the school to convey the concept of lines and angles and a Sri Lankan teacher who used bananas growing in the schoolyard to clarify the English word “bunch”. Their study goes on to describe how parents with little formal education were able to relate to and understand content of curriculum based in agricultural settings. Parents who where previously embarrassed by their ignorance of “school knowledge” felt more capable of talking with their children about what they were learning. Taylor and Mulhall (2001) document a case in Sri Lanka where after a school science lesson in compost students shared these ideas at home and inspired their families to set up their own composting systems.

Across the globe in an underserved immigrant community located in California, Lori Hammond (2001) reflects upon the potential of a school garden to bridge the divide between Mien/Hmong families and mainstream public education. In a collaborative effort
which drew upon the vast ecological and practical knowledge of the first generation Mien/Hmong community, teachers and community members built a demonstration garden and field house as well as jointly designing culturally situated school materials which included Mien/Hmong knowledge. This multi-cultural/ multi-science program placed value upon the knowledge and heritage of the Mien/Hmong community reconciling the two cultures and modes of knowing. Aikenhead (1995) describes another program that culturally contextualizes science education through cross cultural science curriculum for first nation students. Developed by the Ahkwesahsne Mohawk Board of Education, a series of lessons called Circles & Lines presents several school subjects such as science, math and social studies within an anthropological context. This program allows students to consciously cross cultural borders with an understanding of the cultural context of their education.

This paper looks at school gardens with a new depth attainable through this interdisciplinary approach. In the style of Lori Hammond (2001) I examine the meeting of cultures through classroom science education and explore how garden education can provide a common ground for this cultural encounter. However, instead of urban United States, this case study is set in rural Mexico. There have been quantitative analysis of the effect of contextualized science education programs in rural Mexico, however a qualitative case study format offers the opportunity to observe subtle cultural nuances and determine what would be useful in further developing such programs. In the remainder of this paper I highlight patterns I observed in the initial phase of creating this garden project and provide insights into which components are important in building a truly resilient garden education program.
METHODOLOGY

The Project

I met Drs. Helda Morales, Bruce Ferguson and Ron Nigh when they came to speak to my Ethnobotany class in the spring of 2009. They were researchers from Chiapas interested in the effect of garden education on student’s perceptions of agriculture, science and nutrition. Helda Dr. Morales and her colleagues were spending a year on sabbatical in Santa Cruz, Ca. studying garden education in preparation for their own burgeoning school garden project in San Cristobal. The project involved building gardens in each school and providing a series of workshops for the teachers in order to guide them in utilizing the garden as a teaching tool. In order to evaluate the effects of garden education on the student’s perceptions of agriculture, science and nutrition, I helped the team develop a survey, which was given at the beginning of the program and would be repeated a year later after the program was finished. Besides or perhaps In addition to my passion for school gardens, this project captivated my imagination because it offered an opportunity to do academic research while making a meaningful contribution to three different communities. This thesis is based on 11 weeks of field research based in San Cristobal, Mexico. Upon return to the US I did extensive secondary research to build a theoretical framework through which I could make sense of (the experiences I had.) Or just “my experiences.”

The Study Communities

Pequeno Sol, Rebsammen, and Vicente Guerrero, the three schools participating in the garden education project, are urban, semi-urban and rural, respectively. Not only do
they represent three distinct locations in the San Cristobal area, they also correspond roughly to three distinct socio-cultural backgrounds, namely privileged ladino, mestizo, and Mayan, respectively. Dr Helda Morales recruited these schools in the fall of 2009 through informational sessions and by directly contacting the school directors. The three participating schools were chosen based on their expressed interest in the program. I describe each in more detail below.

**Pequeno Sol, San Cristobal Proper**

Located in the outskirts of San Cristobal, Pequeno Sol is a private alternative school. The school grounds house all grades from preschool through high school. The school serves around 200 students and staffs 8 teachers from grades 1 to 6. Though originally founded in the 1980s as a Waldorf School, Pequeno Sol does not strictly adhere to Rudolf Steiner’s doctrine. The classrooms at Pequeno Sol have a unique circular architecture and are constructed from adobe blocks. Creative re-use of tires, tin cans and raised planting boxes make up succulent container gardens outside the classrooms and in the concrete courtyard. Pequeno Sol also houses a recycling center where parents can bring their recyclables and compost their food scraps. The bottles, cans and cardboard in the recycling center are reused in classroom art projects and have been great resources for garden construction.

As a private alternative school, Pequeno Sol enrolls students from a very specific demographic: the wealthy and well-educated segment of society. This serves the school in several ways. Families have more time to invest in their children’s education. This is
illustrated by a parent group that was proposing a waste education program designed to teach the students about the life cycle of consumer products and maximize the school’s creative reuse of their existing recyclables. The mother spearheading the project has a master’s degree in agronomy and volunteers her time to lead these workshops. Other parents in the community have enough time to drop off and pick up their students from school as well as overseeing their homework. This abundance of free time is a luxury not shared by the parents in the rural and semi-urban communities. The affluence and education of the Pequeno Sol community also provides the school with abundant resources; for instance, the classroom shelves are lined with books bought by the school or donated by parents and the walls are full of art projects, diagrams and costumes. Pequeno Sol is not lacking in any art supplies or educational tools. The affluence of the school also supports staff positions such as a grounds keeper, Don Mattie, who was indispensable in the building and maintaining of the garden. The teachers I observed at Pequeno Sol seemed to invest a considerable amount of creativity into their lesson plans. Dr. Morales, as a mother of a Pequeno Sol student, has a unique perspective into the teachers of Pequeno Sol. Though critical of many some aspects of the curriculum, teacher’s abilities and teaching style, she considers it one of the best schools in the city. Pequeno Sol is not representative of the typical educational system of the San Cristobal City population. Because of enrollment fees and the unique values that it embodies, Pequeno Sol draws a very progressive and affluent community. Though it was not the original intention of the project to choose such a specialized school, none of the other urban schools expressed interest in participating in the school garden project. Thus Pequeno Sol should not be taken as a case study that is representative of urban populations in this part of Mexico;
however, it does reflect a particular socio-economic background that is progressive, educated and affluent.

**Enrique Rebsamen, Ocotal**

The semi-urban school Rebsamen is located in Ocotal II, a municipality of San Cristobal on the northwest side of the mountain and Pro-Natura ii preserve El Huitepec. The road that leads to the school hairpins off the main carretera (highway) at the last bus stop on the line and winds through fields of cut flowers and vegetables. The school serves 52 students from pre-school to sixth grade. The whole schoolyard is covered in concrete accept for the steep hill leading up to the yard. The concrete school building is divided into three classrooms which house pre-school, Kindergarten through second grade, and third through sixth grade, respectively. The school yard consists of a concrete basketball court. There are three teachers who oversee these mixed grade classrooms.

The students of Rebsamen represent a predominantly mestizo community, people with indigenous and ladino heritage who are fully engaged in the market economy and identify with ladino culture. Though many of the students speak Teotzil, the local Mayan dialect, Spanish is the only language spoken in school and the dominant language in the community. Many of the students report only speaking Teotzil with their grandparents and sometimes with their parents. Students dress in more mainstream ladino clothing: t-shirts

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ii Pro-Natura is a nature reserve aimed at conserving biodiversity. In parts of the park there is still the legacy of human use. Groves of holm oaks that have been coppiced for generations still grow twisted; such harvesting is now forbidden.
and pants for the boys and colorful dresses for the girls. The community’s economic livelihood is mostly based on their flower and vegetable harvests, which are sold at the central market of San Cristobal. The traditional milpa, an intercrop of corn, beans and squash, which serves as a major source of staple crops, is not grown in the community. Staples and produce such as corn and beans are actually bought in the market with money made from selling flowers and vegetables. Though families are very busy, the community chooses one family every year to provide support to the school. This family was indispensable in helping us to prepare the garden space. The state provides the school with packages of food with the intention that they be served during school hours. However, since cooking is not always feasible during school hours, the food is sent home to the families. Because they don’t know how to prepare it, families often sell this food in the market. The three teachers, who work at the school, commute there from San Cristobal and have to teach to multiple grades. This school is unique in its small size and combined grade classroom.

**Vicente Guerrero, Muquem**

The community of Muquem is located an hour and a half by car outside of San Cristobal. Perched on the side of a valley patchworked in small agricultural plots, Vicente Guerrero is accessed by a potholed dirt road, which winds through rolling hills and mountain passes. The school combines both elementary and middle school. The elementary school, which was the focus of our study, enrolls 270 students. Because Vicente Guerrero serves such a large area, many of the students have to walk over two hours to get to school. In response to this the school has an _alberge_ or dormitory which houses and
feeds 50 students who are not able or do not want to make the long journey to school every day. Small agricultural plots cultivated in milpa and fava beans surround the schoolyard. Adjacent to the school is a small store, which provides canned goods and sweets to the community and is frequented by the students during recess. There are very few books on the shelf and art supplies are almost non-existent. Students have to share books to do their lessons. The school does not have a grounds keeper and wrappers and trash are strewn across the playground and buried in the back of the schoolyard. Like many schools servicing indigenous Mayan communities, Vicente Guerrero is a bilingual school. Though these teachers were raised in indigenous communities and speak Tzotzil they have little connection with the communities in which they teach. None of the teachers live in Muquem full time, they prefer to live in San Cristobal and drive to and from the school. The teacher’s three-hour commute often cuts into class time and the school is frequently closed due to weather and teacher strikes.

