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The Cape Verde Project: Teaching Ecologically Sensitive and Socially Responsive Design

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TEACHING ECOLOGICALLY SENSITIVE AND SOCIALLY RESPONSIVE DESIGN

THE CAPE VERDE PROJECT

by

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Abstract

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Under the Supervision of Professor D Michael Utzinger

This dissertation chronicles an evolving teaching philosophy. It was an attempt to develop a way to teach ecological design in architecture informed by ethical responses to ecological devastation and social injustice. The world faces numerous social and ecological challenges at global scales. Recent Industrialization has brought about improved life expectancies and human comforts, coinciding with expanded civic rights and personal freedom, and increased wealth and opportunities. Unfortunately, industrialization also caused wide-scale pollution, mass extinctions and anthropogenic global climate change. Industrialization also reduced the earth's capacity to meet human resource demands – demands that are ever increasing due to population growth, urbanization and over-consumption. This dissertation develops an architectural theory based on ethics as a way for designers to engage the aforementioned issues. Architects play a pivotal role in shaping the environment, with the symbolic power and use of buildings, giving architects great sway in shaping social spaces and ecosystems. This important role necessitates in-depth curricula that address these problems.

Architectural training focuses greatly on aesthetics and technical concerns, often at the expense of other equally important issues, such as ecological damage and social justice. In design education, design problems are often de-contextualized to avoid extraneous complications such as the economy or culture. Much of design education occurs with the study abroad and in the design studio. In the former, a grand tour of canonical buildings introduces architects to the precedents they learn to emulate. The latter is where instructors spend many hours in individual or small group interactions. The study abroad and the design studio provided ideal venues to address many of the current concerns beyond aesthetic and technical issues. These concerns include questions related to community engagement, social justice and the ecological effects of design. However, the complicated nature of these issues makes adequate curricula difficult to fashion. The challenge was to provide a framework for learning that was nimble, with wide-ranging curricula and adequate time for self-discovery. The framework included pedagogical content with contradictory claims and conflicting interests. The curricula were broad but provided attention to detail and deeper place knowledge, employed varied examples, experimentation and field work.

Dedication

Dedicated to:

my mother, Johanna – the real architect in the family,

my father, Madukwem – for loving education,

my brothers, Madukwem Jr., Nkemjika and Ogugua – for not causing me too much drama… or trauma

my daughter, Briyana – for being herself,

my son, Jideobi – may he never lose his bliss,

and most of all my wife, Jamie – for patience and loving care… and patience.

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CI.DLOT: Centro de Investigação em Desenvolvimento Local e Ordenamento do Território; Research Center in Local Development and Territory Planning

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And many others…

There are two things that interest me:

the relation of people to each other, and the relation of people to land

– Aldo Leopold

Photo by Natalie Dulka

INTRODUCTION

> *We just can't seem to stop burning up all those buried trees from way back in the carboniferous age, in the form of coal, and the remains of ancient plankton, in the form of oil and gas. If we could, we'd be home free climate wise. Instead, we're dumping carbon dioxide into the atmosphere at a rate the Earth hasn't seen since the great climate catastrophes of the past, the ones that led to mass extinctions. We just can't seem to break our addiction to the kinds of fuel that will bring back a climate last seen by the dinosaurs, a climate that will drown our coastal cities and wreak havoc on the environment and our ability to feed ourselves. All the while, the glorious sun pours immaculate free energy down upon us, more than we will ever need. Why can't we summon the ingenuity and courage of the generations that came before us? The dinosaurs never saw that asteroid coming. What's our excuse? – Neil deGrasse Tyson*[1]

The situation that Neil deGrasse Tyson describes and the behaviors associated with it, are not just failures of scientific knowledge or technological know-how. The circumstances are not the outcome of a want of creativity. If anything, it is our creativity that got us where we are. It is the things we make – our artifacts – produced from our creative impulses and ingenuity that have led to the current state of affairs. Hence, it is time to rethink how and why we make the things that we make. Furthermore, because the causes and consequences of these circumstances, which include the availability, access, use and disposal of resources, are not spread uniformly across the planet or among the human population, there are ethical and social justice implications to that reconsideration.

Some of the things that we make, that are great contributors to the condition Tyson describes, are buildings. The circumstance that Tyson describes is a condition of the built environment – the result of our intentional altering of the world. What is design but intention? Hence, if our designs produce a reality that is not our intention, then we must rethink our design. Because the challenges that we face are so great; the ecological damage so pervasive and social justice implications so fraught, our reconsideration must be fundamental. The first part of this dissertation is an attempt at that reconsideration.

In their seminal report, Boyer & Mitgang (1996, pp. 27, 35), call on architects to promote the value of beauty in society, and that the training of architects should include how to clearly and convincingly communicate of the value of beauty to the public, and how to create healthier, more environmentally sustainable architecture that respects precious resources. Architects, they suggest should be dedicated to preserving cities, and to build for human needs and happiness, and to have more contact with clients and community members, and that these be inculcated into curriculum and design problems posed to students. They assert that how the built environment affects people and the ecological consequences of the construction, use and disposal of buildings, should be emphasized to students and professionals.

These recommendations, adopted by the organizations that represent architecture education and practice, underscore the challenges that the architecture education is now confronted with. Cape Verde project was devised to address some of these challenges. It is an attempt to expand the aesthetic concerns addressed in architecture

to some of the other concerns alluded to in the Boyer Report. While the Cape Verde project was not conceived for the purpose of a dissertation. It was only after the return from Cape Verde and as the studio had been underway for several weeks that the idea was proposed. However, the project was conceived as a learning experience with a deep investigation into ethics.

There are strong theoretical bases for research and education in all the above recommended areas except with regard to the ecological consequences of buildings. Hence, this dissertation is the development and articulation of a different philosophy for architecture education that provides a framework for addressing the aforementioned circumstances. Towards that end, the students were presented with a context in Cape Verde that allowed for engagement in the issues that pertain to the circumstances described above, as well as the cultural, political and economic implications of those issues. The design studio was then used to allow and encourage students to develop their own design approaches, grounded in ethics, in addition to aesthetic and technical considerations, to attempt to address those issues. It is hoped that by developing these new approaches to design, the students may develop new formal languages. Hopefully, such formal languages would meet the current challenges, while they anticipate future developments and would also become part of the long tradition and broader discourses in architecture, design and the provisioning of humanity.

The elements of that philosophy include various pedagogical theories, including robust ecological literacy and cultural understanding, experiential learning and critical engagement with context and issues related to the context. The Cape Verde project was

an attempt to develop such a philosophical framework in design education to achieve these goals. The first component of the framework was the immersion in Praia, where the students experienced first-hand, the aforementioned issues pertaining to ecology and resource scarcity, as well as how those challenges were met by their hosts and the nature of the responses. The study abroad was structured in a way that encouraged the students to engage those issues, principally by measuring resource flows and participating in the daily activities of the host family.

The second component was the design studio, where the students were given the freedom to develop their own responses to their experience of Praia. The students were not required to respond with any particular aesthetic position, technical approach or material choices. Rather, they were encouraged to develop their own design approach that included their own aesthetic positions, their own technical approaches and material choices, as long as their decisions could be justified within the context. The justification was to be made on the basis of how well they attended to the circumstances of their clients, their host families, and how well they addressed the ecological, social and cultural issues that they witnessed during the immersion.

The Cape Verde project was conceived as a way for architecture students to recognize the impacts of humans on ecosystems and to respond to the social justice issues of the day. The first goal of the project was to enable students to understand the state of the world, by gaining a clearer awareness of the ecological crises we face, and the social and cultural implications of these crises. Once students gained this knowledge, the next goal was for them to develop an ethical position to these crises and

the implications of the crises. Another goal was for students to take these crises and implications into account in their design approaches, and finally to alter their views and relationships to the world.

To achieve these goals during the Cape Verde project, two major aspects of architecture education were used differently than is the norm. The first of these aspects is the grand tour. The idea of the grand tour is for architecture students to travel to the architecture meccas to see important buildings. These form the canon of important buildings that are used as precedents. Architecture students develop their notions of what architecture is by seeing these major works. The second (and more pivotal), major aspect of architecture education is the design studio. In the studio, the precedents are used as research material for design ideas.

During the grand tour, the interactions with canonical buildings are almost entirely on the basis of pure visual aesthetics. The understanding of visual aesthetics and the technical knowledge to accomplish similar aesthetics comprise the practical education of architects. However, this practical knowledge to achieve the aesthetics represented in the canon is secondary to the enculturation of the student into the architecture ethos. That enculturation begins in the studio, where the habits, the norms and the outlook of architecture professionals are crystallized. In studio, the desk critiques, the reviews and the charrette are used towards this enculturation and the development of the competitive spirit in the students. Competitions, which are used in school and in practice, are also used to develop the competitive spirit. This competitive spirit is often developed at the expense of cooperative impulses.

As such, architecture education's focus on enculturation, competition, aesthetics and technique often results in the neglect of other important issues, such as ecological, cultural and social concerns. The client base is also limited, precluding the vast majority of the planet who constitute the growth of the world's population and receive the burden of current ecological problems and the social implications of these problems. If architecture is a social art (Boyer & Mitgang, 1996, p. 3), it must respond to current issues.

Considering current issues such as the global ecological crises we now face, an architecture education in which canonical buildings are merely seen is insufficient to address these concerns. The buildings must be engaged. Eschewing the grand architecture tour during the Cape Verde project, the students engaged with buildings in the burgeoning informal settlements of an urban area of the global south – emblematic of where many of the world's population live, and where many more will live. The buildings were not merely seen, they were measured and analyzed. The inhabitants of the buildings were observed, but the students also learned to live as their hosts do.

In lieu of seeing the canonical precedents, architecture students engaged in the Cape Verde project measured the resource flows into, through and out of buildings in a city of the global south. Such a city is of interest for the ecological, cultural and social issues mentioned, because global south cities are where much of the human population growth on the planet is occurring. The city of Praia and the island of Santiago in Cape Verde were ideal for such inquiry because the context was somewhat delimited. Thus, the students gained a reasonable grasp of the resource flows and how contextual

characteristics influence those resource flows. While quite small and somewhat self-contained, Praia is representative of many other urban areas of the global south, sharing similar accelerating growth rates and percentages of urbanized populations.

The impact of such resource use on ecology, culture and society provided a basis for developing an ethic about design. By comparing the resource use in Cape Verde with their usage in the United States, the students discovered interesting differences and disparities that they were the beneficiaries of. The students raised many social justice concerns and critiqued existing structures that supported the current status quo. Hence, while the experience was particular, Praia was more germane than traditional locations on the grand tour for study of concerns that humans face and the issues we will face given the projected direction of humanity. Therefore, the Cape Verde study abroad has more relevance than the grand tour for addressing issues of ecological ethics and social justice.

In the studio, the students were encouraged to take on the resource acquisition challenges that their Cape Verdean host families faced, while respecting various aspects of the local context. Hence, their design responses addressed the ecological, cultural and social characteristics of Praia. Those characteristics included climatic and geological constraints, the availability of building materials and construction techniques, the culture of the place and the social habits of the people, as well as the economic situation of their hosts. As part of their learning, the students compared the energy performance of their designs with those of the existing abodes of their Cape Verdean hosts.

The hypothesis is that projects that engage participants strongly in the context, (socially, culturally, ecologically and otherwise), are more effective in encouraging students to think about available resources and the impact of architecture on the world. It is also more likely to motivate them to expand their knowledge and engage critically with issues and contexts, to become more ecologically literate and more active in social justice.

Research questions addressed the following frameworks, which will be discussed in more detail in Part 2; Ecological Literacy, Cultural Pedagogy and Experiential Learning. The research questions had several dimensions. First dimension was whether it is possible to draw out learners' interest in ecological, cultural and social issues. If so, would the project engender the desired engagement of current issues and how can that be achieved in a design school? Did the learners improve their ecologically literacy and attempt better cultural understanding? A second dimension was how much of a learner-centered experience the project was. Did the learners participate in creating content and how useful was the Kolb model for these learning activities? How useful is immersion in meeting these goals and what qualities made Cape Verde an ideal location? Did the immersion enhance the learners' ability to engage in the ecological issues, provide useful learning about the culture and illustrate social practices? Did it include opportunities to critically engage in the context and the remoteness of the immersion location necessary?

A third area of research questions was whether the ecological, social and cultural issues influenced the learners design ideas. Was there evidence of that engagement in

their documentation and analyses, or in their syntheses and design approaches? How did this manifest in their work, in their narratives, journals and other recorded data? Did it also influence the "outcomes" of the design class and were there connections between larger issues and their work? The final area of questions involves immediate, intermediate or long-term changes in the learners' attitudes to these issues. Did it inform their plans for their academic and professional careers? Did it have an effect on their design philosophy or outlook in life? What was the change in their writing and discourse with regard to these issues? Did it help the learners make connections to larger global issues?

The Cape Verde project provided the contexts, in the study abroad and the studio for students to engage in observation, analysis and design that addressed ecological ethics and social justice. The students became learners who took charge of the curriculum, deciding what was important to learn, and deciding the necessary tasks to achieve that learning. The learners analyzed what they learned and proposed design responses to the challenges that their host families faced, justifying how their design proposals were optimal for their host families and context. The learners demonstrated increased ecological literacy of Cape Verde and their home city of Milwaukee by comparison. The learners reported deeper cultural sensitivity and understanding. These new insights elicited the creative and imaginative instincts of the learners in ways that are lacking in more traditional approaches to the design studio and studying abroad.

The Cape Verde project is a possible template for teaching ecological design in architecture that transitions students from passive consumers into actively engaged

learners. Instead of turning out architects who saw their role in society to be guardians of the architectural tradition, the project attempted to inculcate strong beliefs in the learners to be empowered citizens of the world who join with others to be good stewards of the planet.

For ecological design and sustainable architecture to join the ranks of other strains of architecture, a robust theory must be put forward. That theory must join the ranks of architecture aesthetic theories, environment behavior theories and humanities infused architecture culture theories. As Professor Utzinger once said to me, the basis of such a theory is ethics: and that is for a few simple reasons, to safeguard that the planet remains habitable for humans, that we do not extinguish other life forms or damage ecosystems upon which we all depend, and that we do this in a way that provides for all members of our ever-broadening community, without compromising our shared future.

PART ONE – ETHICS

If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it. – Albert Einstein[2]

I once commented to a colleague that I had come to believe that architecture theory did not really exist. "Well, I think it does," he replied, "but not to the people that matter."[3] The people that matter, he meant, were the practitioners. Architecture theory "such that it is," he went on, "is the province of academics and critics." The theoretical discourse in architecture is not of great concern to the profession. Rather, it is a concern for the discipline of architecture, although, it has consequences for the profession, because it is integral to the education of the architect. Architectural theory has extensive historical roots, and is dedicated to meeting certain ideals. The comedian Lenny Bruce once talked about how his opinion of church architecture evolved over several years. He said that when he was young, he observed that people who lived in rat and roach infested tenements would go to church, with its expensive stain glass windows, polished chalices and golden candelabra, to donate their last dime. He was quite angry at the church for, as he saw it, taking advantage of these supposedly poor gullible people. Later in life, he reflected that he had come to understood why it had to be that way; that people who lived in such meager accommodations, needed something transcendent to help them cope with their daily struggles. If the church was also rat and roach infested and crumbling, what hope then would they have?

As such, the longest tradition in architecture theory posits, in the main, that the point of architecture is to promote the beauty in society because beauty is seen as

virtuous. Architecture theory exists to promote the value of beauty, and there is a long history of discourse on what beauty means and how to achieve it. Hence, architecture has been considered, along with painting and sculpture, as a fine art. However, the promotion of art for its virtues is a social act, and architecture more than other forms of art, requires the participation of the public. Therefore, while architecture has also been included when claims are made that art should not necessarily have a function, architecture is clearly different. It is this dialectical nature of architecture that provided fodder for artistic expression and much of the architectural criticism and theory.

The other qualities of architecture also have theoretical frameworks that undergird them. There is much theory associated creating healthier spaces, and preserving existing buildings and cities. However, although building for human needs and happiness was a strong part of the Modernist project, it has less cache in design studios. Theory with regard to the ecological consequences of the construction, use and disposal of buildings is supported mainly by engineering and the physical sciences. Hence, there seems to be no coherent architectural theory for research and education in the area of sustainable design, or more appropriately ecological design.

The purpose of architecture as practiced, it seems, is to mediate and sometimes shut out nature. And the product of architecture, the building, degrades and sometimes destroys the environment. Likewise, nature is detrimental to architecture (Ingersoll, 1996, p. 119). Thus, architecture is antithetical to ecology, but like all things on the planet, architecture is dependent on nature for its constituents. Architecture theory is also antithetical to nature, though not antithetical to the idea or ideal of nature.

Engaging in architecture in a way that minimizes damage to the environment requires the adoption of more ecologically sensitive design approaches. An ecologically based architecture requires a development of new architectural theory – or at least a refinement. I propose that the basis of such an architectural theory is in ethics, and such ethics must encompass various aspects of life, including the aesthetic basis of existing architectural theory.

Existing architecture theory is the product of human ethical underpinnings that have served us well in the past. However, those ethics must be reassessed in the face of changed circumstances. The old ethics have been shown to be inadequate, because our designs have not produced the world we intended (Orr, 2002, p. 13). If we consider an ethic a sort of collective instinct, then an ethic helps to guide our communal responses (Leopold, 1970, p. 239). Our new ethics must take advantage of the communal nature of architecture; that is, the social responsibility of architectural work. Such ethics must result in stewardship of natural resources, to bequeath a viable home planet to the next generations. However, the new ethics must go further, to encompass other species, their habitats and ecosystems, and the whole planet, because of the interrelated nature of all aspects of the planet. Therefore, it is important to extend the notion of community to other species, habitats and ecosystems, and all other inhabitants of the planet – everything that makes up life, in order to address ecological damage and social justice. In developing ecological ethics, we make the requisite compelling case for minimizing ecological damage. Likewise, any disproportionate effects of ecological damage raise ethical questions.

The design and construction of architectural edifices have long-term implications for their sites and surrounding contexts. The extraction, use and disposal of materials for construction, as well as the resources, such as water and energy employed in these activities have great impacts – often benefitting one group at the expense of another. Hence, there are serious social justice implications of those material and resource uses. Therefore, the design choices that architects make, to create this or that aesthetic effect, to serve one function or another, and to meet some aspiration or desire, has very important ecological and social justice implications.

We cannot assume that this is an understanding that we all share. It is therefore necessary to clarify why this is important, and to explain what complex interrelated factors contribute to these circumstances, as well as their impacts. Therefore, it is important that the education of the architect include robust discussions of these issues. Such a discussion would begin with proper ecological literacy, including the local and global conditions with which we live. While there can never be complete scientific consensus on any matter, the preponderance of evidence for the state of the world is nearly unassailable. Yet, political discourse and economic imperatives keep us from addressing ecological damage. The discussion of this state of the world is the first chapter in this part.

The second chapter is a discussion of how developing ecological ethics that attends to the current ecological devastation underway and social justice issues present in the world can be developed, and how those ethics fit into the history of ethics and ethics within architecture. I assert that education is the key to beginning this development,

because it requires all of us to start the requisite reconsiderations when we are young. So, the ethical justifications for our current educational system are also discussed. I attempt to frame what such ethics might look like. In the third chapter, I begin with a discussion of what the notion of community – extended to other groups and the rest of life – might entail. This is an important aspect of successful ecological ethics that could underpin a renewed architectural theory. Chapter 3 ends with discussion of an ecological design approach that has ecological ethics at its foundation.