The student body represents an entirely Mayan community whose primary language is Teotzil, the local Mayan dialect. All of the girls wear traditional embroidered blouses and thick skirts woven from black wool in the Chamula style. Muquem families graze sheep and cultivate milpa and diverse home gardens for subsistence. Since farmers rarely produce enough from their milpa to sell, they diversify economically in order to maintain a viable livelihood. This can take the form of making and selling coal from wood harvested in the forest, to migrating to the United States to find work. Since families are under a lot of economic stress, and often live a distance from the school, they have very little time to participate in the school community. The monetary poverty of the area is reflected in the resources available to the school.
The Art of Asking Questions

Surveys

Two separate surveys were administered to students and teachers respectively. The survey for the students was designed and implemented by Dr. Morales, myself and the research team to gather baseline data about students’ perceptions of nutrition, agriculture and science. In Dr. Morales’ experimental design this baseline information will be compared with information gathered after the gardens have been established and utilized, in order to measure the effect of garden education on student perceptions and preferences concerning nutrition, agriculture and science. Though I will not be using the responses in a comparative analysis through time, the responses yield valuable emic perspectives. I have drawn on questions that pertain to students’ perceptions of agriculture, their parent’s work and their future. The survey was administered to fifth and sixth graders. I have information from 19 students ranging from 4-6th grade at Rebsamen (14 girls and 5 boys) 27 fifth graders from Pequeno Sol (12 girls and 14 boys) as well as 24 fifth graders from Vicente Guerrero (12 girls and 12 boys).

Before the surveys were administered, they were pre-tested at each school with six students, a boy and girl representative from each grade from fourth through sixth. Half of the students were administered the survey orally and the other half wrote their own answers. The trial surveys revealed many points of confusion related to terminology and cultural relevance. The challenge of creating one uniform survey for three entirely different cultural contexts meant that some confusion was inevitable. To compensate for the confusion we made sure to include control questions that rephrased the original
question in several ways. We also included a mixture of open-ended questions, yes or no questions and preference listing questions. The open-ended questions gave us a lot of insight into how well students understood the language of the survey. At Vicente Guerrero where Spanish is spoken as a second language, the majority of the students were unable to answer the open-ended questions appropriately. We discovered during the oral testing at Vicente Guerrero that the students were not comfortable with the direct questions of the survey. They answered shyly and often looked to teachers or other researchers for a “right answer” despite our explanation that there is no “correct” answer. The information gathered from Vicente Guerrero for the most part is unreliable because of these factors.

After the surveys were passed out to the participating classrooms, a researcher and teacher stayed in each class to answer questions and clarify ambiguous phrasing. However, students were encouraged to answer “no se” if they truly did not understand the question.

The teacher survey was designed to gather information about the teacher’s background experiences with gardening and farming as well as the challenges they have experienced in the classroom. This survey was tested on two teachers from other schools. The greatest challenge was making sure the questions were relevant for all teachers despite the diversity of their backgrounds. Unfortunately by the time I left none of the teachers had returned the survey.
I. Table 1: Illustrating the sample size and age distribution of surveyed students

<table>
<thead>
<tr>
<th></th>
<th>Pequeno Sol</th>
<th>Rebsamen</th>
<th>Vicente Guerrero</th>
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</thead>
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<td>12</td>
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<tr>
<td>Boys</td>
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<td>5</td>
<td>12</td>
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<td>Total</td>
<td>19</td>
<td>19</td>
<td>24</td>
</tr>
</tbody>
</table>

**Homework Assignment**

This assignment, which was sent home with fifth and sixth grade students from each school, was designed to connect students with knowledgeable family or community members. Students were to pick a plant and could choose to interview the family or community member about how that plant is tended, prepared as a dish or how it came to the community. We were able to gather valuable information from 20 of the 6th grade students of Pequeno Sol. However, the students at Rebsamen and Vincente Guerrero did not fully understand the assignment and did respond to the assignment.

**Drawings**

In each school we asked students from 1st to 6th grade to draw a picture of what their “dream garden” would look like. We provided drawing materials such as colored pens and pencils as well as paper. From Pequeno Sol we collected a total of 125 drawings from grades 1st through 6th. From Vincente Guerrero we collected 95 drawings from grades
1st through 6th. And Finally from Ocotal we collected 20 drawings from the two combined grade classrooms. The creativity and diversity of responses gave insight into the student’s vegetable preferences, their knowledge of agriculture and their perceptions of the garden. This method was particularly useful at Vicente Guerrero where students were unable to understand and answer questions written in Spanish. Because all participants could understand and accomplish this task equally, this research method provided us with the most reliable data for comparative analysis.

Unstructured Interviews

Unstructured interviews provided me with some deeper insight into the lived experiences of the people in and around Muquem. H. Russell Bernard provides a simple description of this method:

There is nothing at all informal about unstructured interviewing and nothing deceptive, either. You sit down with another person and hold an interview. Period. Both of you know what you’re doing, and there is no shared feeling that you’re just engaged in pleasant chitchat. (2006: 211)

I conducted two unstructured interviews during my time in San Cristobal, one with Dona Irma, the director of Vicente Guerrero and another with a local milpa farmer living outside of Muquem. I spoke for half an hour with Dona Irma in the space that would become the garden, and she spoke about her perception of the students and their families as well as her take on the benefits of a school garden. I spoke with Salvador a local milpa farmer in his field while he planted corn. We covered subjects from how to plant, harvest and store milpa to his son who recently returned from the US. These interviews gave two unique
perspectives into the community of Muquem and were indispensable to my deepening understanding of the region.

**Participant Observation**

Participant observation was probably the most important research method I had while working in San Cristobal, H. Russell Bernard offers a definition:

Participant observation involves immersing yourself in a culture and learning to remove yourself every day from that immersion so you can intellectualize what you’ve seen and heard, put it into perspective, and write about it convincingly. When it’s done right, participant observation turns field workers into instruments of data collection and data analysis. (2006: 344)

I divided my observation time between Pequeno Sol, located on the outskirts of town, Rebsamine, located in the hills outside of San Cristobal, and Vincente Guerrero, which is an hour drive outside of San Cristobal in the province of Chamula. During each visit I participated in or helped facilitate school activities or administer surveys. After each visit I would spend time recording the events of the day and my impressions about these happenings. This etic perspective allowed me to draw simple comparisons between the teaching styles, organization and student bodies of the three schools participating in the project.
DISCUSSION

Harvesting Insights

In working with each school, I became aware of my own cultural biases. In the beginning period the research team and I designed and implemented surveys, the format of which reflected the acceptable norms of the academic world. I came to realize that the way the students dealt with these surveys reflected their own concepts of acceptable and normal. These two conceptions of “acceptable and normal” were at times divergent. In creating the surveys, our primary concern was that the students understood the intention behind our questions; it is this point that proved to be challenging. The students of Pequeno Sol seemed very comfortable with the process; their answers demonstrated a clear understanding of each question's intention. Though some of the questions pertaining to agricultural lifestyles seemed redundant and superfluous, the survey was not problematic for them. The students of Rebsamen were able to answer the questions, however many of the questions were confusing and required clarification. At Vincente Guerrero, Tzotzil is the student’s first and primary language. This made the survey, which was written in Spanish, very difficult and yielded unintelligible answers, which often demonstrated an incomplete understanding of the question. Since the surveys gathered from Muquem were unreliable at best the information gathered through the surveys did not provide for accurate comparison. The process of revising, administering and reviewing these surveys was at times more informative than the student’s responses, because it gave us insight into the different ways each student body reacted to our surveys. In the section
below I will draw upon observations of the three schools to illuminate two key strengths that the students from the rural settings demonstrated during the surveys.

A pattern that I observed while interacting with the students of Vincente Guerrero and Rebsamine was their penchant for collaboration. When students were unclear on the meaning of a word or the intention of a question, they would lean over to their neighbors and whisper questions and answers, rather than asking a teacher. Two girls openly filled out the survey together even though they were not related, giggling and conferring as they put down the same answers to every question. At Vincente Guerrero, where language was a huge barrier to understanding the content and intention of the questions, students would attempt to work together to understand the questions. The students of both Rebsammen and Vincente Guerrero seemed far more comfortable working collaboratively. As discussed above, research by Chavez (2002) and Gaskins (1999) has shown that collaboration is culturally supported from a young age in communities with Mayan heritage.

Concerned with collecting reliable data, I was at first frustrated by the whispering and conferring. Collaborative working was counterproductive to the goal of our survey since we were interested in the responses of the individual. However, I came to recognize that the ability to work collaboratively is a strength. Just as I failed at first to see collaboration as an asset, it is often overlooked by the tools used to measured student’s achievement. Like our surveys, standardized testing is interested in the responses and knowledge of the individual and utilizes multiple choice and short answer questions. There are so many factors that cannot be measured by standardized testing, which is why so many of the gifts of rural students have gone unrecognized. An important part of contextualized education is
building upon the gifts and proficiencies inherent to the student body. This happens most naturally on the localized level where a teacher recognizes and caters to the gifts of his or her students. School gardens are a perfect place for teachers to foster collaborative learning in science education. Not only is maintaining a garden a group effort, but experiments are often most effective when done in teams. Instead of filling out science worksheets by themselves in the classroom, garden education encourages students to interact with each other as much as with their environment.