Chapter 1 – State of the World

A grim specter has crept upon us almost unnoticed, and imagined tragedy may easily become a stark reality we all shall know. – Rachel Carson[4]

Two hundred years of the Industrial Revolution and unprecedented economic activity has brought with it many advances. On the plus side, there have been great strides in communication and transportation. We have experienced unprecedented breakthroughs in medical prowess and agricultural output leading to an unparalleled increase in life expectancies. Incredible technological ingenuity and design creativity allowed unparalleled cultural expression. Although rewards were disproportionate, the Industrial Revolution was clearly a phenomenal feat – attributable, mainly to human genius and the power provided from fossil fuels.

The structure of our world is based on fossil fuel use, which has negative environmental implications including pollution, global climate change and mass extinction. A recent analysis showed that technological improvements will make shale oil and natural gas more readily available (U.S. EIA, 2013). Thus, the ecological challenges associated with fossil fuel use will remain a concern for decades. This fossil fuel dependent structure, is sustained by global capitalism, and reduces the planet's ability to recover as resources are depleted and ecosystems damaged – that is, the carrying capacity of the planet has been exceeded by human demands for land and resources (Wackernagel & Rees, 1998, p. 54), (Wackernagel, et al., 2002).

Weart wrote a detailed history of the science on global warming that shows its reality quite convincingly (Weart, 2009). Powell studied the conclusions of scientific

studies on climate change and found that only an infinitesimal number dispute its veracity (Powell, 2012). In spite of overwhelming evidence, there are many who maintain that global warming is not occurring – or if it is, that it is not anthropogenic. In spite of this state of affairs, many still claim that the market will adjust or even rectify these problems (Gordon & Richardson, 2001). Ecological devastation and cultural injustice are often reframed as commercial success and technological progress. E. F. Schumacher asserted decades ago that global capitalism consumes the very basis upon which it is based (Schumacher, 1973, p. 21). In addition to its ecological impacts, the structure of global capitalism requires cultural marginalization, as well as huge social and economic disparities across the globe (Knox, Agnew, & McCarthy, 2008, pp. 77, 361-363). Marginal communities suffer disproportionately from the direct inequities of global economics (Agyeman & Evans, 2004), (Corburn, 2002), (Gunder, 2006), (Harvey, 1996). Such communities, who are often much smaller contributors to that ecological damage, suffer from their consequences at greater rates.

Harvey (1973, pp. 96-118)suggests that this structure amounts to a redistribution of wealth from lower income earners to high income earners, and he argues for a reversal from the top to the bottom. He suggests that redistribution could occur on the basis of greatest need, the common good or merit. However, in the current system there is a winner-takes-all-attitude, where a priori conceptions of winning favor certain groups.

These intertwined issues of ecology, culture and society have been raised by many marginalized people for some time, especially among indigenous groups across the globe. Many indigenous cultures make no distinctions between issues of social justice

and the problems associated with ecological damage (Davis, 1986), (Hawken, 2007, p. 23). The nascent environmental justice movement, which bridges the social justice concerns and issues of ecological crises, is growing in the US and elsewhere in the more developed world. However, indigenous peoples have long accepted the connection as natural. For many indigenous groups, the "environmental and social justice movements address two sides of a single dilemma. The way we harm the earth affects all people, and how we treat one another is reflected in how we treat the earth" (Hawken, 2007, p. 2).

For most indigenous peoples, environmental justice is a matter of cultural survival. Many of these communities are in the global south and face immense social instability.

> *Most traditional societies were operationally stable in the environmental sense but usually lacked mechanisms to resist disturbance if faced with factors they did not co-evolve with. Thus a traditional American Indian hunting society might have had mechanisms in place that would prevent human unbalancing of food animal species but no corresponding mechanism for animals just being killed for their skins; after all, how many skins could a semi-nomad carry around, how many were useful, and what sane person would waste time killing more fur-bearers than the fur of which they had use for? Bring outside fur-traders into the equation and the system collapses. The reality is that this is not a fault which can be prevented. No matter what mechanisms are proposed to maintain stability and balance, it will always be possible to find some perturbation large enough or alien enough to upset the apple-cart…. We can only hope our solution will not encounter what it is not designed to withstand. – Michael Novack*[5]

While many indigenous peoples in the global north have moved to urban areas, many in the global south where spared this necessity until recently (Howard & Lobo, 2013). This

is no longer the case. Like their counterparts in the north, indigenous peoples in the global south migrate "in response to new conditions of industrialization and globalization" (Angeles Trujano, 2008, p. 7). Indigenous migrants include "individuals moving to more economically developed centres to seek opportunities, displaced communities and groups removed by force."

Removed from our land we are literally removed from ourselves. – Mick Dodson[6]

These indigenous peoples are a small but substantial part of an unprecedented wave of rural to urban migration currently underway (IOM, 2010). There are positive aspects to this migration. Most migrants are seeking improved living standards and provide valuable resources to their families back home in the form of remittances. Western civilization and global capitalism bring salubrious changes in the form of increased life expectancies, improvements in health and opportunities, but also bring increased social and cultural instability. Many of the migrants are displaced from their land due to ecological damage, extractive industry or a combination of these and other factors. The survival of indigenous peoples and the plight other marginalize communities, as the ecological crises continue to unfold, raise many ethical questions.

There are serious spatial implications for humans due to these massive global changes (Harvey, 1973, pp. 96-118). The mass migration involves humans, but also includes various species seeking more salubrious climates, as ecosystems shift and natural nutrient cycles are disrupted by the aforementioned ecological damage. Due to the unpredictability of the impacts of the global ecological crises and the social justice implications, technology and design must provide a viable response for a sustainable

future. However a robust response requires that technology and design be guided and tempered by an ethical, philosophical framework. Thus we must engage in an honest ethical discourse, to provide a philosophical framework which holds out the hope for addressing potential missteps. The extent to which that discourse is inclusive will influence how robust our response will be and shape the nature of that response.

An ethical, philosophical framework that provides a robust response to ecological crises and social justice involves a richer engagement with place, must be informed by robust ecological literacy, cross-cultural understanding and critical engagement, to minimize the likelihood of previous missteps. Aldo Leopold described an ethic as "a mode of guidance for meeting ecological situations" (Leopold, 1970, p. 239). At the time he was writing in 1949, industrialization had developed to such an extent that Leopold anticipated that the ecological situations he mentioned could be "so new and intricate, or involving such deferred reactions, that the path of social expediency is not discernible to the average individual." This knowledge which Leopold affirmed, that species interact with their ecosystems in complex ways, was as rare for his time as it is for ours.

While many have championed rights for other animal species, Leopold was an early proponent of extending the notion of community to the ecosystem itself. With this insight, Leopold surmised that if we considered instinct the survival mechanism for a species, then an ethic is the same for a community (Leopold, 1970, p. 239). As such, a robust ethical response to ecological devastation and social injustice must be communal. The following chapters address the nature of the current ecological crises

and our use of resources, some qualities of ethics, the nature of community, and the development of an ecological ethic in architecture.

Eco-Crises

> *Our ecological troubles have been variously attributed to Judeo-Christian religion (White L. , 1967), our inability to manage common property resources such as ocean fisheries (Hardin, 1968), lack of character (Berry, 1977), gender imbalance (Merchant, 1993), technology run amuck (Mumford, 1974), disenchantment (Berman, 1989), the loss of sensual connection to nature (Abram, 1996) exponential growth (Meadows D. H., 1998), and flaws in the economic system (Daly, 1996). – David Orr*[7]

In recent years, we have discovered that there are limits, to both readily available energy and our knowledge of how the planet works. The price of our success has become devastatingly clear. We have witnessed human population explosion, rapid urbanization, intense consumption and ecological destruction. The negative aspects of this unparalleled era include climate change, biodiversity depletion and diminished available resources, as well as increased social dislocation and political upheaval. These negative aspects are outlined in the foregoing, providing a snapshot of the ecological state of the earth and human society.

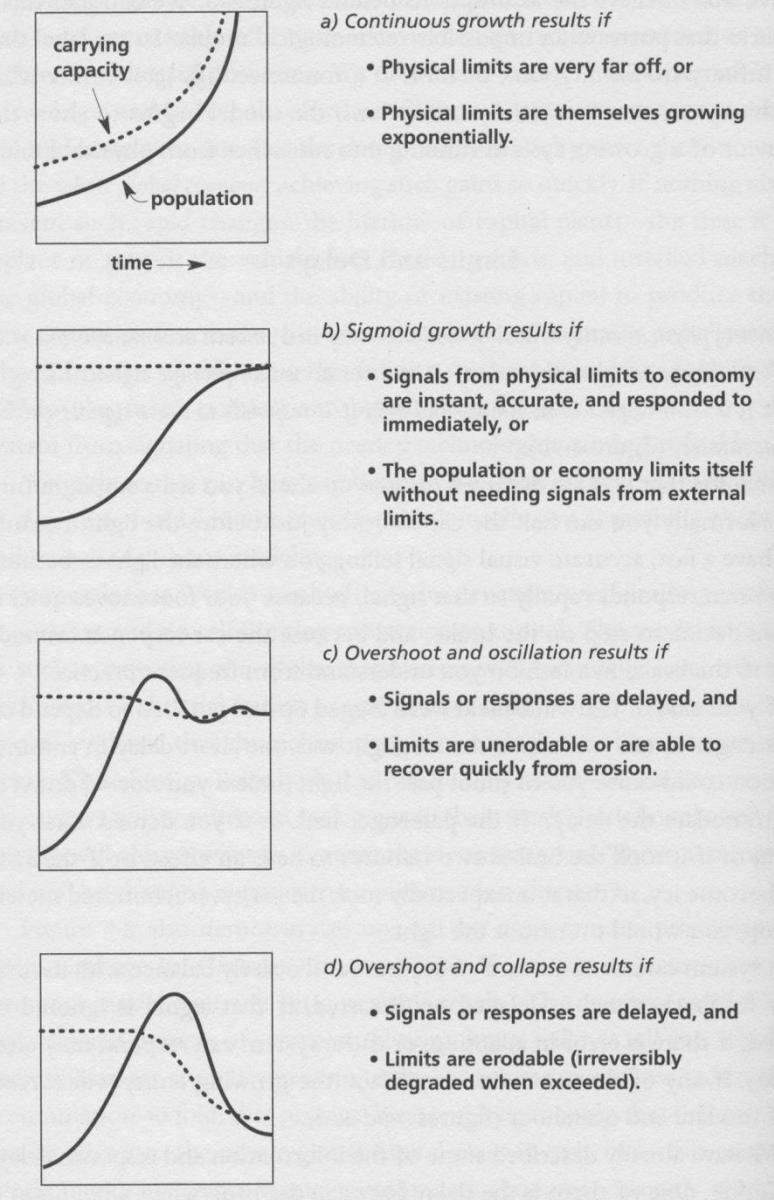


Figure 1: Four Possible Models of the Future
Source: (Meadows, Randers, & Meadows, 2004, p. 158)

Global Warming

At first global warming sounded like a good idea, especially to people in Northern climes. But starting in the 1960s, scientists recognized long-range problems, concentrating at first on sea-level rise and a threat to food supplies. New items were gradually added to the list, ranging from the degradation of ecosystems to threats to human health. Experts in fields from forestry to economics, even national security experts, pitched in to assess the range of possible consequences. It was impossible to make solid predictions given the complexity of the global system, the differences from one region to another, and the ways human society itself might try to adapt to the changes. But by the start of the 21st century, it was clear that climate change would bring serious harm to many regions — some more than others. Indeed many kinds of damage were already beginning to appear. – Spencer Weart[8]

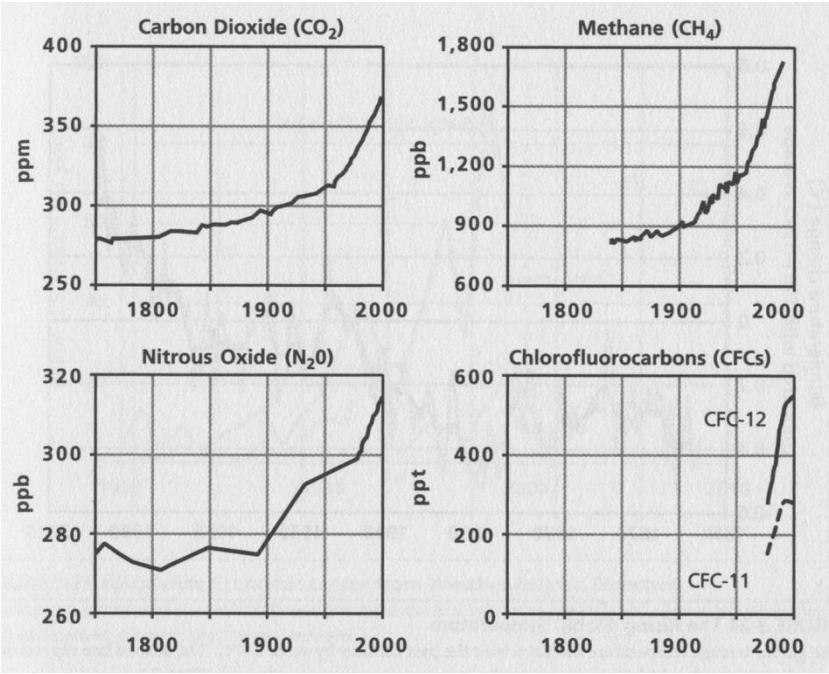


Figure 2: Global Greenhouse Gas Concentrations
Carbon dioxide (in parts per million), methane (in parts per billion), nitrous oxide (in parts per billion), and chlorofluorocarbons (in parts per thousand), all reduce emission of heat from the earth to outer space, thus increasing the temperature of the earth. The charts show the historic changes in the atmospheric concentration of these gases (Meadows, Randers, & Meadows, 2004, p. 115).

According to James Hansen, a leading American climate scientist at NASA's Goddard Space Institute, Arctic ice began to melt significantly in the 1970s. He "suggests that a concentration of 300–325 parts per million (ppm) of carbon dioxide might be necessary for the ice to increase again" (Douthwaite, 2010). Climate scientists do not really know what concentration of carbon dioxide equivalents is the top threshold. They only know that it is currently at a very high historic level and has risen at an unprecedented rate. More troubling is that scientists are not sure what level will lead to the inevitable tipping point.

John Schellnhuber, director of the Potsdam Institute for Climate Impact Research in Germany, asserts that anything above the pre-industrial level of 270 ppm might be excessive – with even the slightest global temperature increase triggering several climatic tipping points (Adam, 2008).

> *Nobody can say for sure that 330 ppm is safe…. Perhaps it will not matter whether we have 270 ppm or 320 ppm, but operating well outside the [historic] realm of carbon dioxide concentrations is risky as long as we have not fully understood the relevant feedback mechanisms. – John Schellnhuber*[9]

In the 200 years that fossil fuels have been used on a mass scale, the planet has warmed approximately 0.7 degree Celsius (Douthwaite, 2010, pp. 53-54).

Considered on a geological time scale, global temperature may well be on a cooling trend. However, most previous high global temperatures or high concentrations of carbon dioxide do not coincide with human habitation on earth. As Figure 3 shows, even after accounting for oscillations due to the El Niño effect and cooling from volcanic

clouds, solar radiation alone does not explain the considerable change in the earth's surface temperature. Figure 3 also establishes the reliability of climate models.

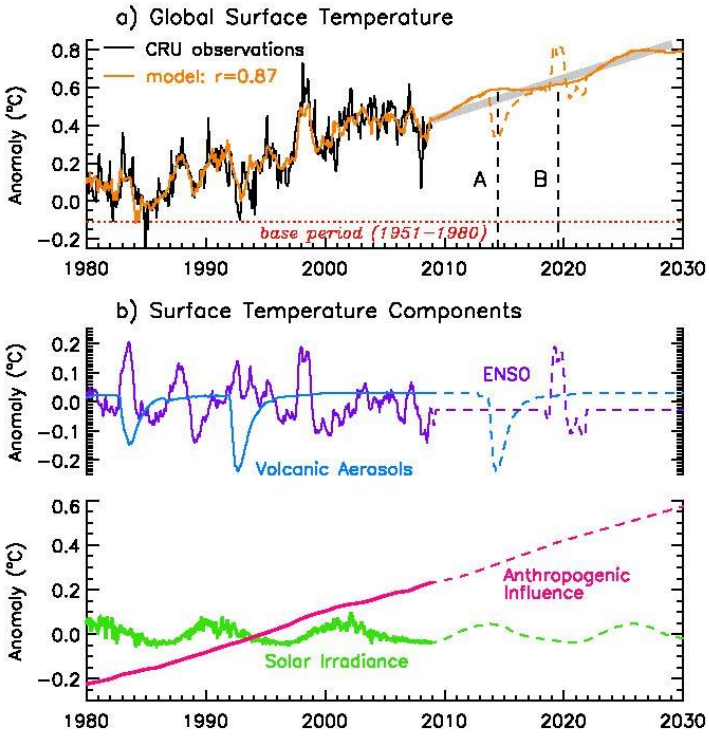


Figure 3: Earth Surface Temperatures
(a) Observed monthly mean global temperatures (black) and an empirical model (orange) that combines four different influences. (b) Individual contributions of these influences, namely El Niño/Southern Oscillation (purple), volcanic aerosols (blue), solar irradiance (green) and anthropogenic effects (red). Together the four influences explain 76% (r2) of the variance in the global temperature observations. Future scenarios are shown as dashed lines. Source: (Lean & Rind, 2009).

Global warming is not uniform. The greatest rises in temperature have occurred around the North Pole. A very disturbing aspect of polar warming is the phenomenon of self-reinforcing positive feedback loops. For instance, Arctic ice has been melting rapidly (Amos, 2013), (Shukman, 2012), reducing the amount of ice that reflects solar energy back into space. The sea which has replaced the ice is darker and hence, more heat-absorbing. This increases the rate of planetary warming even more.

There is an even more foreboding aspect to global warming, because its implications are even less understood than those of the other features of climate change.

> *The conventional thought has been that the permafrost 'lid' on the sub-sea sediments on the Siberian shelf should cap and hold the massive reservoirs of shallow methane deposits in place. The growing evidence for release of methane in this inaccessible region may suggest that the permafrost lid is starting to get perforated and thus leak methane... The permafrost now has small holes. We have found elevated levels of methane above the water surface and even more in the water just below. It is obvious that the source is the seabed.*
>
> *– Orjan Gustafsson*[10]

The permafrost in Russia is melting and releasing large amounts of methane into the atmosphere. Methane is "about 20 times more powerful as a greenhouse gas than carbon dioxide and many scientists fear that its release could accelerate global warming in a giant positive feedback where more atmospheric methane causes higher temperatures, leading to further permafrost melting and the release of yet more methane." (Connor, 2008). Even if the concentration of greenhouse gases stabilize at the current level, the damage is already done. The considerable inertia of Earth's climate system will require many years to stabilize from the increase to nearly 400 parts per million (ppm) of carbon dioxide in the atmosphere (Human, 2012).

Figure 4 depicts greenhouse gasses and a breakdown of the sources of those gases. The breakdown of the sources gives the impression that commercial activities and residences account for only 10% of greenhouse gas emmisions, while transportation appears to be a large contributor. In Figure 5, a chart showing greenhouse gas sources by sector is compared to a chart of the sources by systems. This latter chart is a clearer

illustration of how various aspects of modern living create the phenomenon of anthropogenic climate change.

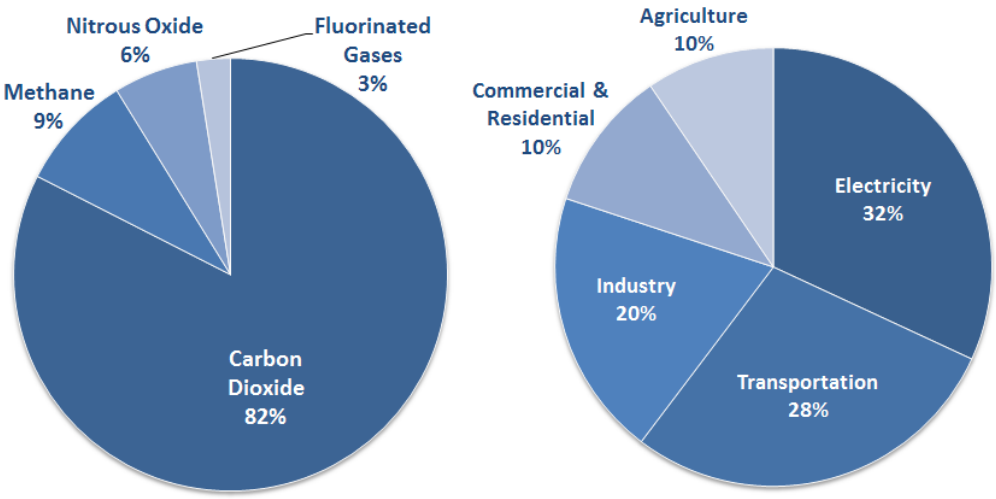


Figure 4: Greenhouse Gas Emissions.
2012 U.S. Greenhouse Gas Emissions by Gas (Percentages based on Tg CO_2 Eq.) – Left and Sources of Greenhouse Gases – Right (U.S. EPA, 2008).

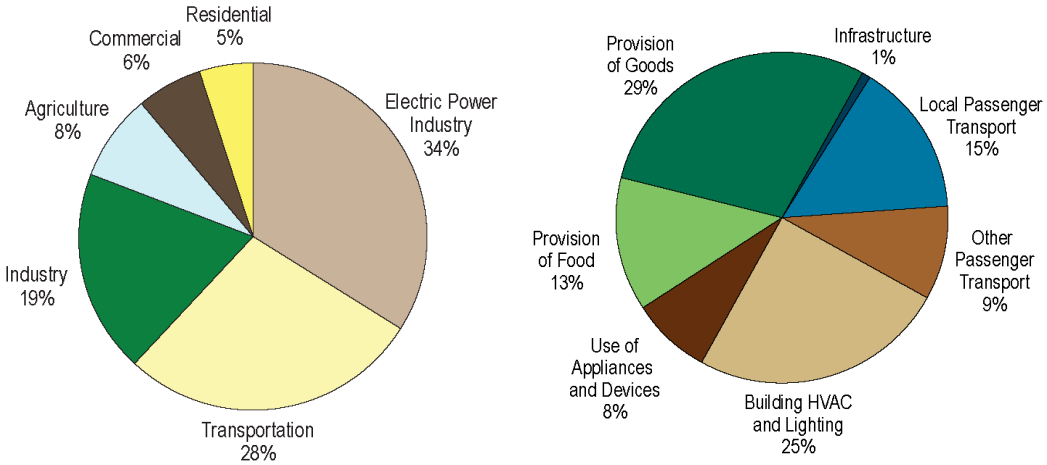


Figure 5: Sources of Greenhouse Gases.
2006 U. S. Sources of Greenhouse Gases by Sector (Left) and by Systems (Right). Source: (U.S. EPA, 2009)

The comparison in Figure 5 provides a better understanding of the connections between materials and land management and climate change. The systems approach enables targetted policies to promote mitigation efforts that can compliment implementation efforts with the sectors approach. The systems-based groupings of

major greenhouse gas emission sources show what parts of the economy work together to meet particular needs. For instance, “the Provision of Food system includes emissions from the Electric Power Industry, Transportation, Industry, and Agriculture sectors associated with growing, processing, transporting, and disposing of food” (U.S. EPA, 2009, p. 11).

The share for transportation appears to diminish considerably. However, it provides a more accurate picture of what personal transport contributes to climate change. The juxtaposition of both charts makes it clear that all sectors of the the economy make use of transportation services, use electricity and benefit from industrial production. The systems groupings also shows that building comfort and light contribute 25% of U. S. carbon footprint. Hence, reductions in operating energy of buildings through the use of daylight, passive heating and cooling techniques is an obvious area for architects to participate in minimizing ecological damage.

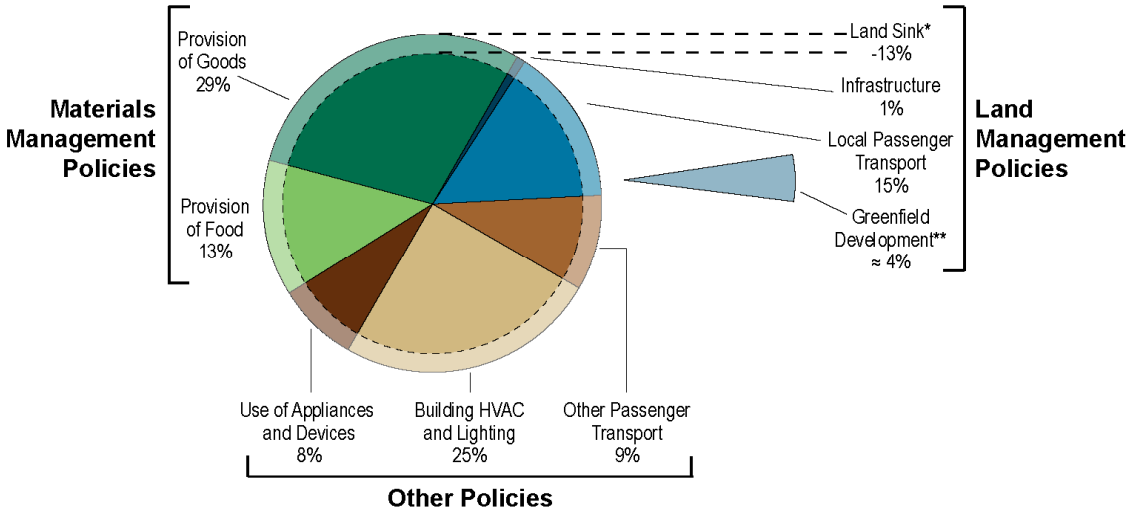


Figure 6: Systems-Based View of U.S. GHG Emissions. 2006. Source: (U.S. EPA, 2009).

Figure 6 illustrates that environmental impacts can be mitigated more broadly by influencing policy and design decisions. For instance, food provision and local transport have transportation components. These transportation components can be minimized by policies that promote less driving for food shopping and dissuade people from moving far from city centers. In the subsequent section on food, I will discuss the qualitative aspect of food provision's transpotation component.

Table 1: Average U.S. Household Carbon Footprint
Average U.S. household carbon footprint by consumption category, including international emissions embodied in imported goods (Stolaroff, 2009), (Weber & Matthews, 2008).

Consumption Category	Total [tons CO2/Consumption Category household]	% Total
Food/Beverages	6.7	15%
Transportation	6.5	14%
Housing and Utilities	12.9	28%
Health	4.6	10%
Furnishings, Equipment, Maintenance	2.1	5%
Recreation and Culture	1.7	4%
Miscellaneous Goods/Services	7.6	17%
Clothing/Footwear	2.5	5%
Communications	0.7	1%
Education	0.6	1%
Total	**45.9**	**100%**

The consumption of goods and the provision of services such as health also constitute considerable contributions to greenhouse gas emssions (Table 1). The provenance of such goods and the necessity for such serviecs are all things that designers have decisive influence on. Architects and other designers are often specifying the furnishings, equipment and finishes that go into residential, commercial and other buildings. Such specifications have implications for durability and maintenance – both of

which contribute to carbon footprint totals. The type and efficacy of heating, cooling and lighting provided in a building affects the physical and mental health of the occupants (Fisk, 2002).

Architecture contributes directly to climate change and other ecological crises, and the impacts of those contributions are at multiple scales. At the scale of the building, energy use for heating, cooling, lighting and appliances are a large component of those impacts. Lack of insulation, adequate daylight and other similar design techniques affect the operating cost of a building (in terms of carbon and money).

At the scale of the block, design approaches and policies affect greenhouse gas emissions. For instance, in Milwaukee, the typical block is oriented on a north-south axis – that is, the east and west sides of the block are longer than the north and south edges. This orientation does not give adequate access to sun to each building on the block. Each building is effectively blocked by its neighbor to its south. Optimal solar orientation at the block level, rather than at the building scale, would orient blocks on a more east-west axis.

At the peri-urban scale, there has been a decades-long trend towards suburbanization in the U. S. (Karlenzig, 2010, p. 301), due to cheap and available fossil fuels. “McMansions” proliferated across the landscape, often set on large plots of land, formerly devoted to farming. The subsequent rise in property values forced out more farmers – further diminishing the supply of local food. Some developments materialized without adequate support systems such as jobs, food shops or cultural destinations. Hence, many of the residents had to commute long distances for such support systems.

In some instances shopping malls and big-box stores sprang up to meet some of those needs, adding to the ecological footprint of those communities. The suburban malls and big-box stores also made downtowns less economically viable – leading the downtown shops to permanently shutter their businesses. The abandoned buildings from shuttered downtowns became a drain on the economy and leak toxic substances into the soil, causing further ecological damage. Many developments, suburbs and especially exurbs also encroached on wilderness areas, with the attendant negative impacts on biodiversity. Changes in zoning and design approaches could reverse the suburbanization trend. Such changes range from policies and designs that promote mixed-use buildings to allow for working, living and recreating locally, to encourage pedestrian-friendly and bicycle-friendly communities with good public transit to promote greater health and well-being, and re-urbanization to alleviate the stress on farmland and wild areas.

Loss of Bio-diversity

The first rule of intelligent tinkering is to save all the parts. – Aldo Leopold[11]

The overwhelming majority of the planet's biodiversity is wild and humans could not survive without them. These species take a myriad forms. They live in the air, in the water, on land and below ground. Many species provide food directly for humans. They drive the oxygen, carbon, nitrogen and other gas cycles, without which we would perish. Many species filter the air, aerate the soil and water. They break down poisons, ameliorate the climate, and control pests, eliminating disease vectors. They regulate freshwater, decompose wastes, and create soil. They recycle nutrients and store solar

energy in fuels and food. “They also serve as an immense trove of the genetic information that will allow for future evolution” (Mills S. , 2010).

The genetic information of each species, presents a whole world of libraries of survival on earth. Many constitute very successful adaptations to the vagaries of a quixotic environment – and in many cases they have done so for much longer than humans have (Remy, Taylor, Hass, & Kerp, 1994), (Ferguson, Dreisbach, Parks, Filip, & Schmitt , 2003), (Selosse, 2002). Scientific knowledge of species is limited (May, 2007, p. 207). For instance, estimates are that identified species are a small percentage of the number that actually exists. On the other hand, there are many instances of multiple counting of species, due to independent discoveries and the lack of a viable common database. These inconsistencies are greater for plant species than for their animal counterparts. Other species, including other eukaryotes are even less well known than most within the animal and plant kingdoms.

Within the animal kingdom, there is more known about mammals, due to the preferences of biologist about what species to study. Furthermore, ecology, the study of ecosystems, is much newer than biology, which tends to focus on specific species. Species unknown to science represent more instances of genetic novelty, further adaptations from which we could learn and life forms that merit ethical consideration. Consideration of other life forms does not require a diminution of human consideration, but requires an extension of ethical consideration. Learning from other life forms provides an alternative to how we now live, which is causing unprecedented ecological damage.

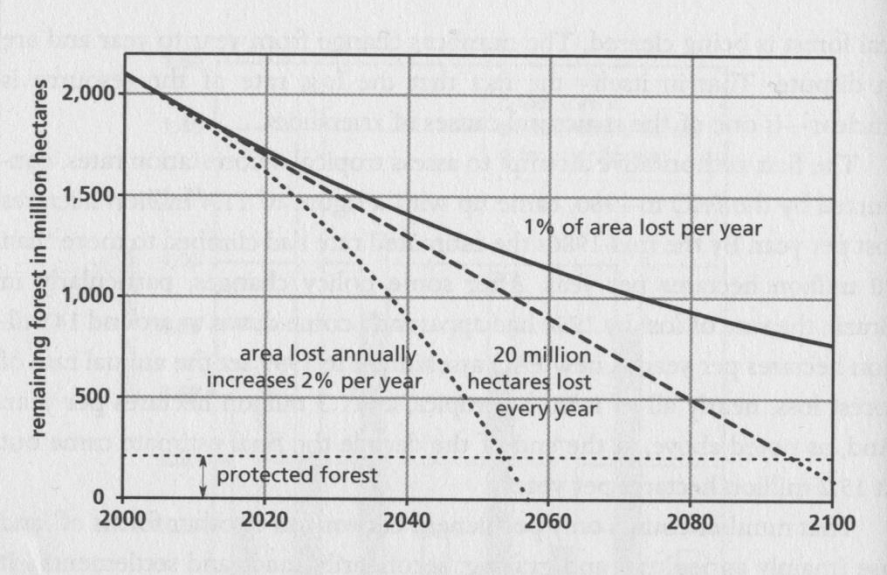


Figure 7: Some Possible Paths of Tropical Deforestation
Estimates of the future loss of tropical forests depend upon assumptions about demographic, legal, and economic trends. Three scenarios are shown in this graph, relative to the trend typical in the 1990's when we lost 20 million hectares per year. The middle line depicts that trend, with the unprotected forest gone by 2094. The other lines depict 1% loss of forest area and 2% loss of area per year. Source: (Meadows, Randers, & Meadows, 2004, p. 78)

While extinctions occur all the time, it is difficult to know how many species are extant, due to the reasons mentioned earlier. However, many scientists still assert that we are in the midst of a mass extinction (May, 2007, p. 210).

> *The crucial difference between the impending Sixth Wave of mass extinction and the previous Big Five is that the earlier ones stemmed from external environmental events. The sixth, set to unfold over the next several centuries-seemingly long to us, but a blink of the eye in geological terms-derives directly from human impacts. – Robert May*[12]

There have been extinctions caused by humans, even during our hunter-gatherer stage. Although these losses were significant, they did not occur on a global scale. The global scale of the current extinctions is a function of the global nature of human civilization and the demands of modern society on the planet's resources.

While insects and other organisms have great range of habitat, the ingenuity of human adaptation is clear in how we have spread across the planet and moved into space. However, the ubiquity of that spread and its unforgiving scope present great threats to other life forms. Throughout history, humans have transformed the landscape, affecting the earth and causing occasional extinctions. However, the scale of that impact and transformation has accelerated greatly in the 200 years of the Industrial Revolution (Ellis, Goldewijk, Siebert, Lightman, & Ramankutty, 2010), and the number of extinctions have also increased.

One legacy of industrialization and colonialism is that languages have been disappearing at an alarming rate – one every two weeks (Crystal, 2000, p. 19). Considering that where species are abundant, there is a coincident ubiquity of language, any loss of language signifies loss of multiple species. Or at the very least, our knowledge of those species may be postponed. Such postponement may seem inconsequential, but it may delay understanding of the local habitat before it is too late. Such knowledge may be useful for humans, because we are dependent on ecosystems. As a friend once said to me, “we need the planet. It is not clear the planet needs us.”

According to anthropologist in residence at the National Geographic, Wade Davis, language is the living expression of a culture, “the sum total of all the thoughts, dreams, ideals, myths, intuitions, and inspirations brought into being by the imagination since the dawn of consciousness” (Davis, 2004). He believes that distinct cultures “represent unique visions of life itself.” Each of those voices are potentially “part if the overall repertoire of humanity for coping with challenges confronting us in the future” (Parsell,

2002). “Extinction of species and cultures is driven by globalization” (Hawken, 2007, p. 102) and the repository of culture is language.

Rather than adapt to the ecosystems we are presented with, we humans have chosen (and increasingly so in the recent centuries), to create alternate ecosystems – buildings. These ecosystems in these last two centuries are more about walling off the human from the rest of nature. And while many other species create cocoons, none have quite the devastating impact on the environment as ours do. This impact is further aggravated by our insistence on forcing our cocoons into every conceivable ecosystem regardless of fit. Within and around the cocoons, we insist on uniform environmental sensation. Universal solutions are sought and imposed on nature: “If brute force doesn’t work, you’re not using enough of it” (McDonough & Braungart, 2002, p. 30).

An architecture that never causes harm to the ecosystem in which it is located may never be possible. However, forcing nature to conform to our whims at all costs is not in our interests. Human industrial success has negative consequences for the planet, for us and for other species. As such, we have much to learn about how to adapt and relate to the planet and its ecosystems. Many such lessons reside in the very biodiversity we have depleted and could provide a necessary rethinking of our design approaches and to all our social interactions. This would definitely include how much we spread across the planet and how we arrange our dwelling places.

Figure 8 shows an estimate of the ecological footprint of the planet. The horizontal line shows the estimated biological capacity of the planet – the total available ecological

footprint, assuming we lived sustainably. The bold line shows an estimate of our actual total ecological footprint, expressed as a ratio of the biological capacity (May, 2007).

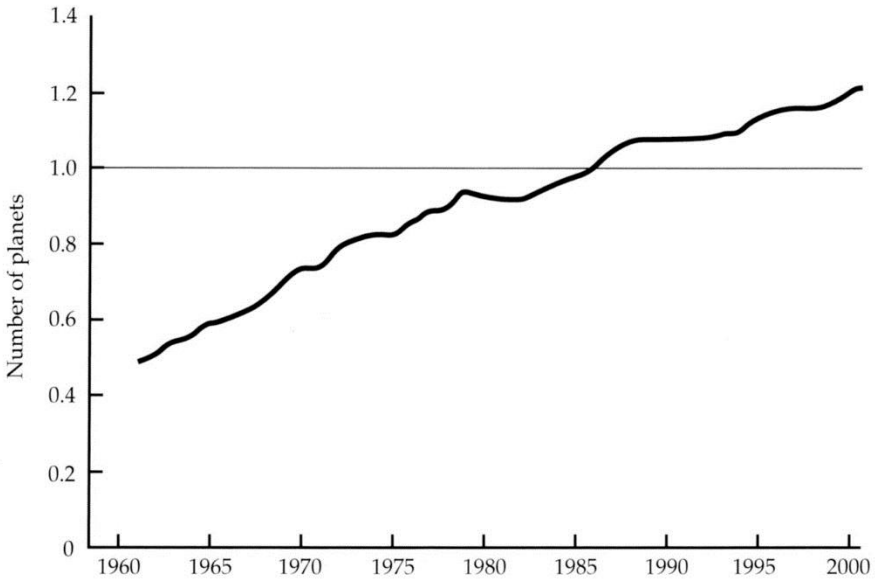


Figure 8: Total Ecological Footprint vs. Carrying Capacity.
Estimate of the total ecological footprint of the human population, 1960-2001. Source: (May, 2007)

As the figure illustrates, the ecological footprint of humans is beyond the ability of the planet to sustain them. According to the graph that overshoot, when human demand exceeded nature's supply, occurred in 1980. It is also likely that following that overshoot, the carrying capacity of the planet has been diminished.