Another pattern that differentiated students from Pequeno Sol from those of Vincente Guerrero and Rebsamine is the ways in which students engage in the classroom. While teaching a worm-composting lesson at the rural schools of Vincente Guerrero and Rebsamine, I was struck by how uncomfortable the students seemed when asked direct questions. Students were comfortable answering easy questions in unison with their classmates but when asked more abstract questions they would become more shy and reserved. This was in direct contrast with the urban students of Pequeno Sol who would eagerly raise their hands and try to shout out the answer before their classmates. Students from Vincente Guerrero and Rebsamine also asked significantly fewer questions than did those from urban Pequeno Sol. At first I interpreted this to mean that the students of Vincente Guerrero where less engaged in the lesson, however the students were very quiet and attentive compared to the easily distracted and disruptive students of Pequeno Sol. Upon further research, I discovered this may be a cultural pattern. Gaskins (1999) found that children are integrated into the adult world through active observation through which they learn how to accomplish certain tasks. Excessive questions are often interpreted as inattention. Children are not expected to demonstrate their knowledge through answering
questions but instead by accomplishing tasks correctly. This type of active observation is a strength in that it allows students a longer attention span. This strength can be leveraged in the garden, where careful observation often yields important discoveries, which can be recorded and explained later in the classroom. Students can also build their confidence by carrying out the tasks that they are given.

The information that provided most useful in creating comparisons between the three schools was the drawings of the student’s ideal garden. Paradoxically, I found that the students of Vincente Guerrero, who possessed the most experiential knowledge of agro-ecology, displayed the least amount of ecological awareness in their drawings. The majority of students from Pequeno Sol drew gardens systems where elements such as sun, rain, soil, bugs, birds and plants, interacted, while students from Muquem represented the garden as disconnected elements floating on the page. There are several possible factors, which in combination may have affected this result.

First, there is the chance that the students of Vincente Guerrero and the teachers that were helping us translate, could have misunderstood or misinterpreted our directions. In fact in one classroom the teacher translated our directions to mean the students were to draw the one thing that they would most want in their garden. It was not until we noticed that all of the students were exclusively drawing corn that we found the misunderstanding and corrected it.

Though misunderstanding could have played a part in these results, I believe that these results are a reflection of a deeper pattern. Sternberg and colleagues (2001) suggest that schooling correlates negatively with practical ecological knowledge as a result of
opportunity costs. As students spend more time in the classroom, they do not have as much time to spend outdoors observing and participating in the ecology of agriculture. However, this does not seem to be the sole factor influencing the student’s drawings. In a nature walk with students from Rebsamine, I was impressed by their considerable knowledge of wild edible and medicinal plants. I have a personal interest in plants and found that the students identified almost all of the plants and their uses correctly. When I inquired who had taught them these plants they mentioned various family members. Though I did not have the opportunity to go on a nature walk with the students of Vincente Guerrero I imagined that I would be equally impressed by their local knowledge of plants and animals. If the students still demonstrate considerable local knowledge despite spending more time in school then, the opportunity costs of spending time in school cannot account for the lack of ecological awareness in the pictures of the rural students.

Ultimately I believe this pattern expresses the disconnection between traditional and western systems of knowledge in the classroom. Be it the current science curriculum or the teachers style of implementing it, there is something being lost in translation from students’ experiences and school science. Instead of providing explanations of the patterns that students witness every day in their environment, science in the school is being presented as a disembodied package of knowledge. Aikenhead (1996) describes science as a sub-culture with exclusive enrollment. Prohibitive jargon shrouds the subject in a certain mystique, which is hard for the lay public to break through at times. As a teacher, the task of trying to build a bridge between the highly rationalized world of science to the student’s world is very difficult. The teachers participating in this project expressed in initial interviews and surveys that they felt out of their depth in teaching science and would like
to have more trainings in science education. As it is, the state mandated curriculum is often abstract and inaccessible. Using school gardens as a teaching tool could help teachers ground curriculum in the experiences of the students, thus making science more accessible.

In the training we offered on using the garden as a tool in teaching science we encouraged teachers to view science as a process rather than a collection of facts. We presented the basics of the scientific method and experimental design and gave them the opportunity to ask their own questions and set up their own experiments. Basic concepts of science can be made accessible to the teachers and students through tangible experiences that build upon existing frameworks of knowledge.

Using garden education to culturally and ecologically contextualize curriculum is not as simple as just letting students go and experience the process of planting and harvesting, though there is certainly value in that. It is about recognizing gifts that students bring to the classroom, and reconciling the differences between traditional and scientific knowledge systems through hands on activities. Contextualized garden education requires teachers to be imaginative, attentive and spontaneous. In rural schools where there is a dirth of resources, the garden becomes an important teaching tool and resource. By virtue of its nature, contextualized education does not look the same in every school or classroom. Because of this fact there is no one formula for creating a contextualized garden education program, however giving teachers the tools to explore the use of gardens on their own is the first step in creating localized and impactful curriculum.
CONCLUSION

Saving Seed

In the three months that I spent in Chiapas Mexico, working to develop school gardens and teacher trainings for three schools, I had the opportunity to observe and interact with students from various backgrounds. I was able identify the proficiencies and strengths that the students from the rural settings brought to the classroom; specifically their ability to work collaboratively, learn through active observation and the experiential knowledge that they brought to the classroom. I argue that these strengths can be harnessed through culturally contextualized garden education. Already, in the early stages of establishing school gardens, it is clear that the lessons students from each school take from the project differ substantially. The framework of knowledge and experience that the students from each school bring to the classroom are distinct and confer unique strengths. However, accompanying these strengths are corresponding areas of improvement. The students of Pequeno Sol bring into the garden a theoretical knowledge of ecology and agriculture; however, they have an underdeveloped relationship to their environment and the source of their food. In a workday with the students, one sixth grade girl stopped in the middle of digging a bed and said, “Wow this is hard, I can’t believe there are people who do this so we can have food.” Already this student is making a connection between the processes she is involved in and the people and place her food is coming from. At Rebsamine, the students spend a significant amount of their time helping their parents’ farm, they have an experiential knowledge of how to care for living things. In our first class with the students we planted vegetable seeds in seed trays. When we did this activity at
Pequeno Sol the students forgot to water their seeds and when we returned in a week they were all dead, however the students of Rebsamine diligently watered their seeds and by the time we returned they had begun to germinate. However, the concept of compost is relatively new to them and they had a very basic grasp of ecological concepts. In this case the garden will be a great resource for teaching science, because it gives a new dimension to an already familiar setting. By contextualizing science curriculum in something that is concrete and familiar to the student, information can be retained and used more readily.

Garden education has a great deal to offer students of a diversity of backgrounds; however, to establish a self-sustaining program, the garden must also be beneficial to teachers and family members as well. What does a resilient and self-sustaining garden project look like? I believe it looks very much like a resilient and self-sustaining garden. Just as each member of the primary crops in the milpa serve several functions, the school garden will be more successful and resilient if it also serves several purposes for the students and teachers. Apart from being a teaching tool, it can also be a source of food and income for students who would like to be more intimately involved with the garden. The students can harvest, sell or eat the vegetables. These students can be the caretakers of the garden even in the summer months when school is not in session. A teacher from another community reflected on his memories of the school garden planted in his own elementary school, he remembers that what made it so successful was that students like himself were given ownership over it if they invested their time and care.

Besides supplemental food and possibly income, the school garden project can also instigate the creative reuse of trash generated at the schools. At Vincente Gurrero, the site
for the school garden is in close proximity to the burn pile for the school’s trash. Plastic bottles, tin cans and broken glass poke their incongruous heads from the weeds. Though this abundance of trash seems problematic it can also be viewed as an opportunity.

Inverted plastic bottles with perforated caps can become vessels for drip irrigation, egg cartons can become seed starting trays, tin cans make great pots, as do plastic bottles. Building awareness of the effects of trash and the solutions available to deal with trash can help students become better stewards of the land and community. Just as nutrients are cycled in the milpa, waste and refuse can become a resource for materials and teaching opportunities.

In the milpa there are several plants that serve similar purposes or possess overlapping niches, for example: pest control. While some weeds serve as a trap crops, others repel pests altogether, they are all serving the purpose of keeping the insects from inflicting considerable damage on the important crops. Similarly to keep a school garden functioning, support from a diversity of different people with overlapping jobs is critical. Building relationships between the school and community is important in providing support for an on going program. Looking closely at the community of Muquem, there are two cultural extremes in the creation of this garden. On one end are the experts in western science: the entomologists, ecologists and anthropologists who are instigating the construction of the garden. At the other end are the elder farmers in the community who posses a wealth of practical knowledge about agroecology. Both are great resources for local and scientific knowledge; however, they exist at cultural and epistemological extremes. To span the divide between these two “experts” what is needed is a chain of cultural brokers, who are invested in the garden. These people can be teachers, family
members or students. The more that the local people there are involved in creating and supporting the garden the more resilient it will be. Change is inevitable and at some point, Helda and the rest of the researchers may not be there to provide support. The more people who value the garden and are invested in its livelihood the better chance it has of survival. An interesting way to promote the longevity of the garden program and build stronger relationships with the community would be to collaborate with community members in creating pamphlets and other curricular materials. This would provide a strong base of agricultural knowledge from which to build a scientific framework.