Figure 9 shows the average ecological footprint for different regions. The populations of each region are indicated on the x-axis, while the ecological footprint per person is on the y-axis. The resulting rectangular areas represent the total ecological footprint by region. The sum of all the rectangles gives the total human ecological footprint for 2001 shown in Figure 8.

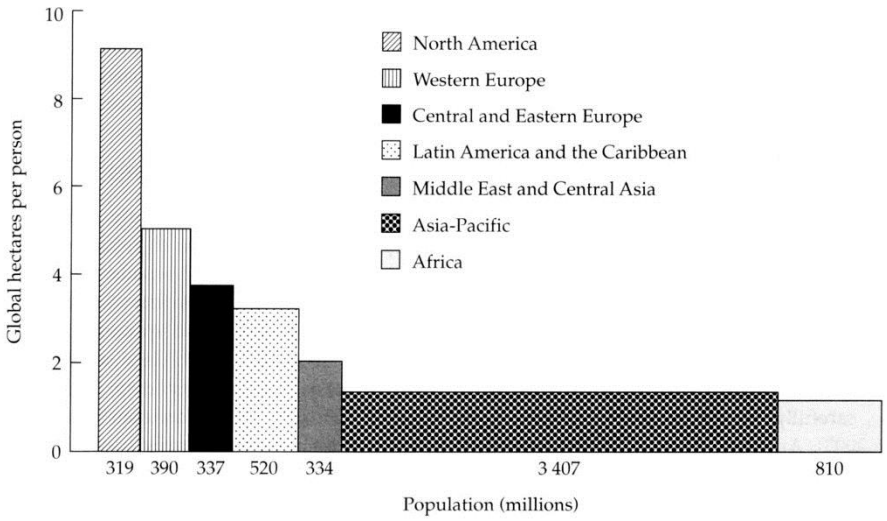


Figure 9: Average Human Ecological Footprint.
The average human ecological footprint in 2001 is shown, in units of area (hectare, ha), for each of the planet's major geographical regions. Source: (May, 2007)

Taken together, figures 8 and 9 illustrate that as with all questions involving ecological crises, there are social justice implications (May, 2007). For instance, when considering the biological capacity of the planet, with 2001 population, the global per capita ecological footprint for that year should have been 1.8 hectares. However, the actual ecological footprint of humans was 2.2 hectares.

If one were to consider the ecological footprint by country, an even more complex picture emerges. For instance, the per capita ecological footprint of Sweden is 7.0 hectares, while the average Egyptians has a footprint of 1.5. With this information, one could surmise that Swedes are living beyond their means and Egyptians are living within the biological capacity. However, Sweden has a carrying capacity of 9.8 hectares per capita, while Egypt's is only 0.5. By this measure, Swedes live within their means and the Egyptians are three times above theirs (May, 2007), (WWF, 2004).

However, this is a snapshot view of ecological footprints, and while it helps understand the complex nature of the state of the world, it does not give a full picture. Taking a historical view provides a fuller picture. The Nile valley has overflowed its banks for centuries in annual cycles, providing soil rich in nutrients as it receded. Egyptians structured their life with the ebb and flow of the Nile, using irrigation canals and food storage to manage the floods and weather the droughts (McDonough & Braungart, 2002, pp. 95-96), (Worster, 1984, pp. 58-59). English and French engineers intervened during the 19th century, introducing Western techniques of agriculture and water management – techniques more suitable to English and French climatic conditions. The post-colonial Egyptian government continued these methods, culminating in the construction of the Aswan High Dam in 1971.

Soon, the dam prevented the silt from reaching the farmers, stopping the ebb and flow of the Nile. The alterations put into place by these design and policy changes, also changed the life of the people. Many of those farmers migrated to the cities. Combine these changes with a burgeoning population and increased consumption, and the result is that Egypt no longer produces enough food for its populace. In Egypt, as in many countries in the global south, colonization, rapid industrialization and increased flow of trade facilitated changes in consumption habits and the introduction of foreign methods of agriculture with initial increased yields, which in turn led to an increase in population.

Population and Consumption

> *Consider the true statement. "Total energy consumption in the United States increased 1,100 percent (12-fold) between 1880 and 1966, while population increased 300 percent (four-fold)." On a quick reading, one might infer from this statement that population growth was not the major factor. Actually, the increase in energy consumption per capita in this period was only 200 percent (three-fold); the 12-fold increase in total energy use is the product, not the sum, of the four-fold increase in population and the three-fold increase in use per person. – John Holdren*[13]

In 2013, I traveled to Nigeria to work on a project. We were installing a small aquaponic system at a secondary school with the students and their teachers. The goal was to produce some fish and vegetables for science education and possibly for consumption or to generate some income. One of our crew, attached to me by the local NGO for whom I was working, had worked for oil companies and others, dredging the canals around the Lagos Lagoon. He was very excited about this work and told many stories about his experiences. One day, while regaling us with another of these tales, apropos of nothing, he announced that his work was environmental work. A long discussion about ecosystem damage, flood and erosion fears did not sway him, so we let the matter go.

A few days later, we were driving around, looking for a part, when something happened and he remarked on the population density of that area. We all concurred that it was quite dense. I pointed out that we are all responsible because we have so many children. Of course we should have many children he replied, after all, the bible encourages us to "go forth and multiply." I remarked that perhaps, such an admonition

made sense among a tribe of a few thousand wandering about a vast desert with a hostile environment and hostile neighbors. He was unmoved, redirecting me to the bible. Then I mentioned that it will only get worse, pointing out that median estimates project that by the year 2100 Nigeria will be the third most populous country in the world at 730 million people.

Nigeria is a proper case in point of the direction of human occupation on the planet (Meadows, Randers, & Meadows, 2004, p. 23). In 1950, Nigeria had a population of about 36 million. By the year 2000, it had grown to about 125 million. That was a four-fold growth rate. In 2000, Nigeria was growing at an annual rate of 2.5% (World Bank, 2001, p. 164), which corresponds to a doubling time of 29 years. If this rate is maintained, the country may approach a billion inhabitants by 2087. The living conditions of many Nigerians are already constrained (Anderson, 2010). The population is already taxing the limits of the biological capacity. Lagos and Nigeria are indications of what could happen to the whole planet if population growth continues apace. Cameron Sinclair of Architecture for Humanity once said that “the reality check is that the world is not going to look like Dubai. It’s going to look like Lagos, Nigeria, right? And when we are spending most of our education teaching most of the architects to design some God-awful, horrible building in the middle of the desert, when they should actually be designing adequate and affordable housing for 90% of the planet, there is a big disconnect” (Douglas, 2010).

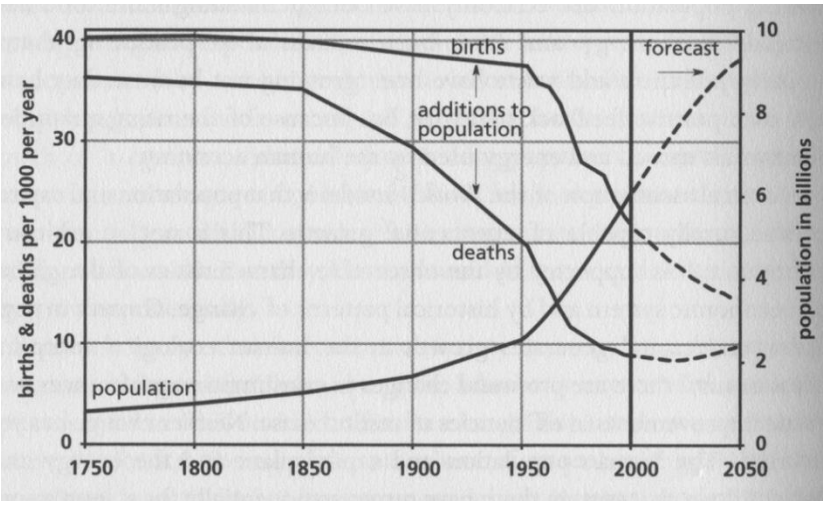


Figure 10: World Demographic Transition
The gap between the birth and death rates determines the population growth rate. In spite of the recent in the growth rate decrease (starting in 1965), world population continues to grow exponentially. Source: (Meadows, Randers, & Meadows, 2004, p. 28)

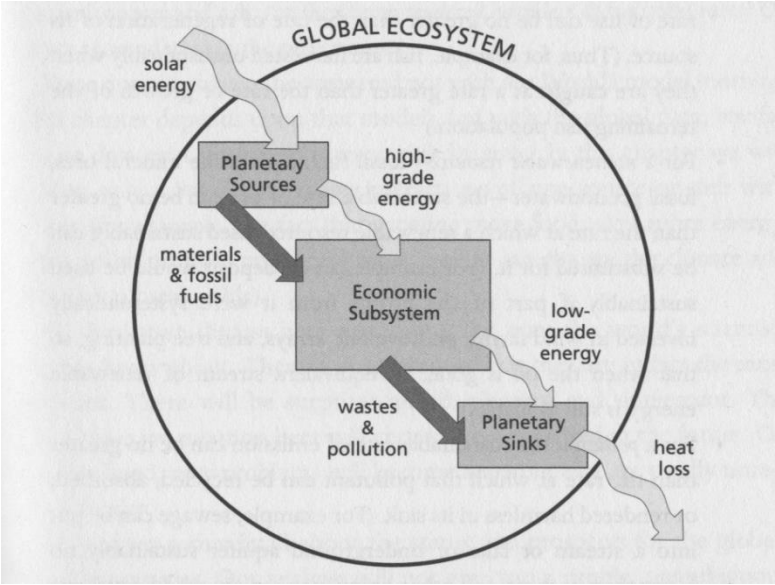


Figure 11: Population and Capital in the Global Ecosystem.
Population and capital are sustained by flows of fuels and nonrenewable resources from the planet, and they produce outflows of heat and waste, which contaminate the air, water, and soil of the planet. Source: (Meadows, Randers, & Meadows, 2004, p. 53), (Goodland, Daly, & El Serafy, 1991)

Population is the great multiplier. Whatever characteristics a culture has, an increase in population exaggerates that quality (Ryerson, 2010), (Diamond, 2005, pp. 487-496). This is true for the salubrious and pernicious aspects of a society. A planet with finite resources cannot accommodate infinite growth of any species (Krausmann,

et al., 2013). David Pimentel has estimated that the planet has a long-term carrying capacity of 2 billion people, assuming a Western European standard of living (Pimentel, et al., 1999). We may well have outgrown the planet's carrying capacity (Hopfenberg & Pimentel, 2001). There are other estimates as alluded to in the previous section on biodiversity – some are lower and some are higher. However, there is broad consensus that the growing population requires an increase in food production (Postel, 2001), (Young, 1999), (Bongaarts, 1994), (Brundtland, 1993).

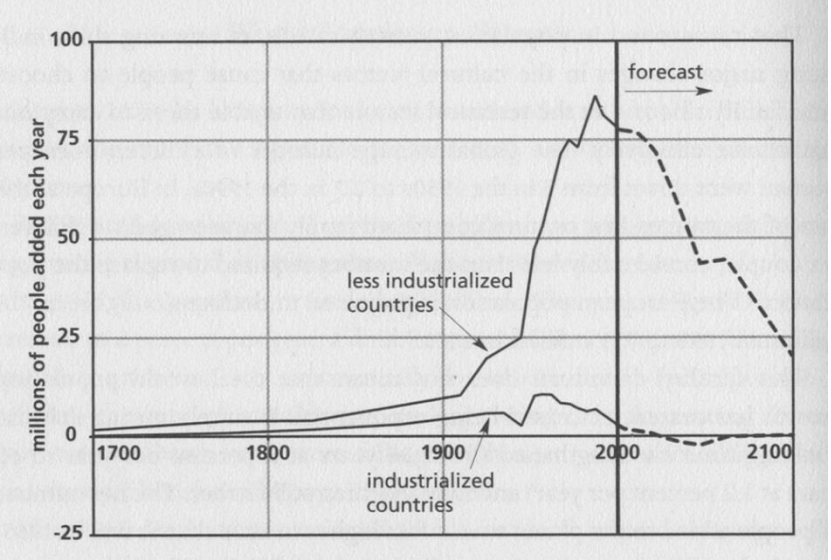


Figure 12: World Annual Population Increase
The forecast for the decline in population growth rates assumes that recent declines in birth rates will continue.
Source: (Meadows, Randers, & Meadows, 2004, p. 30)

Population growth, which remained relatively flat for centuries, spiked sharply in the middle of the 1800's. Its trajectory closely matches that of oil production. And while technology has and will continue to increase yields (Ausubel, 1996), (Marchetti, Meyer, & Ausubel, 1996), many questions remain about the quality and availability of food where it is needed most. While technology has improved yields with pest resistant crops and intensive farming techniques (Ausubel, 1996), the overall degradation of available

arable land may eliminate any such gains. The stark fact remains that success in food production produces greater population, which demand more food (Farb, 1978). Hence, the concerns about social instability still remain.

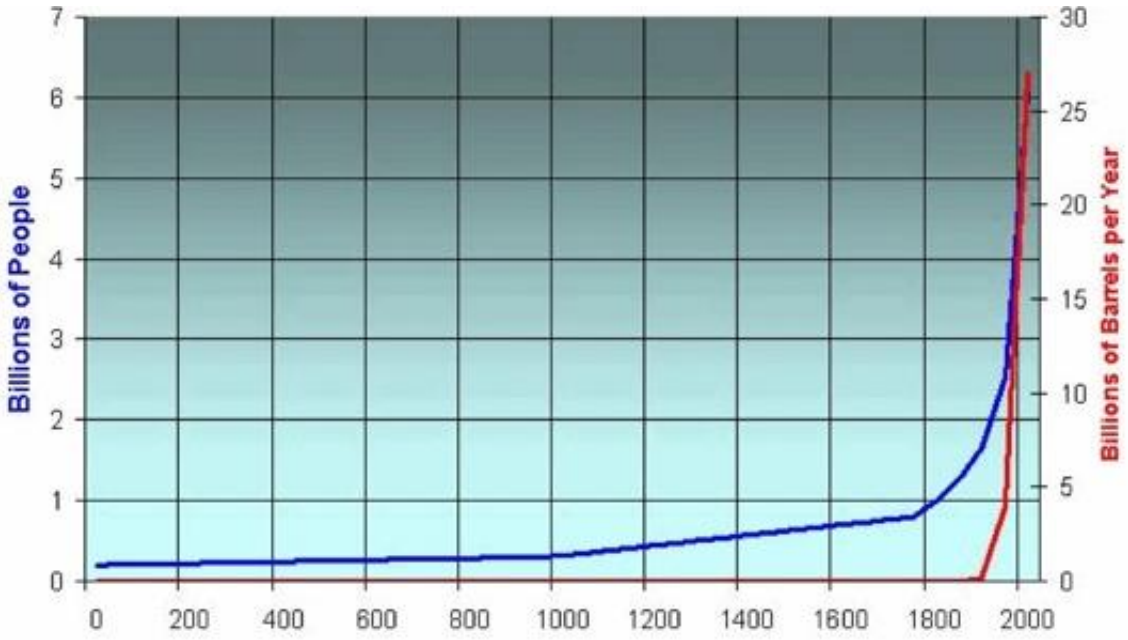


Figure 13: World Population and Oil Production.
Source: (Goodchild, 2010)

Hopfenberg and Pimmental (2001) point out that we are not necessarily faced with a "Malthusian" question, "how do we feed the [increasing] population?" but rather, the "Quinnian" question, "how do we stop increasing the population?" The controversial nature of population control measures may have hindered serious discussion about the unprecedented growth of the world's human population. Successful population control in China is often attributed to coercive policies. However, a more careful analysis demonstrates that it is more likely due to education, economic opportunity and greater gender equity (Sen A. , 1999, p. 219). Hence population control is an ethical matter.

Population is inexorably tied to consumption rates. Figure 13 illustrates how our consumption of resources has increased with our population. What Figure 9 shows is that the ecological footprint of humans on earth is a function of both our number and our consumption rates. As more of become affluent, more of us desire consumptive lifestyles which expand our average footprint.

Urbanization

> *The hut was made of corrugated metal, set on a concrete pad. It was a 10 by 10 cell. Armstrong O'Brien Junior shared it with three other men. Armstrong and his friends had no water, they bought it from a nearby tap owner. No toilet, the families in this compound shared a single pit-latrine and no sewers or sanitation. They did have electricity, but it was an illegal service tapped from someone else's wires and could only power one feeble bulb. This was Southland, a small shanty community on the western side of Nairobi, Kenya. But it could've been anywhere in the city, because more than half of the city of Nairobi lives like this. I.5 million people stuffed into mud or metal huts with no services, no toilets, no rights. – Robert Neuwirth*[14]

Sometime in 2009 the world passed an "invisible milestone." More than half the planet now lived in urban areas (United Nations Population Fund, 2007), (UNDESA/Population Division, 2009). The growth in cities has been very rapid even though the rate of increase has stabilized. The distribution of the world's human population is irregular and uneven (Gaston, 2010, p. 21), (Small & Cohen, 2004), with preference for coastal areas along oceans and rivers, as well as volcanic highlands – ostensibly for the rich volcanic soil. The distribution is governed more by physiographic rather than by climatic factors. Coastal plains are most vulnerable to the effects of

global warming – especially sea level rise. The current rapid urbanization is all the more troubling for this reason – especially because the urbanization appears to be accelerating in the global south, where the brunt of those effects of global warming are being felt.

One pernicious aspect of urban population growth is that the area occupied is increasing faster than the population size (Gaston, 2010, p. 19), (Marshall, 2007). Thus the land mass occupied by urban areas is growing at a faster rate than their population and is due to two phenomena. First, the number of households is increasing faster than population. Second, the first trend is exacerbated by an increase in average living standards. These two phenomena occur even in countries with declining overall populations, such as Italy and others in the global north. In these countries of the global north, urbanization has tapered off and is in decline in some countries. However, urban and suburban sprawl continue apace, exacerbating the extant problems faced by metropolitan areas. Hence, even as their overall populations decline, the consumption rates are still rising.

The challenge is that as the world population urbanizes, we require more sophisticated infrastructure than we did in rural areas. Many governments, especially in the global south, are finding it challenging to meet those infrastructure requirements. Many in the global north are finding systems of infrastructure taxed by the increased consumption and the diminished ecosystems services previously provided but taken for granted. Northern urban areas have also had to contend with sprawl for decades, particularly in the form of suburbanization.

Cities consume about three quarters of all fossil fuels and produce four fifths of greenhouse gas emissions (Ash, Jasny, Roberts, Stone, & Sugden, 2008). Cities occupy 2 percent of the world's land mass, house 50 percent of the population, use 75 percent of resources and produce 80 percent of wastes (Ratti, 2011). Thus, design decisions in urban areas have great scaling ability.

Over the course of history, various societies have had difficulty adapting to changing times (Diamond, 2005). While the city is a creative response to the challenges that humans face, municipal authorities often find that adjusting to change is challenging. With some cities, the adaptation is ad hoc or not managed by government. Neuwirth (2006, p. 10), claims that "squatters are the largest builders of housing in the world – and they are creating the cities of tomorrow." It is important to understand that prior to the current economic paradigm – introduced in many places by colonial authorities; land was almost freely available in most parts of the world. Many who live in "informal" settlements operate with this assumption (Neuwirth, 2006, p. 22). They also often operate outside of the "normal" state tax structures (p. 55). Such places lack formal governing structures such as building codes (p. 164), and often operate without infrastructure such as roads or pipe-borne water (p. 83).

After living for 3 months each in informal settlements in Istanbul, Mumbai, Nairobi and Rio de Janeiro, Neuwirth discovered that governments provide few, if any, amenities, social services or infrastructure. However, he reports on how individually and collectively the inhabitants of these communities have provided these services for themselves. Provision of amenities such as transport and water, in the absence of state

institutions, are economic opportunities for the inhabitants – an economy that operates outside the larger state regulated system. The informal economy constitutes a large percentage of all economic activity in many countries in the global south (Schneider & Enste, 2000). In some countries in Africa, the informal sector of the economy is larger than the formal one, compared to the United States where the informal economy is at 8%. The skew towards the informal economy in the global south must be considered in light of all the housing construction that occurs in the informal settlements of urban areas (Roy, 2005).

One major issue with urbanization is transportation. Another invisible milestone of sorts was when the number of passenger cars on the planet surpassed the one billion mark in 2010 (Sousanis, 2011). Passenger car miles traveled is estimated to triple or quadruple by 2050 (OECD/ITF, 2011, p. 9). The implications of the infrastructure challenges that these estimates pose are difficult to anticipate. So, considering that large percentages of the world's human population will be living in cities, with inadequate and deteriorating infrastructure, there is potential for ecological damage and social upheaval. Large populations traveling in vehicles caught in congested traffic, releasing exhaust, thereby causing pollution and preventing timely delivery of food, healthcare and other services.

Natural Resources: Supply and Use

> *As the world grows more populous – the United Nations projects eight billion people by 2025, up from 6.6 billion today – it also is growing more prosperous. The average person is consuming more food, water, metal and power. Growing numbers of China's 1.3 billion people and India's 1.1 billion are stepping up to the middle class, adopting the high-protein diets, gasoline-fueled transport and electric gadgets that developed nations enjoy. The result is that demand for resources has soared. If supplies don't keep pace, prices are likely to climb further, economic growth in rich and poor nations alike could suffer, and some fear violent conflicts could ensue. Some of the resources now in great demand have no substitutes. In the 18th century, England responded to dwindling timber supplies by shifting to abundant coal. But there can be no such replacement for arable land and fresh water. – Wall Street Journal*[15]

Many of the natural resources that we humans use seem abundant and readily available. This is the case for air, water and many other resources that we take for granted. Therefore, they are considered common goods and as such free. Hence, they are often abused by individuals, communities or corporations; this phenomenon was called the tragedy of the commons by Garrett Hardin (Fisher, 2008, p. 28), (Hardin, 1968). If members of a community do not come together to safeguard these common "goods" an individual or entity may not have any incentive to use them judiciously. In fact, Hardin surmised, the opposite is true.

All humans have multiple interactions with nature – in spite of our seemingly willful attempts to remove ourselves from it. Designers are constantly challenged by nature as they engage their creativity to make the environment more hospitable to human habitation. Toward that end, material resources are necessary to reshaping the world –

or at least, aspects of the world. Naturally occurring resources are extracted, processed and shipped to where they will be used.

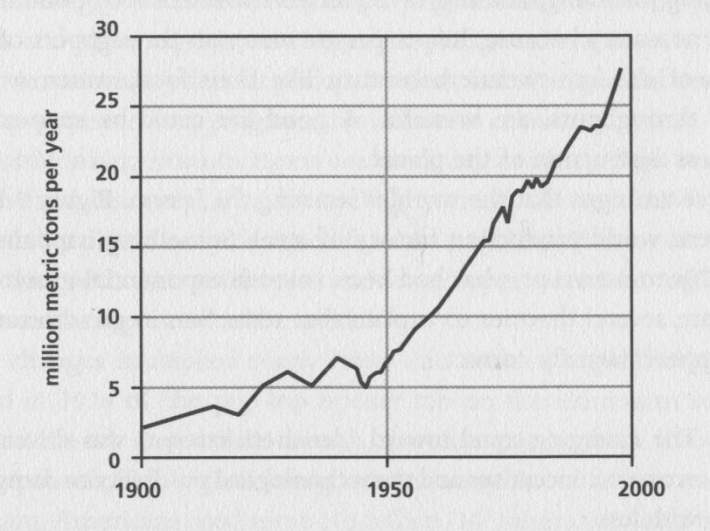


Figure 14: Global Consumption of Five Important Metals
Copper, lead, zinc, tin, and nickel. Source: (Meadows, Randers, & Meadows, 2004, p. 101)

The designer uses these refashioned resources (often in modular units), to provide goods and services to their clients and users. The durability of these goods and their components are important ecological considerations. The utility of the services and the extent to which they are culturally, economically, socially and aesthetically received are all germane. And in light of current ecological crises, the environmental impacts of all phases from sourcing materials to their eventual disposal become important (Rockström, et al., 2009).

Robert Ingersoll has claimed that architecture and building is “antiecology,” a point forcefully illustrated in the recovery of wildlife at Chernobyl, Russia (Zabytko & Mychalcewycz, unreleased) and the demilitarized zone (DMZ), between North and South Korea (Azios, 2008). The abandonment of those two locations by people has been

accompanied by a flourishing of non-human life forms: Endangered species returned in great abundance as buildings and human infrastructure decay and crumble.

The realization that other species flourish in our absence may lead to several possible lines of reasoning. One is that to be ecologically sensitive, we should not build. On the other hand, one might take the position that our survival is more important than those of other species and thus, we should not care about the viability of other life forms. However, since our survival is dependent upon other species, we need to consider their survival. We must also acknowledge the devastating effects of design decisions and construction practices on their survival. Hence, the decision to build or not, is an ethical consideration. Such ethical considerations must permeate all aspects of design and construction.

A simple investigation of resources used in buildings (especially in dwellings), and the waste produced therein, provide useful social and economic indicators for human interactions with nature. How we find and provide water and food is a function of our location, cultural habits and relationships with other humans, other species and the environment. How much waste we produce is an indicator of those relationships and interactions as well, but also a strong indicator of our creativity. The amount and type of waste produced in a system is indicative of several problems with that system's processes. While it is impossible to avoid waste production, the amounts indicate the efficiency of the process that produced the waste and the suitability of the raw material in that process. Furthermore, the type of waste is also germane – especially with regard to the utility of the waste in other processes. Hence, our uses of resources must be

holistic, requiring greater awareness of our position in the chain of resource flows. Designers must be shrewder, possessing a better understanding of how our resources are sourced, processed, used and disposed of.

Energy

> *If all the ineffective ideas for solving the energy crisis were laid end to end, they would reach to the moon and back… I digress. – David MacKay*[16]

The physicist David MacKay believes that there are three issues that cause concern about a fossil fuel driven society. The first is that fossil fuels are finite – cheap oil and gas may run out in the near future. Although technology is constantly finding new efficiencies in energy use, fossil fuels are running out and they are increasingly harder to find. Yet, energy consumption rates continue to rise. Thus, MacKay argues against simply burning these fuels.

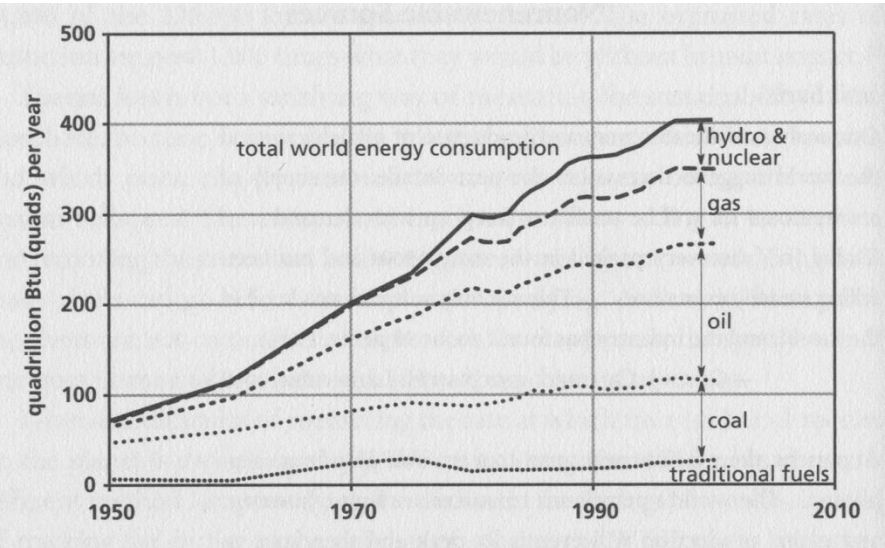


Figure 15: World Energy Use
World energy use doubled three times between 1950 and 2000. Fossil fuels dominate the primary energy supply; coal's share peaked at over 70% in the 1920s, oil peaked at over 40% in the 1980s. Natural gas, which is less polluting that than either coal or oil is projected to contribute a greater percentage of future energy sources. Source: (Meadows, Randers, & Meadows, 2004, p. 88).

As E. F. Schumacher has pointed out, non-renewable resources are like capital, and drawing on principal is always a bad idea (Greer, 2011, p. 5). So, MacKay suggests that perhaps, fossil fuels should be reserved for certain more valuable uses that have no alternatives – such as making plastics. He insists that this should exclude disposable wrappings and bags. The second issue involves energy security. There is much political instability in many of the regions where much of the fossil fuels are still available. The third issue is that it is "very probable that using fossil fuels changes the climate" (Weart, 2009). This third issue requires global action, while the other two can be tackled nationally in each country.

McKay contends that the first two issues should be enough to prompt a rethink of how we live. However, the third issue has longer term implications and global effects, making a mockery of national boundaries. The biggest contributor to climate change is the increase in the greenhouse effect caused by several gasses, principally carbon dioxide (CO_2). Most CO_2 emissions come from fossil-fuel burning and the main reason we burn fossil fuels is for energy. So McKay thinks that to fix climate change, we need to sort out a new way of getting energy. Thus, the climate problem is seen here mostly as an energy problem.

Unfortunately, these issues are not that simple. We have made progress with efficiencies, decreasing the amount of energy input per output and the costs of production on renewable technologies are coming down. However, our per capita energy usage has increased (Smil, 2010). As Figure 16 shows, as the average fuel consumption per 100 km has declined steadily, the average annual distance traveled per

car has increased at about the same rate – eliminating any potential gains due to efficiency. This means that it is not simply a design problem – it is also a human behavior problem.

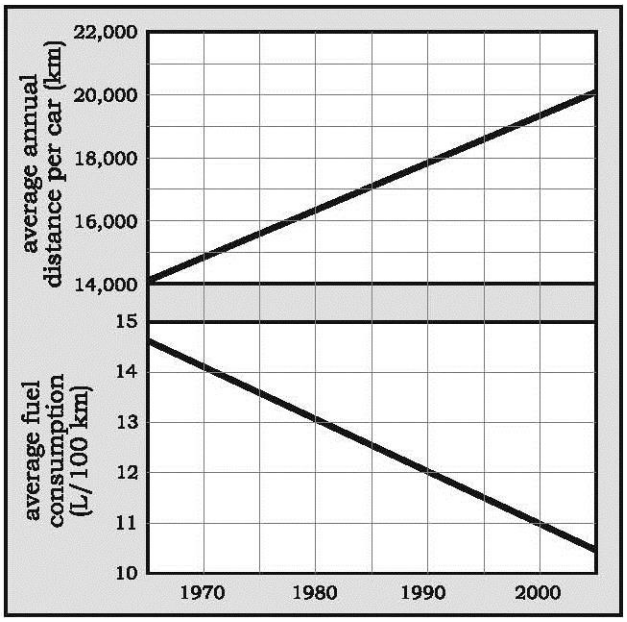


Figure 16: Average fuel consumption and average distance driven per U. S. car 1965 – 2005. Source: (Smil, 2010, p. 718).

Understanding the implications of such a human problem is crucial for designers. Therefore, the designer needs to understand energy use in buildings as both abstract concept and practical matter. The designer must foresee technological breakthroughs but also the trends of usage in many forms. It is imperative to take into account the consumptive behaviors of people – an ever-expanding phenomenon that is growing even faster in the global south.

It is clear that the artifacts we produce and our rates of consumption make increasing demands on natural resources. They also produce more toxic waste – or waste that cannot be easily reabsorbed by the ecosystem. I posit that, given the serious eco-crisis that we face, a strong case for ecological responsibility has to be made – and it

must be made on ethical grounds. Such a case must be made to all people but it must be made more strenuously to decision-makers such as designers.

Water

> *In fact, our water problem turns out to be much more worrisome than our energy situation, for three main reasons. First, unlike oil and coal, water is much more than a commodity: It is the basis of life. Deprive any plant or animal of water, and it dies. Our decisions about water—how to use, allocate, and manage it—are deeply ethical ones; they determine the survival of most of the planet's species, including our own. Second, also unlike oil and coal, water has no substitutes. The global economy is transitioning away from fossil fuels toward solar, wind, and other non-carbon energy sources, but there is no transitioning away from water. And third, it is through water that we will experience the impacts of climate change most directly. – Sandra Postel*[17]

Water is unique – the only natural substance that is found in all three physical states—liquid, solid, and gas—at temperatures normally found on Earth. Some of its unusual characteristics are that its solid floats in its liquid because it expands when it freezes. Hence, the sea ice at the poles. Water can dissolve many things, making it excellent for all manner of activities from washing to the transport of waste. The high solvency and its high rate of cohesion make it critical to the survival of most living organisms, moving nutrients up the blood stream or plant roots. Its high specific heat index makes it an ideal heater and refrigerant. Water has the ability to regulate air temperature and is a very good sonic transmitter (U.S. Geological Survey, 2013).

While the planet is effectively covered in water, most of it is saltwater in the oceans. Freshwater only constitute 3 percent of planetary water and less than one percent is

readily available. Freshwater is essential to survival. Historically people have settled close to substantial available water. Over half of the readily available supply of water has been diverted for human use.

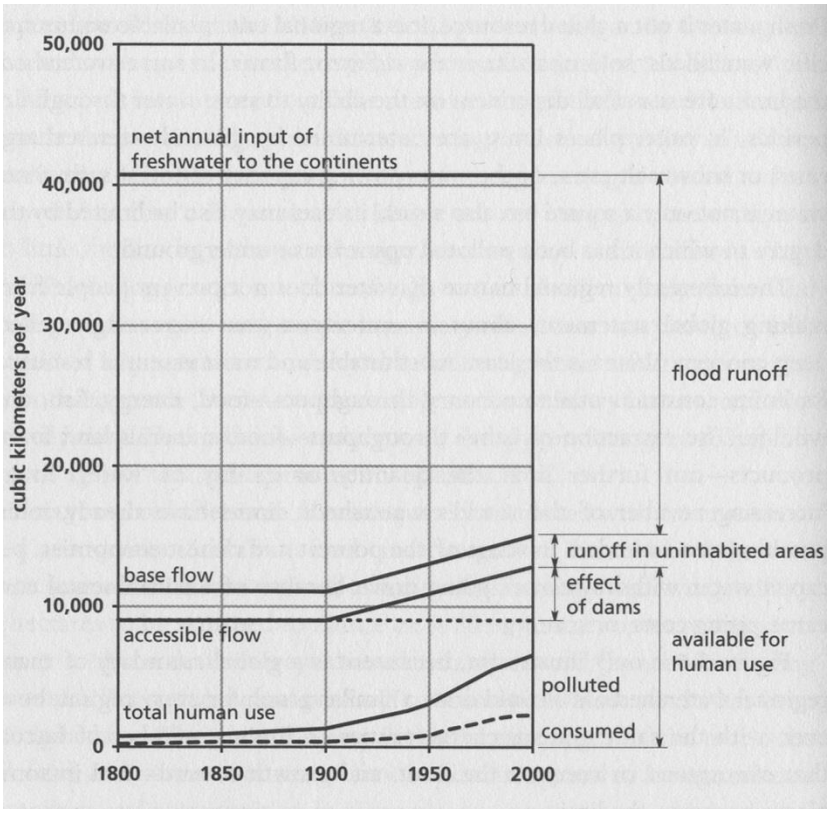


Figure 17 Freshwater Resources
Global freshwater supply and use shows how quickly increased consumption and pollution can approach the limits of accessible water. It shows the importance of dams in increasing accessibility. It also shows that there is a correlation between pollution and dam construction and with industrialization more broadly. Source: (Meadows, Randers, & Meadows, 2004, p. 68).

As the world's population has grown, along with intensifying urbanization and agriculture, water use has been pushed to the limits (UN/WWAP, 2003). Catastrophes associated with water are major factors in conflict in many countries. Natural disasters, including floods, droughts, storms, and other climate-related events displaced 20 million people from their homes in 2008 (IDMC, 2009). The same year, India experienced the driest June in 80 years (Ridge, 2009) – only ten months after 3 million people were

dislocated when the Kosi River breached a dam in Nepal and flowed down river into India (Timmons, 2008). That same year Australia was in the 7th year of a drought unparalleled in the preceding 100 years (Draper, 2009). Failed rains in Ethiopia and Kenya led to the worst food crisis in a quarter century (Rodgers, 2009). These weather events show no sign of abating (IRIN, 2013a). The United Nations estimates that by 2030, nearly half of the people on the planet will live in areas of "high water stress" (UN/WWAP, 2009, p. 150).

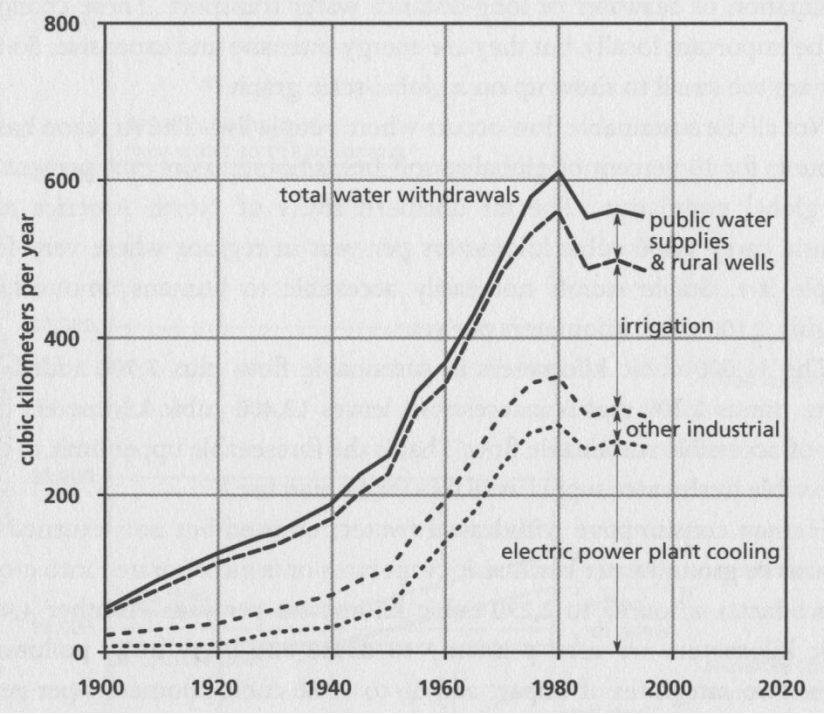


Figure 18: U. S. Water Use
Water withdrawals in the U.S. during the 20th Century. Source: (Meadows, Randers, & Meadows, 2004, p. 70), (Gleick, 1998).