Above all else the key to building a truly resilient and sustainable garden education is time, patience and trust. More than digging beds and planting seeds, garden education is about building relationships. Relationships are cultivated between teachers and the material, community members and school, students and the earth. As a group entering a school and community with a project, building trust is incredibly important. As outsiders to the community and school, cultivating trust requires cultural sensitivity and openness. In small communities time moves very slowly, and building relationships and winning trust takes more than a couple months or even a year. Paramount to building a strong garden program is time and commitment. I look forward to seeing the seeds planted through this project and paper to blossom and flourish.
Bibliography


Appendix I: Research Material

CUESTIONARIO CIENCIAS NATURALES
4 a 6to GRADO DE PRIMARIA
FEBRERO 2009

Nombre_____________________________________________________________
Grado_____________________________________________________________
Escuela_____________________________________________________________
Lugar_______________________________________________________________

1. ¿Cuáles son tus cinco comidas favoritas?
   1. __________________________________
   2. __________________________________
   3. __________________________________
   4. __________________________________
   5. __________________________________

Por favor, circula la respuesta que mejor refleje tus gustos:

2. ¿Te gusta comer verduras?  No
   Un poco
   Si
   Mucho

3. ¿Te gusta comer frutas?  No
   Un poco
   Si
   Mucho
4. ¿Te gusta comer gansitos o galletas dulces que vienen en paquetitos?
   - No
   - Un poco
   - Sí
   - Mucho

5. ¿Te gusta comer sabritas o totis?
   - No
   - Un poco
   - Sí
   - Mucho

6. ¿Te gusta tomar refrescos?
   - No
   - Un poco
   - Sí
   - Mucho

7. ¿En qué trabajan tus papás?
   - Madre: _____________________________________________
   - Padre: ____________________________________________

8. ¿Qué quieres hacer cuando seas grande?
   ________________________________

9. ¿Te gustaría ser agricultor cuando seas grande?
   - SÍ
   - NO
   - NO SE

10. ¿Te gustaría sembrar frutas o verduras cuando seas grande?
    - SÍ
11. ¿Alguien en tu familia es agricultor?
   SI
   NO
   NO SE

12. ¿Conoces a un agricultor?
   Si
   NO

13. ¿Te gustaría tener o trabajar un rancho, granja, terreno o parcela agrícola cuando seas grande?
   SI
   NO
   NO SE

14. En la escuela, ¿cuál es tu clase favorita?

15. ¿Te gusta la clase de ciencias naturales?
   SI
   NO

16. ¿Te gustaría ser un científico?
   SI
   NO

17. Nombra todas las frutas y verduras que puedas pensar (y circula las que te gustan comer a ti)
Para ayudarte a hacer esto, primero piensa en cada letra del alfabeto y escribe todas las frutas y verduras que empiecen con esa letra. Después recuerda de los colores del arcoíris y escribe las frutas y verduras de cada color. Puedes usar más papel si necesitas.

18. ¿Tu familia tiene un huerto en tu casa o en la parcela? SI NO

18. A Si tienes uno, ¿cuánto tiempo pasas jugando allí? MUCHO ALGO NADA

18. B ¿Ayudas a tus padres a trabajar en el huerto? SI NO

18 C ¿Usan plaguicidas, herbicidas, insecticidas o venenos en su parcela? SI NO

18 D ¿Con qué limpia el cultivo tu papa o tu mama?__________________________________________

18 E ¿Cómo abona el cultivo tu papa o tu mama?__________________________________________

19. ¿Cocinas o ayudas a tus padres a cocinar? SI NO

20. ¿Tu familia cultivan alguna comida que tu comes? SI NO

20. A ¿Que comida cultiva tu familia? _____________________________________________
_____________________________________
_____________________________________
_____________________________________

21. ¿Tus padres te dejan comprar lo que te gusta comer? SI

NO

22. ¿Si no te dejan comprar lo que te gusta comer, porque no te dejan?____________________________________
23. ¿Qué comes en la escuela?

24. ¿La mayoría de las veces, donde compra tu familia la comida?

25. ¿Cuántas horas de tele ves al día?

26. ¿Cuál es tu anuncio favorito?

27. Pensamos sembrar un huerto aquí en la escuela. ¿A quién debemos pedirle ayuda para que nos diga como sembrar bien?

28. ¿Donde conseguimos las semillas para sembrar en el huerto de la escuela?

29. ¿Tienes semillas en tu casa para compartir y sembrar en el huerto de la escuela?

30. ¿Tu o alguien de tu familia ha hecho dieta para bajar o subir de peso?
   SI
   NO
   NO SE

31. ¿Alguien en tu familia tiene azúcar o diabetes?
   SI
   NO
   NO SE
Teacher Survey

Your Agricultural History

1. Do you have previous experience with agriculture and/or gardening?

2. Who taught you the most about gardening and/or agriculture?

3. What was the purpose of gardens or farms that you have had experience with in the past (ie. Pleasure, education, to grow food for subsistence, to complement the food bought in the store, or to sell at market, etc)

Agricultural practices in the present

4. Do you have a garden or farm? What contribution does this garden or farm make to your household? (ie. Pleasure, to complement the food bought in the store, to grow food for subsistence, or to sell at market, etc)

5. Do you manage insects in your garden? How do you manage insects in your garden?

6. Do you fertilize your garden? How do you fertilize your garden?

7. Do you weed your garden? How do you clear land/ weed?

8. Who would you go to seek advice about agriculture and growing food? Who is the most knowledgeable about agriculture in community?

Nutrition

9. List your five favorite foods

10. Are you on or have you been on a diet to try to lose weight?

11. Are you on or have you been on a diet to gain weight?

12. Do you have diabetes?

Educational experience
13. Do you live in the community that you work in? If not,

14. Does coming from an agricultural family give students an advantage or disadvantage in school? Explain.

15. How much do you interact with the parents of your students? In what way?

16. What resources and activities do you use to teach science?

17. What resources and materials could benefit your science class?

18. When you were a primary or secondary student was there a garden at your school?

19. If yes, what were some of the benefits of having a garden in your school?

20. What challenges did your school encounter in maintaining/ using the garden?

21. Through this current school garden project what benefits do you foresee?

22. Through this current school garden project what challenges do you foresee?

23. What materials or assistance would help you to utilize the garden most efficiently as a teaching tool?

24. What subjects/lessons do you think could be best taught through the garden?

25. What would be the benefits or drawbacks of bringing a farmer to your classroom? Would you want to do this?

26. What is your opinion of your students’ nutrition habits?
Appendix II: Field Journals

My Blog

The Secret Heart of San Cristobal.

The colonial facades of this town are like everlasting gobbstoppers. They are layered with so many coats of colorful paint that a chipped wall could look like the technicolor topography of a rainbow. Just yesterday I walked down the street to find some young painters with ladders and brushes turning a mint green wall to a pink and orange trimmed masterpiece. There are walls in this city covered in great spray painted scenes, walls scribbled with obscenities and demands for justice and freedom. If an archeologist could pick and brush through the stratified generations of paint I wonder what graffiti he would excavate.

But all of this is just the charming and sometimes disturbing face that the city puts on, its real heart is hidden behind metal and wooden doors. Walking down the street the straight sober facades give little away of the lives and livelihoods of the inhabitance within. It is only peering over walls, into open windows and doors that you will find the secrets of this city. On my first day here in San Cristobal I found myself exploring the roof top garden at Casa del Pan. The raucous clucks and coos of poultry sent me peeking over the wall. There in the middle of the neighbor’s concrete courtyard a peacock strutted it’s stuff for all it was worth pulling its opulent train of feathers behind it. On the other side of the building garrulous turkeys took dust baths under young pine trees. All of this in the middle of a orderly city!

Just yesterday I was walking down the street and spied through an open door a room carpeted in pine needles with an alter full of silk flowers and plastic saints. There a marimba band was beginning to set up their instruments to play their bright music inside the darkening hall. I love Saturday nights because there are certain houses on the street that open their gates to sell tamales. You can tell such a house by the red cellophane bulbs that light up outside the door. In the entrance way you can buy a chicken mole tamale wrapped in a banana leaf as a pretense to spy into the family’s inner garden. There you can see succulents and flowers overflowing from terracotta pots, tin cans and plastic bags. In the courtyards of wealthy families you can find mosaiced tables underneath pepper trees where you can drink agua de limon and enjoy the babbling of a fountain. Then there are the families that use the space to grow their food and keep some poultry. Chickens cluck and scratch beneath chayote vines and durasnos.

The new apartment that I just moved into opens onto one of these gardens.
The compound is shared by three sisters their husbands, children and mother. The space is full of lawns, tree houses, forgotten toys, small beloved dogs, flowers and vines. From my balcony I can see a jade bush growing like magic from the terracotta roof and bougainvillea lit with Christmas lights arching over the drive way. This is a city of secret treasures that I am only beginning to be initiated into. Behind the unyielding walls inside these inner gardens lives unfold.

Ode to a Chicken Bus

It has been three weeks since I returned from Guatemala and the finger shaking part of me keeps raising her eyebrows at all of the excuses I’ve made for not writing about my adventures down there. Of all of my cop-outs the most compelling is that the experience is just too immense to put into words. This is followed closely by “I’m hungry, I’m going to go find a quesadilla.” So, I warn you now, what follows is a paled version of the vivid original:

Winging through mountain passes like a bat out of hell we made our way by chicken bus back to la frontera. Melissa and I spent a week in Guatemala visiting my friend Katie’s nonprofit while we waited for our own project in San Cristobal to build up steam. I have fallen in love with these antique school busses painted like a fiesta and given a new lease on life in the form of a supped up eight-wheeler engine. Some how the world just looks more beautiful out of the window of a bus named Ana Maria. Maybe it is the carving of Jesus Cristo hanging over the cobweb cracked windshield, or the breast feeding babies on colorful laps or the piped in music to match the paint job, but I would take a tooth chattering ride on a born-again-school-bus over a demur tourist shuttle any day. As we climbed through the mountains I was sure we were going to break down but some how we always made it to our destination even if it took us hours and hours!

I was happy for the time to reflect on the rich experiences we had had in Chajul the small Ixil village where Katie’s nonprofit, Limitless Horizons, makes it’s home. As gringos in an almost exclusively indigenous village we were quite a spectacle. Molly, who has been working in Chajul with limitless horizons for the past year, says, “The best part of being a tall awkward looking white girl in this town is the power to transform the mood of any child you pass in the street. Kids stop crying and stare when I pass by. It is almost a super power.” I can’t say that my super power included calming distraught children, actually it was just the opposite. One day while wandering down one of the dirt paths that divide Milpa from pasture, I turned the corner and was face to face with three school age girls. Just the sight of me sent them running in the opposite direction screaming! Am I really that scary?

The nonprofit, Limitless Horizons Ixil, enables kids to go to school by finding
sponsors in the US to support their families in buying food and school supplies. It has recently branched out to provide families with other practical things like stoves that have chimney pipes so they don't have to inhale cook-fire smoke. While we were there, they were working on a garden project to help diversify the vegetables that the people grow in their home gardens. We planted carrot and chard seeds as well as starts of onion, cauliflower and cabbage in 17 different homes. The home gardens that we visited were already incredibly diverse. As you could imagine I was bursting with questions. I accosted the women who tended these gardens with my curiosity as politely as I could. I asked questions and drew pictures of as many plants as I could find. The beating heart of Mayan agriculture is Maize. The Mayan creation story, as written in the Popul Vu, recounts how the gods searched for the right material with which to make humans, first they tried earth and wood before they finally molded them from masa. You are what you eat, and these people eat a lot of corn. Almost all of their dishes involve some form of corn. Tamales stuffed with scarlet runner beans called Tchican and wrapped the leaves of a type of Canna Lily called Tz’ukun. They consumed most of their greens in a dish called boxbul, masa wrapped in a leaf and doused in thin chile salsa. In the back yards that we visited, almost every plant that I pointed to had leaves that could be used for boxbul. Later when we walked through the milpas to the sacred mountain, there were many wild plant species that were used for boxbul when the people had to go into hiding during the bloody Guatemalan civil war. Every plant had a use and some multiple uses, from tobacco species that provided natural insecticides to plants that could be coppiced to be used for fence posts.

Sitting, sketching the fruit of a tomate de arbol I met Katarina. She knelt beside me with her gold-toothed smile and a brightly woven tunic to look at my drawings. She laughed at my Spanish but was patient with my questions. When I asked her the name of another large tree with big green fruits she sent her son to run across town to her mother’s house to bring back a ripe anona fruit. The ripe fruit had black skin. We ripped one open right there and scraped the sweet white flesh from the skin with our teeth. Another fruit was gifted to me, a treasure that I kept in my bag.

I forgot about the fruit in my bag until days later when Melissa and I were bumping and swerving in a chicken bus back to the boarder. The pine swathed hills were flying by. It had been hours since we had had our breakfast of beans and eggs and probably a couple more hours until we would stop again. Searching in my bag for a scarf I came across the anona fruit. I sunk my thumbs into the peel and pulled it apart, it’s big black seeds glistening. Melissa and I shared the fruit and it tasted like mango (but without the annoying fibers that get caught between your teeth for days). With gratitude we sucked at the fruit, savoring every bite as if it were a holy communion. Thank you Katarina with your gold-toothed smile and unexpected gifts. With an unfolding love in my heart and a digesting fruit in my belly I threw the
black seeds out the window. All accept for one, which I tucked back into my bag as a token of all that Chajul had planted in my imagination.

You may ask: what exactly will I be doing here in San Cristobal for these next three months? A worthy question that I am only now beginning to be able to answer. I can tell this much, my senior exit requirement is one university hoop that I am happily cartwheeling through. When I first began to think about what I wanted to do as a culmination to this patchwork quilt of an education I have been creating for myself, a serendipitous meeting with three professors from Chiapas Mexico came to mind. Helda Morales, Bruce Ferguson and Ron Nigh were on sabbatical researching school gardens in Santa Cruz last spring when they gave a lecture to my ethnobotany class. I invited them to come and visit Dirt to Dinner, a garden class that Juli Idleman and I started for home-schoolers in San Jose. They showed up in mass on the day I brought the baby stellar jays that I had rescued to class. We spent the day with the students searching through our dessimated chard for beet leaf miners, a grub that the baby stellar jays loved to eat. What a wonderful way to explore predator prey relationships in the garden!

As is the case in so many parts of the world the traditional agriculture of San Cristobal is being threatened. Consumers are wooed by big, one stop shopping markets, like Chedraui and a great deal of the youth find working 9-5 jobs far more glamorous and lucrative than cultivating the land. The loss of traditional agriculture means the loss of the ecosystem services, like habitat for rare migratory birds and a food source for pollinators. It also means the loss of healthy nutritional habits and a greater disconnection from nature. Helda, Bruce and Ron are interested in the effect of garden education on student's perceptions of agriculture, science and nutrition. In this project we are working with schools in four different locations around San Cristobal. The first is an alternative school, which enrolls students from an urban setting. The second has a semi-urban student body and the last two enroll students from a completely rural and predominantly indigenous setting. In February we begin building gardens in each school and for the next five months we will offer workshops for the teachers with the goal of empowering them to use the garden as a teaching tool. For the past couple of weeks we have been designing surveys for the students and teachers that will give us a baseline understanding of their nutritional habits and their perceptions of agriculture. After a year the research team will give another survey so we can get an idea of what effect the school gardens had.

I have discovered that there is a true art to asking questions. This initial survey has gone through many incarnations, as we share it with teachers and students alike. It is easy to take for granted the definitions we use for words like “agricultor”. When we asked the students, “Queires ser un agricultor cuando ceas grande” many answered no. But when we asked whether they would like to plant seeds and grow food they said yes. A good question meets the students where they
are with their own definitions. As a bumbling student of Spanish I am painfully aware of the detours and misunderstandings language can fall prey to on our journey to making ourselves clear. Many of the students, like me, are learning Spanish as their second language, at home they speak a Mayan dialect called Teotxil. Written surveys allow people to gather a lot of information from a lot of people, but they are truly a can of worms.

What I love, is sitting down with people and talking, exploring meaning on the meandering dirt path of gesticulations, words and drawings. My favorite moment this week was sitting in a classroom at the center of a huddle of sixth grade girls in their traditional brightly colored blouses and black woolen skirts. We passed my journal back and forth between us. I would write a word in Spanish or show them a picture of a plant that I had drawn and they would translate it into Teotxil. Maize=Ixim, Mariposa= Pepen, Gracias= Colabal. When I left one of the girls gifted me a picture of a pyramid shaped flower that she had drawn.

Come spring all of these vivid experiences and colorful ideas will some how have to constellate themselves into a thesis. For now I will let my curiosity guide me as I ask questions and explore the plants and people of this rich and beautiful place.

I should first explain what brought me down here. Last spring in my ethnobotany class I met three professors from San Cristostal, Helda Morales and Ron Nigh. They were on Sabatical in Santa Cruz researching school gardens for a similar project in Chiapas. Helda's presentation on indigenous pest management practices in the highlands of Guatemala captured my imagination. I approached her after class and invited her to come visit. Months later when I began to brainstorm ways of creatively somersaulting through that last hoop of college, my senor exit requirement, I thought of Helda, Ron and Bruce's school garden project.