Beyond the implications for human survival, water scarcity also affects ecosystems and habitat. The measures taken to supply or dispose of water in and around human population centers have even greater impacts. These measures range from dams and river diversions to cultivation of "thirsty plants" and urban runoff (MEA, 2005b).

Situating buildings, sourcing water and managing water runoff are only a few of the water-related implications of design decisions. The effects of construction practices, the life cycle behavior of materials and efficiency of water dependent systems in buildings and communities become very important contributors to the health of ecosystems, as well as to economic and political stability. Whereas energy use is spread over different sectors, in industry, buildings and transportation, seventy percent of global freshwater is devoted to agriculture. In 50 years, irrigated areas have doubled (IWMI, 2007), consuming two thirds of all water uses (Postel, 2001). Despite major productivity gains in agriculture ("more crop per drop"), this trend is likely to continue causing droughts, desertification and other major water challenges. Hence, the availability of water and food are intertwined.

> *"In America, I'm a waitress and the first thing you learn is to never let your guests' glasses go empty. You should always have water for them at every point in the meal." – Learner*

Food

> *Without Haber-Bosch 40 percent of humanity wouldn't be here.*
>
> *– Vaclav Smil*[18]

Like water, food is also a source of concern (IRIN, 2013b). That concern is multi-facetted and complicated and must be put in historical context. For most of human history, we depended on hunting and gathering. Agriculture is a relatively recent phenomenon occupying less than half a percent of human history (Diamond, 1987, p. 98). And with that invention began the growth of the human population that has not abated since. Agriculture, Diamond (1987) claims, is the worst mistake in the history of

the human race. He points out that the fossil record indicates a dramatic rise in population following the invention of agriculture.

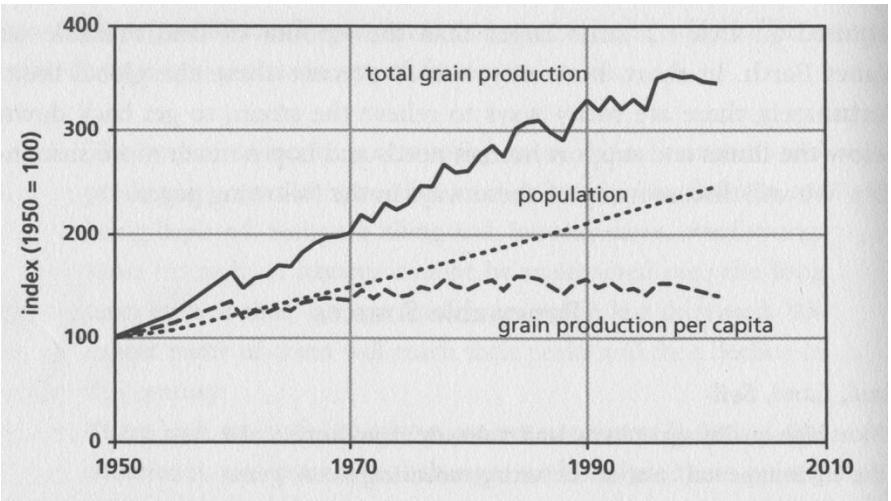


Figure 19: World Grain Production
Grain production increase three-fold from 1950 to 2000, however, per capita production peaked in the 1980s. Source: (Meadows, Randers, & Meadows, 2004, p. 58).

However, fossil records also showed that contrary to previously held beliefs, the transition from hunter-gatherer society to agricultural ones were characterized by declines in life expectancy. So, while agriculture was able to support greater numbers, the adequacy of the food per capita declined – as did the quality, variety and ubiquity of the food.

The social implications of the discovery of agriculture were numerous. Diamond claims that due to the sheer ability to feed more people and the subsequent rise in numbers, the population densities around areas that could support agriculture increased dramatically – leading to the onset of diseases, hitherto unknown in humans. Those greater numbers led to the wiping out of hunter-gatherers – even though the latter were still much healthier. Agriculture did not necessarily improve the leisure time

of former nomads. In addition to poorer quality food, there was a more sedentary life – a great reduction in mobility.

One implication of this, Diamond asserts, was that women who no longer had to carry infants for long treks were increasingly required to bear more children. There is evidence, he claims, in the fossil records of a doubling of frequency of childbirth from 4 years to 2 years. Thus, he argues that the subjugation of women is one of the social impacts of agriculture, among many others. This is an example, Diamond asserts, of how agriculture led to the development of social hierarchies not seen in hunter-gatherer cultures. Over the centuries, humans thrived by encroaching on more wilderness – colonizing forests for farmland.

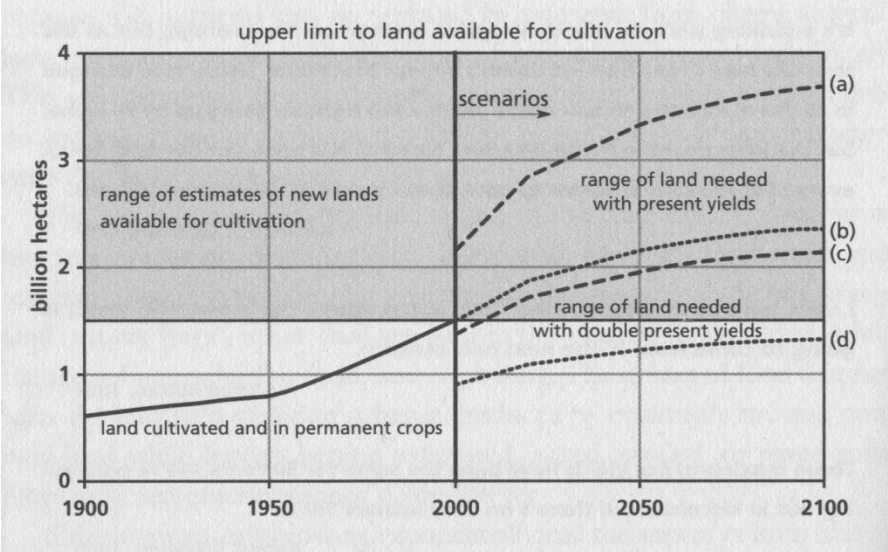


Figure 20: Possible Future Agricultural Land
Cultivatable land is shown in grey. Assuming that population follows the median UN projects, scenarios show the range of land necessary to feed that population. One scenario is if current yield levels are maintained, the other is if yields are doubled. Source: (Meadows, Randers, & Meadows, 2004, p. 64).

In the last few centuries, innovations in medicine, agriculture and increased safety in various arenas have lowered infant mortality and increased life expectancy, accelerating the population growth. Starting in the 20th century, readily available fossil fuels became

critical to food production and consumption. While there are many people on the planet who suffer from “food insecurity,” the major reason we have witnessed such an incredible population explosion is because of the innovations in food. Much of that innovation is dependent on energy – specifically fossil fuels.

For much of the early agricultural period, humans depended on muscle power for farming and wood fires for cooking (Bomford, 2010, p. 121). Most of our food was consumed fresh when available – storage was done by curing, drying, pickling, fermenting and other such methods. Food was packaged in ceramic jars, wooden boxes, leaves and paper. And plenty food was lost to spoilage. All this forced a dependence on the seasons, similarly to hunter-gatherers but less drastically so. This way of life shaped the human diet for centuries until the mass mechanization of farming.

Industrial farm equipment was introduced in mid-19th century America, making farming much easier. However, owning the machines required increased production to pay for them. Later innovations include the wheel blade can opener in 1870, a machine for blowing glass bottles in 1903, with synthetic fertilizer and gasoline-powered tractors by 1910. Within three decades, frozen food, freezers and refrigerators, in homes and in trucks, had contributed to making getting food onto dining tables much easier. All of these were heavily reliant on fossil fuels. In 1840, the USA was an agrarian society with 70% of Americans engaged in farming (Finison, 1979). One sixth of those working on farms were slaves.

In 1900 only 40% of the population was still engaged in farming. By then, while the number of farm workers had doubled, the population had almost quintupled. In 1905,

those 2 million slaves had gained their freedom – obviously a major social improvement, but primary energy consumption had increased from 1.8 quadrillion to 13 quadrillion British Thermal Units (BTUs) per year.[19] Fossil fuels now accounted for 83%, up from zero (Bomford, 2010), (US/EIA, 2012). Currently, thirty percent of the 10 quadrillion Btu of energy used to grow, process, deliver and use food is devoted to kitchen appliances. The total inputs due to fuels, fertilizer, farm equipment and other inputs directly associated with farming only account for 20%.

Even the 10% that involves transport is heavily weighted towards personal transport. The one-third of a gallon that a Ford Explorer consumes in a 4-mile round trip journey to a supermarket is enough to carry a pound of bananas three times around the world on a full container ship (Bomford, 2010), (EPA, 2013), (IMO, 2005). Thus, how far food travels is less important than how it travels, as far as its carbon footprint is concerned. Again, the behavioral implications are as important as the technological.

There are social and cultural reasons to consider the proximity of food sourcing (Allen, 2010). Food is not simply about sustenance, it is inherently social. Growing, preparing and eating food often involves interaction with other people and other organisms. The idea of food consumption is very familiar, even if the actual foods or ways it is consumed are not identical.

Whenever people face challenges to acquiring food – regardless of where they are, we feel connected to their plight. Hence, food connects all of us in fundamental ways that transcend our differences. At the same time, it highlights differences between cultures and traditions: illustrated by how specific foods are celebrated within a group

while some foods may be taboo. Engaging communities in the production of food and the conversations about the production of food, have far-reaching impacts on society. These impacts are political and economic, involving interactions at many levels.

For this reason and due to the aforementioned carbon footprint of food, planners and designers have a stake in these issues. Some of the design implications are policy-related, with codes and zoning, such as the ability to grow food in and around a city (Sandler, 2011). These implications, therefore, may argue for greater involvement of designers in zoning, necessitating broader conversations about the organization of spaces at many scales – from the household to the urban area, and on to whole regions. Finally, food issues and their implications call into question assumptions designers that make that depend on current resource use.

Efficiencies in the use of resources such as energy and water may not be sufficient to mitigate the ecological crises. These crises may cause a shift in cultural and social norms – changing the way resources are acquired, used and disposed. This includes the question of whether (in given circumstances), certain resources should be acquired, used or disposed of, as reductions in consumption may be warranted. Designing and living in less wasteful ways decrease humanity's ecological footprint.

Waste

If I urinated and defecated into a pitcher of drinking water and then proceeded to quench my thirst from that pitcher, I would undoubtedly be considered crazy. If I invented an expensive technology to put my urine and feces into my drinking water, and invented another expensive (and undependable) technology to make the same water fit to drink, I might be thought even crazier. It is not inconceivable that some psychiatrist would ask me knowingly why I wanted to mess up my drinking water in the first place. The "sane" solution, very likely, would be to have me urinate and defecate into a flush toilet, from which the waste would be carried through an expensive sewerage works, which would supposedly treat it and pour it into the river – from which the town downstream would pump it, further purify it, and use it for drinking water. Private madness, by the ratification of a lot of expense and engineering, thus becomes public sanity. This is permitted by our habitual disregard of consequences. We live by buying and selling the causes of every conceivable blight from cancer to famine to holocaust - and are continually astonished to find that these causes have their inevitable effects. As a society, we never look behind us at the generations that will follow us and at the impediments we are throwing in their way.

– Wendell Berry[20]

The strain on resource acquisition is compounded further by the challenges associated with the disposal of waste. There are several forms this takes, including, bodily waste from humans and other animals, solid waste from consumption (much of which is packaging), and waste from industrial processes. All of these lead to contamination of the air, water and soil, with consequences for the availability and quality of other resources, as well as the viability of habitat for other species.

All organisms produce waste. Plants carry their waste and dead material with them all their lives. Unlike plants that hold their waste with and within themselves, animals have to dispose of their waste. Modern European and North American humans seem to be repulsed by their own bodily waste. This trait is not entirely unique to humans, but our own peculiar revulsion may be very strong. Many animals feed on their waste and the waste of others. While humans consume waste material from other organisms, we take great pains to distance ourselves from our excreta and dead fellows. Like most human inventions, the methods by which we dispose of waste are elaborate.

The need to dispose of waste that humans share with other animals did not become a great difficulty until we began to congregate in large settlements (Melosi, 2005, pp. 1-15). The problem of waste is compounded in urban areas by population size and density. This is further exacerbated as urban areas grow, leading to overcrowding and scarcity of available land in the outskirts. Hence, more waste accumulates and sites for disposal become harder to find. Over the course of history, the improper disposal of wastes has been a major public health challenge. Human and animal waste often contaminated the water supply, while burning of solid waste polluted the air. Waste in landfills contributes to air pollution and water contamination, due to off-gassing and seepage. By the late 19th century, it grew into a major environmental catastrophe.

One may argue that waste is inevitable. After all, humans make artifacts for exchange – products and services. When we use them and the energy and other resources required to produce them, the rest is discarded. In any system, once the useful portion is spent, the non-essential part must be waste by definition. Even in the

most efficient of systems, there is still some part that is not useful. Another way to look at waste is as “an indicator of massive failure” of our economic and political structures (Sheehan & Spiegelman, 2010, p. 363). For instance, packaging makes up between 30 and 50% of the volume of municipal solid waste stream (U. S. EPA, 2011, p. 6). Unused waste is a symptom of poor design (Van der Ryn & Cowan, 2007, p. 135), since they often contain useful, and therefore valuable, materials. Designing in ways that turns valuable materials into waste, which then needs to be disposed of in a costly manner is a design failure.

Paradoxically, the response to the historical problem of waste may be the reason for its current pernicious nature. Increased waste has become a large part of the many public health problems of rapid urbanization. In response, many cities in industrialized nations developed sophisticated systems for dealing with waste. Waste removal has become the area where many municipalities excel the most. Trash collection and removal may be second only to pothole fixing among political promises. While road repair is a very technically challenging endeavor, trash collection and removal is fairly straightforward. What is done once it has been removed from the city streets and sidewalks is infinitely more problematic, but has the advantage of being remote from citizens (Melosi, 2005).

Another important aspect in the industrial age is the idea of built-in obsolescence (Strasser, 1999). Advertising and peer pressure were employed to encourage a constant demand for newer products. For reasons of advertising and branding, as well as for supposed preservation of claimed newness and durability, many products are wrapped

with a lot of materials. Thus, the relative ease with which we can throw things "away," and the amount of wasteful packaging, as well as the rapid deterioration of products, facilitate consumerist behavior. Of course, we have discovered that there is no such place as "away."

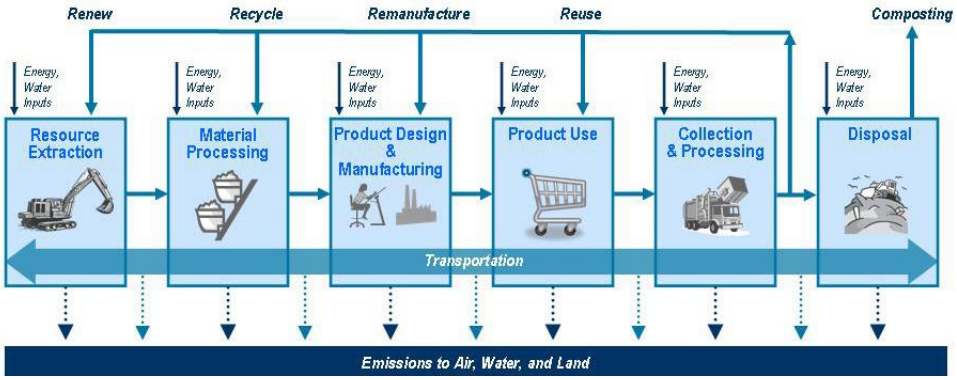


Figure 21: Cycle of Industrial Products.
Source: (U.S. EPA, 2009).

Closing the loops in industrial processes turns waste into a resource, such as the production of "Milorganite" by the Milwaukee Metropolitan Sewerage District from the sewerage. Closing industrial loops also prevents or decreases pollution (Van der Ryn & Cowan, 2007, p. 129). While Milwaukee and other cities have developed good schemes to manage their waste problem, the essential problems remain. First problem is that we turn valuable resources and materials into waste and pollution. Second, we think we can avoid thinking about waste and ecological damage. Third, our cities and homes are designed to enable the previous two problems. Large scale plans to remodel the planet raise ethical questions. Such plans "range from genetic engineering to attempts to engineer the carbon cycle," they include redesigning the fabric of life and inventing machines that are smarter than humans (Orr, 2002, p. 27). The ethical questions include determinations about who decides what, how such decisions are made and for whose

benefit. At the heart of design are “procedural questions that have to do with politics, representation, and fairness.”

The broader design challenge is to “transform a wasteful society into one that meets human needs with elegant simplicity. Designing ecologically requires a revolution in our thinking,” and requires changes to the kinds of questions we pose in design processes from how can we do things more efficiently to deeper questions such as:

Do we need it?

Is it ethical?

What impact does it have on the community?

Is it safe to make and use?

Is it fair?

Can it be repaired or reused?

What is the full cost over its expected lifetime?

Is there a better way to do it?

The quality of design is measured by the elegance with which we join means and worthy ends – addressing ecological ethics and social justice. “Ecological design, then, is not simply a more efficient way to accommodate desires; it is the improvement of desire and all those things that affect what we desire. Ecological design is as much about politics and power as it is about ecology” (Orr, 2002, p. 28).

> *To eliminate the concept of waste means to design things – products, packaging, and systems – from the very beginning on the understanding that waste does not exist. – McDonough and Braungart*[21]

Chapter 2 – Environmental Justice

Had I the heavens' embroidered cloths,
Enwrought with golden and silver light,
The blue and the dim and the dark cloths
Of night and light and the half light,
I would spread the cloths under your feet:
But I, being poor, have only my dreams;
I have spread my dreams under your feet;
Tread softly because you tread on my dreams.

– W.B. Yeats

When Richard Sylvan (as Richard Routley) first suggested a "new ethic (derivatively of a new economics) setting out people's relations to the natural environment" (Routley, 1973, p. 205), philosophers objected, saying that such a new ethic was unnecessary (Passmore, 1974, p. 186). The counter claim was that we owe ethical consideration only to fellow humans, "thus, it could include responsibility for nature, insofar as that affects us, but not to nature" (Curry, 2006, p. 6). Considering the ecological crises that we face a discussion of such an ethic may be timely. In addition to the ecological crises, there are parallels in all other spheres. Just as we are experiencing biodiversity depletion in the form of species extinctions, we are losing languages at an alarming rate (Davis, 1986) – in other words, cultural diversity depletion. Likewise, in the face of economic globalization, there are extinctions of forms of commerce as many countries are forced to abandon economic diversity (Black, 2001). Every facet of our ecological crises is mirrored with a social challenge, political unrest, cultural degradation, resource depletion and economic stagnation.