So here is what we are doing now:

In February we will begin to build the infrastructure for the gardens. In the end of March we hope to begin a series of five workshops and reflection sessions for the teachers with the goal of empowering them to use the garden as a teaching tool for science, math and nutrition. I will only be here for the first workshop, which will be about teaching science in the garden. Many of the teachers have expressed that they have very little experience with science, so this workshop will focus on asking questions and applying the scientific method in the garden.
These past two weeks we have been working on developing a survey for the students. Helda Morales, Steve Gliessman and the rest of the research team are interested in the impact of school gardens on student’s perceptions of agriculture, science and nutrition. Last Friday we had a meeting with some of the teachers to get their input on the survey questions. Their ideas where very helpful! I am most interested in the responses to the questions about seed saving, the economic role of their family’s home garden and who they perceive to have the most agricultural knowledge. I am not sure how much of the information gathered in this survey I would be able to use in my thesis, because human subjects protocol is an issue. I believe that at UCSC in order to give surveys to children under the age of 18 you have to get parent consent. This is near impossible in these communities, because often the parents cannot read Spanish and are distrustful of any paper work that requires a signature. In the past people have signed away rights and land because they were unable to read the document they were signing. Helda will be able to get it approved through the Coeur ethics committee, but I’m not sure if that will be sufficient for me to use in my paper. Since I am probably not going to be able to directly use the information gathered from the survey of the kids, I am creating a survey for the teachers. I haven't finished it yet, but it will be about their perceptions of agriculture, nutrition and the communities they work in. I will send you a copy when it is done. This week we will be field-testing the survey that we developed for the students and we will be giving our first surveys on Thursday and Friday. If I don't finish the teacher survey this week, I will be able to give it out to the teachers when we have our first meeting with all of the teachers in early February. I believe there are about 30 teachers involved.

Helda, Bruce and Ron have been helping me brainstorm ways of incorporating my questions about biodiversity into this project. One idea that is in the works is to create a biodiversity garden with the students at Muquem one of the most rural schools. When they visited the school for the first time to look at the location and gage the interest of the students and teachers. The kids were very enthusiastic and asked when they should bring seeds to plant. So the idea is, that we could send the kids home with a home work assignment to bring seeds from their home garden and interview the person in their family has the most knowledge of garden about the seeds. That way, when we plant the garden all of the seeds will be local varieties. I may research some other native annual species that are used for basketry, medicine etc. that can be planted as well. I am hoping that my work in this region will connect me with some families so that I can do some garden surveys! But that is still to be seen. Do you know if I will be able to use the seeds from this assignment to inform my paper? An interesting factor at play in the area around the Muquem school is
that most of the men in these families work in the United States in order to send money home. I think it will be interesting to see how this extra income and shift in the family structure effects subsistence agriculture and home garden biodiversity. I will let you know other ideas we come up with as they arise.

For the workshops I am hoping to develop some demonstration activities that can help to guide the teachers in developing their own activities and even be used in the schools. One activity that I am particularly attached to is a game meant to illustrate the importance of biodiversity. The students will pretend they are farmers and be given bags of beans. Some of the bags will be all one type of bean and others will be various mixtures of different types of beans. The teacher will have cards that explain various factors that might effect their harvests. For example there is a frost that kills all of the beans that sprout early so each student has to subtract all of the black beans. Students who have black bean mono crops will be devastated while those who had a mixture will still be alright. After the game the students can plant all of the beans in their garden and keep track of how each different type of bean sprouts and grows in different ways.

Thanks for reading all of this! I look forward to any feed back you might have about the direction I am heading with my research and the human subjects issue.

My Journals

Ocotal Rebsamen
March 17th 2010
Ocotal: First Workshop with the Students

Ocotal is a municipality of San Cristobal on the northwest side of the mountain and nature preserve El Huitepec. The road that leads to the school hairpins off the main carreterra at the last comev stop of the san pedro line. It winds up through pineforests decorated with epiphyties, small homesteads and fields of agapanthus, carnations and other cut flowers that are sold at the markets in town. The community’s economic livelihood is mostly based on their flower and rabano harvests which are sold in san cristobal or tuxla. Though almost all of the families plant milpas as well, for their own food. Today We climbed into the cold windy blanket of clouds that incased San cristobal in a timeless chill making the morning hard to differentiate from any other time of day. Up here the cold was amplified by the drizzle of passing cloud. When we arrived, the car that the three teachers use to carpool up to the school from San Cristobal was already parked in the turn out. We got out of the car
and were saluted with a Buenos dias by three girls in pretty dresses running up the stairs into the school yard. The fifty two students in this school are divided between three classrooms. Preschool in one room, first and second graders in another and third, fourth, fifth and sixth in the last classroom. The boys were already running around playing soccer with a deflated soccer ball. The girls huddled together on the steps that lead to the classroom. Their brightly colored pleated dresses made from lace, cotton or shiney satin like material and their equally festive shawls made a stark contrast with gray day and belied the cold bodies beneath. Most of the girls wear to small plastic pumps that squeeze their toes to an uncomfortable looking point. Estrella, who said she wanted to make herbal medicine when she grew up and her little sister who is never far from her side were wearing the same bright red cotton dresses and blue green shaws that they wore the last two times we came to visit. Perhaps most of the other students also are wearing the same out fits but I haven't paid attention what other individuals were wearing.

When we walked into the First and Second grade class room and said good morning we were answered with a chorus of “Buenas dias”. We all held hands and started our workshop with a song. Tierra eres me amiga. After singing it once all the way throught we asked the students sing it with us repeating it back after every line. The students were shy and sang softly when it was their turn to repeat a verse. Helda gave her talk, explaining just like the song says all of our food comes from the earth. That earth is sacred. She asked the students how long they thought it took nature to make just one centimeter of soil. The students were slow to answer this question and were prompted by Melissa until they were all chanting in unison “viente meses, treinta meses, quarenta meses” “Cinquenta anos!” Helda finally said. In the big group they seemed more comfortable responding in unison to every question. This may be a reflection of the kind of teaching style that they use in the school. We worked in smaller groups to do the activities. I was leading the activity planting seeds in glass jars so the students could observe the germination of the seeds. The questions we were trying to answer with observation were: Which type of seed will sprout first? Does size matter? Which will come first roots or leaves? In my group I also had Meastra Sol who helped facilitate by repeating my questions, I am sure the students weren’t used to my strange accent and way of talking. They seemed more comfortable speaking out individually to answer questions. The other groups were creating wormbins and planting seed starts. We gathered back in and made our pledge to the earth.

Third and Fourth followed the same format as First and Second. They seemed even more reluctant to actively participate. In the smaller seed sowing jar activity I had two students and el Maestro. These students gave me blank looks every time I asked a question even after the prompting of their teacher.

Fifth and Sixth grades were by far the biggest group, though if I remember correctly from the day we gave the incuesta only four were sixth graders the rest were in fifth. They were the most comfortable singing the song and a lot more active in participating in the activities. We divided into three groups: worm composting and decomposition experiment, watering seed trays and the planting seeds with and without bacteria experiment. The boys in our worm composting group were afraid to touch the worms but the girls were excited about it! At the end of the activities we held hands and gave our pledge and
afterwards discussed how the students were going to take care of all of the different experiments.

Of the preschool students, only four were able to arrive because of the cold. Helda gave her discussion of the importance of soil, Melissa talk about worms and I made seed jars. The preschoolers had no fear of answering or asking questions and were on the whole the cutest of all of the students.

After we cleaned up all of the materials we joined the teachers in the wooden kitchen, that I had not even realized existed. It must not be used very often for the students. It was decked out with big fire blackened pots and pans. A gas stove that didn't look like it had been used in a while. There was a fire in the hearth that filled the room with smoke and heated the sugary tea and tortillas that had been brought for us. Maestra Sol had brought a steamed vegetable salad for us to share as well.

First Visit: Test Survey January 28th

This was our first test survey for the students of Ocotal. It was a bright and windy day. In the 3-6th grade class we entered after the students had come in from their morning play. They chorused “Buenas dias” Helda explained that we needed help with our survey and asked for volunteers. With obvious excitement almost all of the students raised their hands. She asked for a boy and girl from fourth fifth and sixth grade. Immediately a boy and girl from each grade ran to the front of the class. Outside we introduced ourselves and randomly assigned three students to take the written test overseen by helda. Melissa and I took the other three to be interviewed orally. Soon we realized that it would be difficult to interview all three at the same time. I took the two girls one from fourth and the other from sixth and Melissa interviewed the boy. I soon found out that the girls were sisters. My Spanish was a little bit of a barrier so I read each question out loud. Overall the older girls understood what was being asked. Some words or ideas were confusing to them. They did not know what diabetes is, they were confused by the question about limpiendo how their parents cleared the fields. They didn't understand the options we gave. They also didn't understand what an agricultor was and didn't think that their parents were farmers because they grew mostly flowers and not food. As far as I can tell at this point all of the students come from families that work in agriculture or cultivate food in some way. They have a very through base understanding of the important ingredients of growing food and take for granted that people grow their own food. They know some things in greater detail than I do like how and when to harvest certain things. After our interview we joined the greater group to reflect as a group on which questions were most confusing. Generally everyone found the agricultor question confusing.

After doing the survey the teachers and the family assigned by the community to help with the school served us lunch. The beans and tortillas were delicious!
Survey Day Feb. 12th

When we arrived at the school to give the survey, work had been started already clearing and leveling for the garden. A family chosen by the community is appointed to take care of the school and be available for the year. The husband of this family and his older sons were there with hoes clearing rocks and trash from the soil. I joined Bruce in the 3rd through 6th grade classroom where we gave the written survey. The rest went outside with Helda and Ron to do an interactive interview activity, which involved active physical participation in answering questions as a group. For the written survey Bruce reminded the students that there are no right or wrong answers. But when it came down to the survey there were a lot of questions like, what is diabetes etc. We advised the students to write no say. Two of the girls whispered back and forth between each other answers to the questions. Their surveys looked almost identical. The survey only took an hour to do here because there we had already had the students draw their dreams for the garden and because there were so few students.