As population and the density of urban centers have grown, humans have reassessed their ethical attitudes to economic and political activity, as well as in all spheres of life. Such a reassessment of ecological ethics has been lacking. As Aldo Leopold remarks, an ethic is philosophically "a differentiation of social from anti-social conduct" (Leopold, 1970, p. 238), while ecologically it limits freedom of action "in the struggle of existence." He suggests that we have not had serious ethical reconsiderations even as technological breakthroughs have drastically changed our ability to effect and alter the environment. As Leopold asserted, ethics were simpler to define when the technology involved the use of "sticks and stones" (Leopold, 1970, p. 238).

Ecological damage has broad ethical implication due to the harm it causes other species. However, ecological devastation has some immediate social justice ramifications because damaging ecosystems harms other humans, and because the causes and effects are disproportionate. Some people have greater impact and some people suffer greater burdens. People with fewer material means, who have smaller ecological footprints, tend to bear a greater burden of ecological problems (Agyeman & Evans, 2004). For instance, although there is greater overpopulation in global south countries, the consumption rates in the north are greater (Weinzettel, Steen-Olsen, Hertwich, Borucke, & Galli, 2014). Whereas, people in the global north consume at much greater rates, their wealth allows them to avoid the consequences of such consumption – for instance, the average American consumes over 55 times more energy than the average Bangladeshi (World Population Balance).

It is clear that further development will put greater stress on already overburdened ecosystems. The development of Western countries (and especially urban areas of the global north) was underwritten with the use of resources from elsewhere – most notably from the global south during the colonial period (White & Whitney, 1992, p. 13). Forestalling further development (especially in many parts of the global south), is difficult, because precluding certain peoples or certain countries from improving their economic situation and their social infrastructure is a difficult ethical position to defend. Preventing further development, therefore, can be viewed as a way to maintain the current status quo favoring the interests of the global north, is difficult to enforce practically, and may lead to political unrest. Hence development as such, must be accepted as a matter of course. On the other hand, the development challenges of the global south have to be addressed differently from historical development methods used in the north, because conditions are different and the available resources are different.

The complexities of modern life, and the social cultural and ecological conditions, make cogent educational responses to ecological ethics very challenging. The university campus functions as a site for passing on knowledge, designed to be “convenient, efficient, or aesthetically pleasing, but not instructional” (Orr, 2002, p. 127). The education is concerned with potential financial rewards after graduation and could occur just about anywhere. This kind of education is disconnected from place. However, if the role of context in education is reconsidered, the campus and its integral parts, provide important lessons about place. The performance of the building, its material

make-up, as well as how its aesthetics, cognitive and perceptual effects on its inhabitants or users, all provide ample insights about design, humans and the world around us.

Ethical use of Resources

Every day the bucket goes to the well, one day the bottom will drop out.

– Bob Marley[22]

Everything about the way we live, "our lifestyles, mores, institutions, patterns of interaction, values, and expectations" are shaped by ideas bequeathed to us by centuries of culture (Catton, 1982). Most of this shaping occurred in preindustrial times, when the planet's carrying capacity[23] far exceeded the impact of humans. So while we still have this way of living, the carrying capacity has been exceeded. That loss is due to both the increase in population, but also due to the increases in per capita resource uses and environmental impacts. This over-consumption was facilitated and encouraged by the technological innovations of the last two centuries. The carrying capacity deficit due to human life is increasing quickly, while more people on the planet wish to engage in the very behavior that brought it about. At the same time, many people believe that only superficial changes, if any, to their lifestyle is required.

If this continues unabated, Catton asserts that "social disorganization, friction, demoralization and conflict will escalate." Motesharrei, Rivas, & Kalnay (2014) studied the historical record and report that even advanced, complex, civilizations are susceptible to collapse:

> *The fall of the Roman Empire, and the equally (if not more) advanced Han, Mauryan, and Gupta Empires, as well as so many advanced Mesopotamian Empires, are all testimony to the fact that advanced, sophisticated, complex, and creative civilizations can be both fragile and impermanent.*

According to their paper, population, climate, water, agriculture, and energy are the most significant factors that explain the decline of these civilizations. These factors are interrelated.

Diamond (2005, pp. 487-496) lists twelve such factors in his formulation. They include the destruction of natural habitat at an increasing rate, the loss in population and diversity of wild species, and the intentional or inadvertent introduction of invasive species. Also on Diamond's list are the effect of gasses produced by human activities, which cause air pollution, the greenhouse effect, and damage to the ozone layer, among other problems. Industrial manufacturing is particularly indicted in this behavior – chemical and other manufacturing, industrial farming techniques and energy generation, to name a few, contribute to the release of toxic chemicals into the air, the soil, the ocean and other bodies of water.

The access to sufficient quantities and good quality water and soil is increasingly a challenge. The latter is due in part to increased erosion of soil and the depletion of soil fertility through over-farming and the use of industrial pesticides and fertilizers. This is concurrent with a decrease in available wild food sources. Likewise, the available usable sunlight for photosynthesis by plants, due to increased colonization of land for dwellings, pavement and other human activities, is greatly diminished. Abundant and

easy access to energy is an increasing challenge. Diamond's last two factors population and the consumption rates of that population were discussed earlier.

Diamond emphasizes that all of these challenges must be solved, because each factor is sufficient to cause disastrous collapse, but also because each of them feed the others to varying degrees. For instance, the amount of available sunlight affects the amount of resource extracted for energy production. The degradation of soil results in more chemical fertilizer use, which in turn, increases resources extraction. Population affects all other factors. All of these are relevant to the current ecological crises.

Motesharrei, Rivas, & Kalnay (2014) assert that collapse is imminent when these factors converge to generate "the stretching of resources due to the strain placed on the ecological carrying capacity" and "the economic stratification of society into Elites and Masses." It is the social implications of these factors that played "a central role in the character or in the process of the collapse," in every case in the "the last five thousand years" (Motesharrei, Rivas, & Kalnay, 2014). Their argument is thus, an ethical one, connected to critical social issues. Furthermore, the current high levels of economic stratification linked directly to overconsumption of resources, is a structural challenge. Elites are responsible for accumulating a surplus that "is not evenly distributed throughout society." The majority of the world's population "is only allocated a small portion of it by elites, usually at or just above subsistence levels" (Motesharrei, Rivas, & Kalnay, 2014).

Building construction and operation is resource intensive and produces a great deal of waste. The choice of building materials, the distance they have to travel and the way

they are packaged have ecological impacts. There are regulatory constraints that often encourage unsustainable or wasteful uses of resources. Public health and safety, with the attendant legal threats, often lead to introduction of toxic materials. For instance, a fire resistive material may contain toxic chemicals. These materials may end up in landfills where legal protections are tenuous.

Exposure to people who make their living in landfills may lead to the accumulation of these toxins in such workers. The toxins may also accumulate in human waste at sanitation facilities to precarious levels. These circumstances potentially comprise systems – particularly human-constructed systems, which seem to ignore or avoid potential feedback loops. Indeed, when Ingersoll invoked the second law of thermodynamics and called architecture "antiecology," he seemed to be asserting that entropy only applies to human-made things – and especially with buildings and other such large human artifacts, which is not the case.

> *…it is quite impossible to compare a unit of wildlife value with a unit of land value or to compare a unit of recreation with one of hurricane danger. All that can be done is to identify natural and social processes and superimpose these. By so doing we can observe the maximum concurrence of either high or low social values and seek the corridor which transects the areas of least social value in all categories. Exact resolution of this problem seems unrealizable.*
>
> *– Ian McHarg*[24]

The problem that McHarg laments may soon be overcome with ecosystems services, wetlands banking and environmental markets. Researchers have long converted man-hours into kilo-calories (Watt & Merrill, 1963). More recently, ecosystem services have been defined as "the benefits people obtain from ecosystems. These include

provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious, and other nonmaterial benefits" (MEA, 2005b).

However, defining the earth and what it does in this way leads to subjective valuation and does not address the value of ecosystems to other species. Whether or not it is possible to quantify all of nature and commodify what ecosystems do, there remains the ethical question of whether it should be done. Furthermore, it raises questions about whether the only way to extend value to ecology in contemporary society is with regard to what it does, or whether there is intrinsic value in ecosystems – at the individual and at the community level.

The ecological crises facing the world are mirrored by social crises; the misuse of natural resources is, likewise, mirrored by the misuse of human resources. As mentioned earlier, Motesharrei, Rivas, & Kalnay (2014) found that high levels of economic stratification is a major social factor that leads to the collapse of civilizations. Thus, it is not just the amount of available resources, but also how they are allocated. This aspect is an ethical consideration. Their study also challenges the notion that technological breakthroughs can meet these challenges by increasing efficiency:

> *Technological change can raise the efficiency of resource use, but it also tends to raise both per capita resource consumption and the scale of resource extraction, so that, absent policy effects, the increases in consumption often compensate for the increased efficiency of resource use.*

Productivity increases in agriculture and industry over the last two centuries has come from "increased (rather than decreased) resource throughput," despite dramatic efficiency gains over the same period. As such, the ecological and social issues raised here have ethical implications and speak to how we have chosen to order our society. The pernicious nature of that structure is most obvious in the stifling of creativity in educational systems as it is made subservient to the industrial model (Robinson, 2006). The resolution of the challenges we face will require great creativity. How this will be done requires deep consideration.

Ethics in History – Ubiquity of Virtues

> *Always think of the universe as one living organism, with a single substance and a single soul; and observe how all things are submitted to the single perceptivity of this one whole, all are moved by its single impulse, and all play their part in the causation of every event that happens. Remark the intricacy of the skein, the complexity of the web. – Marcus Aurelius*[25]

This exhortation from Marcus Aurelius makes even James Lovelock's Gaia Theory (1979) seem pedestrian by comparison in its all-encompassing outlook. Where, Lovelock defines the earth as one whole organism, Aurelius saw a unity of everything. Aurelius was a quintessential stoic and stoicism was adopted as the philosophy of the Roman Empire from Greece. It has contributed as one sub-current of many philosophies, persisting in contemporary discourse – if only subtly (Snodgrass & Coyne, 2006). It is popular among today's natural science culture. Stoicism ran counter to Plato's model of transcendent unity. For Stoics, coherence was "the touchstone of truth" – they wished to bind everything into a single organic unity.

Ethical considerations occur across cultures and in different locales – there do not seem to be communities devoid of ethics. Peterson and Seligman (2004) have compiled an extensive comparison of character strengths and virtues across cultures and across time. They conclude that six overarching virtues repeat in many cultures, philosophical systems and cultures. The six are wisdom (and knowledge), courage, humanity, justice, temperance and transcendence. These virtues are defined differently and the importance given to each also varies. The context each culture finds itself in seems to have clear effects on how these virtues are ranked. However, there is no question they are important aspects of life. Furthermore, they appear quite consistently and permeate many cultures across varied geographies. Often one or two of the six are not explicitly named, but they are embedded in the contemporaneous descriptions of one or other of the rest. Although Peterson and Seligman were interested in demonstrating how useful certain character strengths associated with these virtues have been for successful existence of humans on the planet, it is also an important indication of how old and ubiquitous ethical considerations are. While this survey is restricted to "Virtue Ethics," Curry (2006, p. 31) posits three schools of "anthropocentric" ethics, the other two being Deontology and Utilitarianism. These authors illustrate the complexity and potential of philosophical understanding. As they show, the discourse occurs at many levels, from brief aphorisms to lengthy treatises, from layered bromides to labyrinthine flights of fancy.

In the Western traditions, the history of ethics has rich traditions. These are grounded in the Greek Philosophers, expanded and suffused by the monotheistic

traditions of Judaism, Christianity and Islam, and finally culminating in the Science of the Renaissance, the Enlightenment, Industrial Revolution and Modernism (Swyngedouw & Cook, 2009). The aforementioned heritage of philosophical inquiry has bequeathed a worthy set of ways of seeing the world and assessing one's place in it. But they have often afforded humans a priori positions of privilege in a hierarchical system. Advances in science and technological innovation have greatly improved human living conditions and reduced human susceptibility to the whims of nature. Hence, there is a strong undercurrent belief that science can and will allay all fears and solve any problems we encounter.

The history of ethics has been overwhelmingly anthropocentric (Curry, 2006, pp. 26-30). Such anthropocentrism has, to varying degrees and in different ways, promoted a view of the natural environment as separate from the human sphere. Often the rest of the natural world is seen as less important. Furthermore, the current hegemony of Neo-Liberal Capitalism has exacerbated these ethics, such that non-human life – and the ecosystems that support all life, are seen only as resources to be exploited (Robèrt, 2002).

Neo-Liberal Capitalism also has hegemonic tendencies which tend to subsume other cultural outlooks and ways of relating to the environment – some of which have more benign impacts. The combination of industrial development and these ethics in the West have put an end to many repressive practices around the world. But their impact has most often been devastating to both the indigenous cultures and to the environment. While indigenous groups across the globe seem only recently to be raising

these issues, it has always been inherent in their relations to the environment (Davis, 1986), (Hawken, 2007, p. 23). It only seems recent because we have not paid attention.

Western ethical thought as it now exists (deeply influenced by multiple traditions including Greek philosophy, Christian religion, modernists, humanists and of course modern science and industry), provides a single reference point. All the dominant variations of these influences are universalist: that is, they presume to apply everywhere all the time and without exception. For instance, the Christian requirement for salvation through particular means is similar to the notion that the laws of physics apply everywhere in the universe. In one case, everything is known and attributable to a singular all-knowing deity, while the latter accepts that there are unknowns, but they will be known soon enough if we continue to apply these particular set of methodologies.

Universalist hegemonies are used by all such large institutions. In these two cases, and in all similar cases, "to ensure that the one truth is correctly perceived and promulgated, a cast of approved interpreters is also needed." Sugata Mitra (2005) illustrates this when he describes the dissemination of influence throughout the British Empire:

> *Imagine trying to run the show, trying to run the entire planet without computer, without telephones, with data, hand-written on pieces of paper and traveling by ships. But the Victorians actually did it. What they did was amazing. They created a global computer, made up of people. It's still with us today. It's called the bureaucratic administrative machine. In order to have that machine running, you need lots and lots of people. They made another machine to produce those people – the schools. The schools would produce the people who*

> *would then become parts of the bureaucratic administrative machine. They must be identical to each other. They must know three things: They must have good handwriting, because the data is handwritten, they must be able to read, and they must be able to do multiplication, division, addition and subtraction in their head. They must be so identical that you can pick one up from New Zealand and ship him to Canada, and he would be instantly functional. The Victorians were great engineers. They engineered a system that was so robust that it's still with us today, continuously producing identical people for a machine that no longer exists. The empire is gone, so what are we doing with that design that produces these identical people? – Sugata Mitra*

Throughout history major world religions have always placed humans at the center of the world. Thus, they privileged human needs over those of non-humans. Western cultural and economic hegemony is even more universalist, continuing to privilege human needs over non humans and the individual over the communal.

Environmental justice bridges the environmentalists with social justice groups in the global north and south. These movements bridges issues of ecological damage and extractive industries to income disparity and abuse of power, gender equity and empowerment to cultural survival of indigenous peoples (Hawken, 2007, pp. 87-114).

Ethics in Architecture

Vitruvius' theories are some of the earliest we have that address architecture explicitly and in great detail. He, like Aurelius, could be considered a Roman Stoic (Snodgrass & Coyne, 2006, pp. 7-19). For Vitruvius the archetype of organic unity was the human body, which exhibited perfect proportions. Buildings were also to be perfectly proportioned. He would have taken it as a given that architecture was to

exhibit this property of a binding of parts, in order for the building to stand up. It would also exhibit its correct deployment of ratio.

For Vitruvius, “symmetry is a proper agreement between the members of the work itself, and the relation between the different parts of the whole general scheme” (Vitruvius, 1960, p. 14). This passage is from a section in which Vitruvius sets out to educate the architect on the fundamental principles of architecture. Crucial in the account is a positioning of the parts in relation to one another and within the whole. Rigor and precision are necessary for getting these relationships right.

> *Bodies were wholes whose wholeness as qualified matter was, above all, a question of coherence. The agent of coherence – in the body of the world and in all of the bodies in it – was a ratio. – Indra Kagis McEwen*[26]

In contrast to the Stoics, Plato believed that each individual aspires towards the ideal – an ideal that was transcendent. In this scheme the cosmic order constituted “a hierarchy of analogies, in which the part takes part in the whole as its analogous representation.” Any work of art is an imitation of an ideal – the work subsumed in mimesis. The principle of mimesis, “understood as an analogous participation of the part in the whole, lies at the heart of Platonic cosmology.”

The appeal to the beautiful is an exhortation to participate in the Platonic chain of mimesis, by which the artisan copies the ideal: the carpenter creates a bed from the archetype of a bed, the painter paints an imitation of the bed on a flat surface, and the poet furnishes a further mimetic representation. Vitruvius favoring the Stoics, argued for imitation of an ideal that is the world as observed – not as an abstraction of it. In the

Renaissance period, ratio gains prominence over mimesis. It carries with it the connotations of calculation, reason and proportion.

> *Beauty will result from the form and correspondence of the whole, with respect to the several parts, of the parts with regard to each other, and of these again to the whole; that the structure may appear an entire and complete body, wherein each member agrees with the other, and all necessary to compose what you intend to form. – Andrea Palladio*

Once mimesis gave way to ratio for the Enlightenment thinkers, they derived the 'rational' and 'reason.' hence, the development of a principle of reason by the Enlightenment mathematician and philosopher Leibniz. He proposes modern systems of thought that attribute causes in an instrumental way. In rationalism, philosophical propositions and assertions about beauty in architecture, must be worked through from first principles, and subjected to rules of contradiction. So anything that involves contradiction is deemed false. In so far as mimesis features in this interpretive schema, as the reproduction of forms or ideas, it is subservient to the rigors of rational interrogation. With mimesis, the appeal was an external ideal, while the rationalist version starts internally. It is psychological and about impressions. Beauty as coherence in Vitruvius' formulation persists, but it is transformed into an argument about efficiency and economy.

While this rationalist view (based on an internalized Platonic ideal), is now dominant, the Stoical undercurrent remains in the culture. Furthermore, there is a strong contemporary stoical attitude, which makes each individual understand his or her position in the interconnected frame of all the parts (Snodgrass & Coyne, 2006, p. 10).

"A person may be stoical in the face of adversity accepting the current condition." Such a person can place current events in the bigger picture. As Adam Smith opined, a shrewd person accepts whatever circumstances gladly, "if he had known all the connections and dependencies of the different parts of the universe, it is the very lot which he himself would have wished for." Smith attributed this to the stoical philosophers. Understanding one's place, making sense of it all, whether in adversity or wonder, involves an appreciation of one's position in the larger circuit of interconnections.