We visited Ocotal with architect Federico Burkam to design and begin constructing the beds but found that the father and his sons had already created beds. The beds were wide and slightly sloped, the retaining wall was built of stones that were not cemented together, which could be a hazard. It was great to see their enthusiasm and willingness to help with this project. Federico and the team had a different vision of what these beds would look like. Fede gave some suggestions like, we should use the clay in the soil to cement the rocks together and we could make paths so the smaller students can reach the beds. I think that this is a great example of our different vision for the project and gardens. I think this family has a lot experience cultivating the earth, but the needs of a school garden are different than the those of a commercial or personal farm and garden.

March 24th, 2010

Today we had the fortune of being at the right place at the right time. Our unannounced visit to Ocotal turned out to be on the very same day the teachers had planned a natural history/science excursion inspired by our science workshop. I talked to Maestro Ruben about the home work assignment he had given the week before. While the older students finished their assignment the younger students flocked around Maestra Sol who was selling chocolate wafers that she had brought up from San Cristobal. Sitting around waiting for the rest of the students to come she asked if any of the students had remembered to bring their bug catching jars and note books. All of them had their notebooks and some of them brought their jars out. When all the students were out we set off up the road. As usually happens with big groups we ended up spreading out along the long road. Around me a group of girls congregated. They were amused by my accent and asked me how to say words in Spanish. “como se dice casa en ingles” I asked them if any of them spoke Teotzil. Almost all of them did, though most of them said they only spoke a little. As we walked we translated the things that we saw between Spanish, English and Teotzil. For some of them Teotzil was their first language and for others their second. Almost all of them had family members who spoke teotzil, grandparents or parents. As we climbed up through the
cultivated flower fields and into the trees the girls started identifying familiar plants. They pointed to a species of Bacharus naming it in Teotzil and identifying it as a medicinal plant good for drying up diarrhea. Not everyone was knowledgeable of plants. We came across a fernlike plant with red berries hanging down and one student said that it was edible the others quickly denied it telling a story of someone who almost died from eating the berries. When I asked the name of the plant no one knew. But we discovered that it made great paint which launched the group onto a hunt for berries and other pigments to paint with. When I asked one of the girls most enthusiastic about identifying plants where she learned about plants, she said it was her parents who taught her. One of the goals of this project is to empower students in the rural settings letting them know that the knowledge that their parents have is valuable. This education has to start with the teachers, instilling in them the respect for the knowledge of farmers.

When we reached clearing by the radio tower at the top of the hill we separated into two groups. Maestra sol changed her original plan going with what interested the students the most and having them draw and label plants and color them in with plant dyes. The older students went with maestro ruben, who let them run around, yanking up different plants to show each other and hand to us. We found a field planted in some sort of brassica. Looking closely I found a lady bug crawling on one that was filled with aphids. I called some students over to look and the maestro as well. I tried to ask him how to say aphid in espanol but he could only call them plagas. Though he didn’t know the word in Spanish he wrote down aphid in English and said he would look it up. By the time we returned the students were finishing with their drawings and beginning to catch bugs in jars and gather cultivo from beneath the trees for the garden. The Older kids were a little bit of a disruption so maestra sol let everyone run around and be wild for a little while.

Wild exploration with older kids, picking all sorts of plants, finding different pigments.

Aphids and ladybugs

Bugs caught in jars

The walk home Talking with maestro ruben about the parents in the area how only two families have fathers in the us. Most of them work in horticulture or in construction, carpentry etc.

Vincente Guerrero, Muquem:

Test Survey

Melissa and I went to muquem alone with the driver from Ecosur. It was a beautiful day and when we finally parked we were surrounded by curious students. We talked briefly with the Teachers and soon the students were all lined up in a semi-military style on the concrete playground. All 270 of them saluted us with a Buenos dias! Melissa explained that we needed their help answering some questions about what they like to eat and what they think about growing food. This time there was not an overexcitement of raised hands.
Students remained quite in their lines and the teachers helped choose amongst the fourth and sixth grade lines a boy and a girl possibly creating a bias. We went to the cafeteria where the students from the alberge eat. 50 toothbrushes were lined up in a rack against the wall entering into the cafeteria one for each student who stays, because the walk home is too far. We sat down with the students at the long tables, this time I was overseeing the students taking the written test. The students would whisper questions to each other in teotzil the youngest from fourth would look over at the paper of his neighbor to copy her answers. When one of the teachers came over to help she would explain each of the questions to the students in teotzil, when they still did not answer the teacher would prompt their answers. For example the question of what your family grows in their huerto, the teacher explained the question and then listed thing like chicharo, haba, and maize the students copied these answers onto their survey. The teachers intervention was well meaning but also skewed the answers so that we didn’t get to see specifically which questions weren’t understood. Their lack of understanding was shown in the beginning when they would answer yes or no to questions that required a why explanation.

The teachers travel every day in a caravan of two to three beetles. They all learned spoke teotzil as one of their first languages. Being able to speak the language means that they are able to communicate with greater clarity with their students. But not living or growing up in the community means that they are still outsiders to the process of the community. How can this garden bring the teachers closer to the community and help them establish more of a dialogue with the students instead of a call and response?

March 15, 2010
Muquem

Drive in Observations of fields etc.:

Ron gave us the keys to his bug this morning before he and kippy left for merida. Walking down the street in the morning air we were filled with a sense of adventure, we were going up to Muquem with out invitation and with very little plan. At last we had the freedom to move around and explore! Navigating the narrow streets with a car was a completely novel way of experiencing the city, we were constantly on the edge of our seats. When at last we found the road that would take us up into the mountains we snaked up through groves of encinos (holm oaks), bushes bright with yellow flowers and the purple flowers of an medicinal plant that we identified on our last trip. We recognized the turn onto the dirt road when it came and began the slow jostling journey down the rocky road. Along the sides of the road in the Encino groves we passed wood neatly stacked nearly head high! I remembered what the caretaker of the nature reserve el huitepec said about how new shoots were harvested and used to make coal that is burned in the kitche to make tortillas and cook other things. I have seen on the streets of san cristobal women selling elote asado cooked over the very same coals. Further down the road we came to a settlement made from cinderblock houses there on the hillside next to the freshly planted field of beans were tall concrete buildings that looked like out houses but that I recognized as storage
houses for maize. At eco-sur they have about eight of these buildings, the same shape but made from clay. The researchers are studying how storage houses made from clay v. wood v. concrete effect the longevity of the corn. We kept climbing, passing another settlement that was tucked into pasturelands grazed by big herds of black and brown sheep. The wool I recognized from the beautifully shaggy black skirts worn by women from the chamula area. We reached a mountain pass marked by three crosses, and dove down into the muquem valley, we could see billowing smoke and burned patches where farmers had begun to clear the land. The hillside was divided into a patchwork of small parcels; the different shades of brown green and gold indicated that each was in a different stage of cultivation. Later when we were sitting at the tienda close to the school, I asked about who owned the parcel below us and the teachers explained that different families cultivated different plots. The patchwork of parcels is a patch work of different uses and different owners. People don't necessarily live close to their plot of land.

Though we came with out invitation, Dona Irma the directora of the school, welcomed us warmly. We explained that we only came to view the space for the garden so we could make some plans. The area situated behind the main buildings of the school was already lush with vegetation, calla lilies and elderberry grew wildly. Most of the plants were concentrated in a sloped and funneled area. The plants and terrain indicate that during the rainy season there is probably a lot of moisture in this area, maybe even running water. We might consider creating on contour swales and burmes to avoid erosion and facilitate more infiltration of water into the soil. The area that we are thinking of planting gets full sun all day. The space is triangular, backed by the school building and flanked by two walking trails. Beneath the vegetation there is all sorts of trash, I think that one corner of the triangle used to be a burn pile for trash, there is broken glass, roofing tiles and plastic. To use this area we are going to need to do some cleaning! Further down the slope there are two pits that serve as the current burn piles for all of the school's trash. In the pile there were food scraps, plastic, glass, and paper. Unfortunately the burn pile was probably raided by dogs and other animals along the way, so the trash has been spread out around the area. Melissa and I threw out the idea of creating a casita de reciclaje and compost by the burn pile, so that the trash can be turned into resources. Though scheduling has been an issue with Muquem, Melissa and I both thought that multiple visits with small projects would be needed to turn this space into a school garden.

Possible activities to do with the students:

- Trash pick up. The students could answer the question, “which type of material makes up the majority of our trash” by sorting the trash they collect into piles. Then we can talk about what we could do with this trash. Students will probably need gloves because there is a good amount of glass.

- Dona Irma commented on the importance of involving the students, especially the older ones in the bed building process. I this is a great idea, but we should design and build the basic infrastructure of the bed first. The students can do some of the easier work later such as sifting the topsoil or digging the beds after they have already been picked. Dona Irma doubted that any of the fathers in the community
would come for a work day, so we may want to plan a day that our team can come up to work.

- Dona Irma also expressed how much she would like some perennial fruit trees or bushes that didn’t need much attention or care. I think that in a school like Muquem where the teachers and parents aren’t as invested in the school, perennials that need very little care would be a great idea to plant.

Before we even get to our pre-planned soil workshop, I think we at least need to do a trash pick up and awareness day. We can make activities around trash, how long it takes to decompose and how much we are producing! Then we can have a day to design and build the beds just with the adults. Ocotal and pequno sol their own beds without our input. It was great to see their initiative but the gardens were not without their problems: the infamous sloping beds, precarious rock retaining walls, sheet-mulched soil that won’t be ready to use for a year. This could be our opportunity to build a really great garden that is functional for classes and growing food. Unfortunately we don’t have the same kind of community support here as we did at the other schools, which means we will probably have to do a lot of the heavy work ourselves. We may need to bring in materials to create retaining walls for the on-contour beds, as well as picks, hoes and shovels.

- Students only came to school two days last week because of weather and the government aid program for women that took over the school

- Students told us that in secondario every Tuesday and Thursday is are physical fitness days and they just have gym class all day.

- The fifth and Sixth grade teachers still hadn’t passed out the homework that I gave them two weeks before. I don’t think that the sixth grade teacher brought his to school that day but the fifth grade teacher had, he passed it out to his students while I watched, I asked him to read the directions with the students so they could understand it and even translate parts that weren’t clear to them. The sixth grade teacher said he would bring the assignment tomorrow, though he didn’t seem very excited about the idea

- I reminded the teachers to bring their surveys back as well. We will be picking them up on Thursday.

Irma: the space commentary on fathers that up in the US

They need the father’s signature on the birth certificate. For this reason many of the men when they return to from the us change their baby’s name

260 in primary 52 in el alberge

Tuesdays and Thursday are physical education days no class for secondaria

There were only two days of class because of weather and because the women of the community were given financial aid from the government and they had to use the school grounds.
Salvador:

Driving back to San Cristobal in the bug with the windows rolled down Melissa and I stopped every other turn to snap a picture out the window of haphazardly divided parcels. Up on the hillside a fire was burning away the undergrowth leaving a plume of smoke and a charred patch of earth. Beside the fire a figure hacked at the soil with an alcadone (hoe). I wanted so badly to climb the hill and ask what they were doing, why they chose to use fire to clear their field, how long they have to wait after burning to plant and whether they will need to burn again next year. But it was a long way up and Melissa commented that the folks up there might not take well to having strangers asking questions in a language they may not even understand. As we drove on I felt the sinking feeling of not having found anyone to answer all of my questions about the milpa. As we rounded a steep corner planting on the side of the road was an older man with a maize planting tool and a bag full of seeds. “stop here!” I got out of the car and was greeted by the farmer whose name was Salvador. I think he was happy for the diversion. He had nearly finished planting maize in the grass field. I could see the matrix of holes where his tool had punctured through the sod and loosened the soil. At his hip hung a bag made of the shell of an armadillo curled in on itself and fastened with metal. In it were the blue and purple semillas de maiz. When I asked him if I could take a picture of the seeds in his bag he shook his head say that I would take them far away. The tool that he used to plant the seeds was a long straight stick with a metal head that had been flattened to better part the soil. The bark of the handle had been whittled away and the wood was burnished by use. He leaned on it as we talked. I asked him why he was planting straight into the grass and whether he would need to kill it eventually. He explained that he planted this way because it was easiest. After all of the seeds were planted he would fumigate the grass with herbicide. After the maize grew he would not fumigate any more. Adjoining the grass field where Salvador was planting maize there was a hillside planted in beans that lead up to his home. He explained that that field was cleared by fire and then loosened with alcadone. When I asked him why he burnt that field and not the one he was planting now the only explanation he could give me was that it the fumigant would kill the beans. Maybe he meant that at that stage he was not using fumigants because they would kill the beans. Language was a bit of a barrier. We were both speaking our second language, Spanish. I think some things were lost in translation. The conversation, as usual turned to where I am from. “soy de California. Conoces California?” He told me that he had never been to the states but his son just returned from working in Florida. He explained that he would have gone but he is getting old and it is a dangerous journey. His son is twenty three years old (like me) and already has a family. He crossed the border illegally because he did not have a passport. He had to travel four days through the Arizona desert. He worked in Florida and the south for two years before he returned. Now he lives here with his family. I asked him if I could try using his tool and acceded with a laugh pointing out where the next seed should go. He explained that he didn’t measure it exactly, he just used good sense to approximate where it should go. I punctured the soil, breaking it open by using the leverage offered by the tool then Salvador took it from me and showed me how he used the tool to hold the hole open and drop 5-6 seeds from his armadillo pouch into the hole. I tried to ask why he planted five seeds but the question wasn’t understood so after the third time asking it I dropped it. Then I asked how long until the plants sprout. He said it would take about a month when the rains
Reflections on The Surveys

As Melissa and I drove up the winding road we came across a student from secondario in his red gym uniform walking home with his mother. We asked him if they would like a ride. Sure they said and climbed into the back seat. His mother only spoke teotzil so she stayed quite the whole time and let her son answer the questions. He and his family didn’t have a parcela they planted corn in the area right by there house. He had to walk almost two hours to get to his house. He didn’t plan on going to preparatoria when he graduated because it was too expensive and he would have to move. After he graduated he would have to work, but doing what he did not know. I also did not know what he would want to do if he could do anything he wanted. His house was very far away and when we arrived he asked us how much we charged for the ride. We laughed and said it was

Melissa and I drove away, excited at the chance to talk to a real farmer! We will definitely be back! Questions that have occurred to me since we talked to Salvador are: Why did he choose that day to plant, was there something special about that day? Do you plant the beans and squash in the same hole as the corn or a different one? Why do you plant so many seeds in one hole? Can I meet your son and talk to him about his experiences? I would love to know how his experiences have effected the way he views his home and the way he plants and grows food here.

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Reflections on The Surveys
Pequeno Sol y Muquem

When I arrived at the school in the morning the team was beginning to hand out surveys and drawing supplies to the fourth, fifth and sixth grade classes. In first, second and third grades, information about the students’ opinions, knowledge and preferences concerning food and agriculture was collected through a game/ interview. All grades were asked to draw a picture of what they would love to see in their gardens.

We had a detailed pre-planned schedule that had been given to the teachers ahead of time. This formality didn’t seem necessary at Muquem, where schedules seemed to be improvised based on weather and the needs of the teachers. At muquem the teachers molded their plans around our survey, they started class when we were ready to begin the surveys and let all of the students go when we were finished. At Pequeno Sol the teachers fit us into their already full day of lessons. I think that the need for a concrete pre-planned schedule at Pequeno Sol speaks to an important difference in the organization between the schools.

Another striking difference between muquem and Pequeno Sol was the resources available to the teachers and students. In the third grade classroom at Pequeno Sol, there was a shelf of cubbyholes; each cubbyhole had a student’s name written on it and a large stack of books that were used by that individual. In the third grade classroom at Muquem the bookshelf had a sparse selection of books that were probably used mainly by the teacher, as there were not enough books for the students. At Pequeno Sol there were was an abundance of art supplies, costumes, and decorations in the classrooms, this was not the case at muquem. This lack of supplies must make teaching in muquem more difficult and may explain the more improvisational approach to organizing the day at muquem.

When Bruce and I entered the sixth grade classroom at Pequeno Sol the teacher was at the black board explaining fractions. The students were attentive while he spoke and when he gave the floor over to us the students listened, but as we started to hand out surveys, markers and papers the chatting began. Students leaned over desks to compare answers and talked about completely unrelated things. When I returned close to an hour later there were students who hadn’t begun their drawings. The teacher commented that it is hard to get them to do anything. This differed greatly from the almost military order at muquem. The drawings in the sixth grade class weren’t as detailed or imaginative as the younger student’s drawings. Bruce commented that this might speak to the age appropriateness of the activity.

From sixth grade we moved to first, where our abundance of markers was met with excitement. As I moved around the class asking questions, I found a boy drawing a tree. “What kind of tree is that?” I asked. “Zanaoria” he replied. “Zanaorias grow on trees?” I asked. “Yes” he said matter-of-factly. Later on another boy in the class who had drawn a gigantic carrot came over and explained to him that carrots don’t grow on trees. “They grow from seeds you plant in the ground”. The Boy who had drawn the tree looked up at me questioningly. “Si, zanaorias son raizes” I clarified.
As a whole the drawings at Pequeno Sol were more holistic than those at muquem. They depicted vegetables as a part of a system that included soil, sun, rain, clouds and even bugs. At Muqem students drew and labeled vegetables floating in space. This may have been because of different ways that directions were given or possibly the example drawings on the walls at muquem that led the students to draw their gardens that way. You would think that students that come from agricultural families and have to walk through miles of milpas to come to school would be more capable of depicting fruits and vegetables as a part of an whole ecosystem than students who draw zanaoria trees. It might be that the students at muquem take for granted those aspects of a garden.

At Pequeno sol there were a lot less animals depicted as a part of the garden ecosystem. At muquem nearly all of the students included some sort of poultry and some sort of livestock in their pictures, whereas livestock was rare amongst Pequeno Sol students.

We also got to see how ideas move amongst the students. One student draws a butterfly and soon the idea catches on and you have a whole corner of butterflies. In one class, all of the students followed the lead of a boy who added ants carrying away a watermelon to his drawing. By the end of our time the whole class (and especially the boys) had ants crawling all over their gardens. Other than butterflies the students at muquem had very few insects in their pic