> *Aspects of nature, such as growth, proportionality, symmetry, and patterns of fluidity, were generally recognized as analogues to be emulated rather than systems to conserve or to integrate. Architecture and the city became constituent elements of a socially constructed "second nature" distinct from the world as found. – Richard Ingersoll*[27]

There are many obvious and not so obvious purposes of architecture – as representation, as economic tool, as social involvement, as cultural expression or environmental intervention (Taylor & Levine, 2011, p. 190). Even the words 'architecture' and 'building' are fraught – due perhaps, to all the aforementioned purposes and their implications. Hence, the language and the problems that architecture tackles give prominence to the history of the discipline, architectural theory and to practice. On the other hand, study of architecture and its ethics is limited to the study of "iconic works, their designers and their designers' intentions." Sometimes buildings may leak, fail to provide reasonable human comfort or they are uneconomical to construct or use. Yet they still are considered to be good architecture – inducted into

the canon of significant edifices. This is indicative of the internal ideal as postulated by the rationalists.

> *The epithet architecture tends to evoke a self-conscious regard for the process of design particularly of aesthetic concerns, as well as its beneficiaries. All the while it performs a social role in differentiating between different kinds of creative agents like architects, engineers and builders. The label architect serves, among other things, to consolidate certain moral responsibilities in the figure of a person who has benefited from a particular kind of education and professional qualifications – responsibilities that most likely differ from those identified by engineers and certainly doctors and lawyers. – Taylor & Levine*[28]

Ingersoll claims that architecture is inherently "*antiecology*" (Ingersoll, 1996, p. 119) and nature *naturally* detrimental to architecture. Ingersoll's critiques are cast in a historical analysis of the concern for ecology in architecture (Ingersoll, 1996, p. 119). Unfortunately, they include assertions such as the one that Hitler's and Himmler's genocidal impulses were informed by their vegetarian lifestyle and their belief in animal rights – connections that are at times incredibly hyperbolic (p. 145). However, his worry about "ecofascism" is apt. More importantly, he makes the case for avoiding the mistakes of previous ventures into ecology by architects, in part because of the aesthetic injustices meted out on the built landscape, but also because of the great public relations disaster that they were (pp. 137-142). Most importantly, his call to reconnect ecology with the social project of architecture is prescient. The challenges associated with that social project are evident in Hamdi's (1991, pp. 7-8) description of designers and planners "dropping in and out of slums and shanties, bent on solving the housing problem once and for all." The only trouble is that design schools are not very

engaged and architects particularly are ill-prepared to provide any sustantive contirbution, assuming they are inclined to do so. And strategically developing such an inclination is sorely lacking in the academy on a wide scale.

Toward this end, Dutton presents a framework that he uses when teaching – merging Cultural Studies with Critical Pedagogy into "Cultural Pedagogy" as a way to reconnect architecture students with the social project of architecture (Dutton T. A., 1996). For Dutton, reviving agency (for the architect and the user), is paramount – a position that is not only defensible but perhaps, imperative in the face of global ecological crises. Perhaps, the more immediate reason for such prescience may be the fragmentary nature of the postmodern condition, which accepts multiple critiques of that condition without providing a cogent or unifying antidote – especially with regard to the pernicious nature of global capitalism (Dutton & Mann, 1996, pp. 9-10).

Ethics in Education

It seems that everyone has an interest in education, partly because education is our most meaningful attempt at a collective plan for the future. Yet, the future is beyond our grasp. "If you think of it, children starting school this year will be retiring in 2065. Nobody has a clue… what the world will look like in five years' time" (Robinson, 2006).And yet we attempt to educate them for that very distant and "extraordinarily unpredictable" future. This preparation for the future requires adequate socialization. However, when children are very young, before intensive socialization has occurred, they are not afraid to make mistakes. One of the prerequisites for being original is to be

prepared to be wrong. And yet, much of early education is designed to enforce conformity.

> *We know three things about intelligence. One, it's diverse. We think about the world in all the ways that we experience it. We think visually, we think in sound, we think kinesthetically. We think in abstract terms, we think in movement. Secondly, intelligence is dynamic. If you look at the interactions of a human brain… intelligence is wonderfully interactive. The brain isn't divided into compartments. In fact, creativity – which I define as the process of having original ideas that have value – more often than not, comes about through the interaction of different disciplinary ways of seeing things. And the third thing about intelligence is; it's distinct. – Ken Robinson*

In creative fields, this acquisition of the fear of failure has to be reversed. By the time young people arrive in design schools, they have experienced years of conformist socialization. It is this that design schools attempt to reverse. After all, how can creativity occur with the fear of being wrong?

Arguably, given the ecological challenges that we face, everyone has to be more creative. As such, everyone has to minimize their fear of failure. One implication of this is the avoidance of absolute truths. And while design schools often challenge conformity, they instill a different set of conformist ideas and ideals. Design schools seem to accept multiplicity of solutions, but in the process, the kind of solution and even the kind of multiplicity is mediated. Furthermore, the solutions are limited because the problems presented are abstract and de-contextualized.

> *The notion that there must exist final objective answers to normative questions, truths that can be demonstrated or directly intuited, that it is in principle possible to discover a harmonious pattern in which all values are reconciled, and*

> *that it is towards this unique goal that we must make; that we can uncover some single central principle that shapes this vision, a principle which, once found, will govern our lives – this ancient and almost universal belief, on which so much traditional thought and action and philosophical doctrine rests, seems to me invalid, and at times to have led (and still to lead) to absurdities in theory and barbarous consequences in practice. – Isaiah Berlin*[29]

Perhaps, it is useful to allow students to solve design challenges that are complex and yet solvable using their individual genius, but this approach often fails to address current issues – alienating them from the world that exists and the one they will eventually inherit, as well as alienating them from the inhabitants. In the so-called "Hole in the Wall" experiments, a very strong idea was the notion of education as a self-organizing system (Mitra & Dangwal, 2010), (Mitra, 2005). Children learned how to use a computer without any help or instruction, except from their equally novice peers.

Mitra showed how education might work in any setting without teachers. In some cases, non-English speaking pre-teens learned about the biotechnology of DNA from a series of discs with data in English. They taught themselves English, they reported "casually," so they could use the computer. In another case, they taught themselves to speak with a British accent because the voice recognition software only understood that accent. The idea of learning as part of a web of life evokes Marcus Aurelius' notion of "the intricacy of the skein, the complexity of the web," but in a more empowered way. That is, it is not as part of a machine as described by Mitra when he imagines the international officer corps of the British Empire and the educational system that

produced them as a sort of global administrative computer. It is more similar to other self-organizing systems, such as the World Wide Web (Barabási, 2009).

There are multiple trends in design education. There is the need to respond to the obvious, incredible technological innovations burgeoning all over. This requires designers to be capable of innovation and to address the implications (good and bad) of innovation. At the same time, there are incredible pressures on infrastructure from many directions. In many of the more developed nations, there is increasing concern for how consumptive lifestyles have impinged on public health and imperiled the environment. On the other hand, in less developed countries, there is growing alarm at the rapid urbanization and the strains on infrastructure.

As people in the global south urbanize, their consumption rates aspire to those in the north, exacerbating the various ecological crises facing the world. The current technological advances encourage decentralization, including in higher education. Just as occurred in retail, the necessity for physical campuses, buildings and classrooms is being threatened. Even the necessity of teachers is being called into question. Design education cannot assume immunity to these challenges. It becomes an ecological imperative for design education to evolve or it may well go extinct. If the human touch is necessary for education, it must prove its relevance.

Ecological Ethics

The theoretical basis for providing an education that can respond to current ecological devastation, cultural marginalization and social justice issues is in the development of ecological ethics. Curry asserts that much of Western ethical thought throughout history is anthropocentric – privileging humans over other organisms (Curry, 2006, pp. 42-44). The development of ethics, according to Curry, is either religious or secular (pp. 26-30). Religious ethics essentially take two forms. One form is the "dominion thesis" in which the planet is given over to humans to do as they please, obviously not a stringent standard to uphold.

The other form is the "stewardship thesis" in which humanity can use natural resources but are also responsible for its well-being. Secular ethics replaced the divine with humans at the center of life. This began in the west with the rise of humanism in the Enlightenment period. The goal of philosophy was to attain natural truth, instead of divinity. Reason replaced revelation as the path to truth. However, it was increasingly replaced with scientific and technical reason. In this ethical view, all problems have scientific or technological solutions. This is the view held by many economists. The result is that the non-human world is viewed as "a set of inert raw resources to be mastered and exploited by human reason" (Curry, p. 29).

Curry classifies anthropocentric ethics into three broad categories; virtue ethics, deontological ethics and utilitarian ethics (Curry, 2006, pp. 31-39). Virtue ethics, the oldest of the three traditions, stem from the philosophy of Plato in the Western tradition. The central focus of virtue ethics is "on developing virtuous character" (p. 31).

Virtue ethics include certain characteristics codified from antiquity, which appear in many world religions. Virtue ethics have been displaced by deontology and utilitarianism. Deontology is concerned with the duties that one owes to society. Such duties are typically not questioned. Hence, any direct or ancillary damage done in the performance of one's duties are still deemed "ethical" because one carried out one's duty. Utilitarian ethics, on the other hand, focuses on the consequences of actions, and involve finding what actions ostensibly have the greatest potential for good for the greatest number of people.

It is a challenge in utilitarianism (or consequentialism) to determine the greatest good before an action is initiated. Such a determination is difficult after the fact. Thus, adherents of utilitarian ethics often wish to impose their notions of what is best on others. Otherwise, consequentialists resort to statistical measures of good things. Statistical measurements may be purely quantitative, such as how many items were produced or somewhat subjective, such as how many people reported benefitting. All three categories of ethics have advantages and disadvantages, but they fall short in providing a good ecological ethic that can counter ecological crises such as anthropogenic climate change (Curry, 2006, pp. 42-44). Curry argues that although none of the anthropocentric ethics he discusses are individually responsible for ecological crises, they have collectively produced a mindset that has produced our current ecological crises.

Therefore, Curry argues, we must go beyond these anthropocentric ethics to "eco-centric" ethics (pp. 44-46). Eco-centric ethics, in combination with anthropocentric

ethics are necessary for curtailing and reversing the effects of ecological devastation. Curry describes ethics that devolve rights to other sentient beings as “light green.” While light green ethics are inclusive of other beings, it privileges sentience – a quality that humans possess. Thus, the principal criterion for considering other species is the perceived proximity to humans, based on a matrix particularly meaningful to humans. Hence, light green ethics are indirectly anthropocentric.

Ethical frameworks that encompass all animals or encourage care for the environment due to the ecosystems services that they provide to humans are only “medium green” in Curry’s formulation. Ecosystem services are categorized by the Millennium Ecosystem Assessment as provisioning, regulating and cultural, which include examples such as food crops, water purification and recreation, respectively (MEA, 2005a). Medium green ethics include a range from narrow to broad utilitarian considerations, making these ethics mostly anthropocentric.

Curry urges “deep green” or “dark green” ethics that respect the planet in of itself (Curry, 2006, p. 63). Deep green ethics, Curry asserts, must “recognize the value, and therefore support the ethical defense, of the integrity of species and of ecosystemic places, as well as human and non-human organisms.” Deep green ethics is holistic without diminishing individual worth. Green ethics “allow conflicts between human and non-human nature,” and support the notion that human interests may on occasion lose in those conflicts to non-humans.

An example of such a deep green ethic is the Land Ethic, formulated by Aldo Leopold. Fundamental to the Land Ethic is the notion of placing ecological limits on

human freedom. The Land Ethic is not limited to the animate, encompassing the inanimate as well – understanding that the ecosystem itself, and not just the organisms found therein, merit ethical consideration. Leopold also considers individuals as well as wholes and relationships. Most profoundly, Leopold's approach is suffused with humility before the immensity and complexity of the world. The position taken in this dissertation is that the education of young people should be geared toward developing deep green ethics, encouraging them to think like a mountain as Leopold would say, taking the long view and attending to the broad sweep of interactions.

Chapter 3 – Sustainable Communities and Design

…environment is not only in the head, as what is there depends also on the various social, cultural and physical attributes of the environment 'out there.'

– Amos Rapoport

White and Whitney (1992) lay out a description of the evolution of human settlement in three stages. The first they termed the "Pre-modern Quasi-sustainable Settlements" and the second the "Colonial/ Industrial Revolution Unsustainable Stage" followed by what they hope is a "Sustainable Cities of the Future. "In the first stage, settlements were often situated along waterways, and their limits are defined by the ability to expand territory without depleting their resources. The interwoven relationship between the city and its hinterland meant that they shared resources and managed any waste. For instance, human waste produced in the city was prized as fertilizer and used as such in the countryside (King, 2004), (Morse, 1885, p. 231), (Van der Ryn, 1999, p. 27).

Therefore, these early settlements were somewhat sustainable. Technology limited the extent of a settlements' ability to expand. In the second stage, access to remote locations allowed for cheap resources and an expansion of waste dumping. Combined with technological improvements, certain countries were able to industrialize their urban areas, while mechanizing the rural areas. White and Whitney contend that little thought was given to the ecological impacts of these decisions. The authors hold out hope that the third phase, into which we are entering, will be a sustainable period. However, it is first important to understand what sustainability is.

What is Sustainability?

The World Commission on Environment and Development released a report in 1987. The report was an attempt to resolve the apparent conflicts between the desire to provide development and poverty alleviation on the one hand, while addressing ecological concerns on the other. The document titled Our Common Future, often called the Brundtland Report, after the chair of the commission, provides the following definitions:

> ***Environment*** *is defined as "the conditions that affect the behaviour and development of and the physical conditions that exists in the natural world in which people, animals and plants live."*
>
> ***Environmentalism*** *is "concerned about the natural environment and a desire to improve and protect it."*
>
> ***Ecology*** *is "the relation of plants and living creatures to each other and to their environment" or "the study of this."*
>
> ***Sustainable*** *means processes "involving the use of natural products and energy in a way that does not harm the environment" or "an action that can continue or be continued for a long time."*
>
> ***Sustainability*** *refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

There are more technically accurate definitions of these terms used, for instance, by scientists. However, they fail to encompass other connotations including the social import as presented above. Additionally, scientific definitions are assumed within the definitions given above. For instance, environment would include the "natural" and the

"built" environment. These are often viewed differently by different disciplines – for example, an ecologist and an architect may have different understandings of each.

Taking the example of the natural environment, any scientist's definition would assume rudimentary understanding of the earth's composition – its geotectonic cycles and life sustaining processes of the biogeochemical cycles such as water, carbon, nitrogen, sulfur and phosphorous. The definition would also include an understanding of mineral cycles such as that of calcium and silicon. Some of the cycles would exist without life, while others are instigated by life. Without them, life as we know it would not exist (Smil, 2007). The built environment is often used in opposition to nature: This assumes that anything done by humans is unnatural – that it is artificial, usually understood as opposite to the natural. This usage of the built environment seems strange since it implies that humans are not a part of nature – or that we are a special part of nature.

On the other hand, the notions of the natural environment evoked here are informed by an anthropocentric world view – or at the very least a pastoral view of places without many or any buildings. Regardless, the word environment is used in many contexts, with many different connotations. The word is often used for political expediency or financial gain. For example, suppliers to Home Depot's Eco Options marketing campaign make some interesting claims: "Plastic-handled paint brushes were touted as nature-friendly because they were not made of wood. Wood-handled paint brushes were promoted as better for the planet because they were not made of plastic" (Krauss, 2007). There are many divergent views about what constitutes sustainable or

environment-friendly, which must be acknowledged, but they must also be differentiated from marketing.

The Brundtland Report has international consensus, but unfortunately, the report's definition of sustainability is inadequate due to the political nature of the report. The report tries to be affirming of all stakeholders, and therefore, as is often the case with such global institutions, sustainability is paired with development – sustainable development. So, "the word 'sustainable' pacifies the environmentalists, while 'development' has a similar effect on businessmen and bankers" (Orr, 1992, p. 23). In defining sustainability more robustly, Orr makes a distinction between technological and ecological sustainability. This distinction parallels the earlier categorizations of ecological crises and the crises of available resources.

Orr's two types of sustainability include one that is technological and another that is ecological. Technological sustainability extracts from nature whatever it can for human consumption. It is sustainable insofar as it can continue such extractions without harming our ability to continue to do so. Hence, "every problem has either a technological answer or a market solution." It is the total domination of nature with population control, where humans are viewed primarily as economic animals with individualistic urges, while ecological sustainability considers humans as citizens with shared futures. Inherent in ecological sustainability is the notion that there are limits to human knowledge and as such the proliferation of humans must be limited. Ecological sustainability is "the task of finding alternatives to the practices that got us into trouble in the first place; it is necessary to rethink agriculture, shelter, energy use, urban design,

transportation, economics, community patterns, resource use, forestry, the importance of wilderness, and our central values." Technological sustainability "is about expert interventions in which the planet's medical symptoms are carefully stabilized through high profile agreements and sophisticated management techniques" (Van der Ryn & Cowan, 2007, p. 20). Technological sustainability depends on continued growth – progress at all costs, and assumes that all places are the same in the ways its rules are applied. Technological sustainability holds that unsustainable circumstances are a function of inefficiencies in pricing or products, while ecological sustainability looks to nature as the model for living. Ecological sustainability understands that place is important – as such, history and traditions are valued as much as forecasts and innovations. This ecological view of nature as a model for living necessitates an understanding of appropriate scaling and interrelatedness of things.

Five Axioms of Sustainability

Richard Heinberg (2010, pp. 16-19) provides a compelling list of axioms for sustainability.

1. *Any society that continues to use critical resources unsustainably will collapse. Exception: A society can avoid collapse by finding replacement resources. Limit to the exception: In a finite world, the number of possible replacements is also finite.*
2. *Population growth and/or growth in the rates of consumption of resources cannot be sustained.*
3. *To be sustainable, the use of renewable resources must proceed at a rate that is less than or equal to the rate of natural replenishment.*
4. *To be sustainable, the use of nonrenewable resources must proceed at a rate that is declining, and the rate of decline must be greater than or equal to the rate of*

depletion. The rate of depletion is defined as the amount being extracted and used during a specified time interval (usually a year) as a percentage of the amount left to extract.

5. *Sustainability requires that substances introduced into the environment from human activities be minimized and rendered harmless to biosphere functions. In cases where pollution from the extraction and consumption of nonrenewable resources has proceeded at expanding rates for some time and threatens the viability of ecosystems, reduction in the rates of extraction and consumption of those resources may need to occur at a rate greater than the rate of depletion.*

What makes this definition of sustainability more meaningful is that the axioms put forward beginning principles. The axioms begin with the assumption that the desired state of affairs is a world in which human activities cause little or no ecological harm. The axioms also fail to consider equity in inter-human relations. Dr. Karl-Henrik Robèrt convened leading scientists to develop a consensus on what constitutes a sustainable society. From that consensus, four conditions were identified as prerequisites for a sustainable system (The Natural Step, 1989), (Robèrt, 2002). In a sustainable society, nature is not subject to systematically increasing:

concentrations of substances extracted from the earth's crust.

concentrations of substances produced by society.

degradation by physical means.

And, in that society:

people are not subject to conditions that systematically undermine their capacity to meet their needs

These conditions have the advantage of an elegant simplicity. These ideas of sustainability will be used to discuss the notion of sustainable ecological communities.

However, sustainability cannot be divorced from context. It must be tied to the social, cultural and physical attributes that Rapoport mentions. As such, it is important to clarify what community means.

What is Community?

The Merriam and Webster dictionary (2010) defines Community as:

1: a unified body of individuals: as

a: state, commonwealth

b: the people with common interests living in a particular area; broadly: the area itself <the problems of a large community>

c: an interacting population of various kinds of individuals (as species) in a common location

d: a group of people with a common characteristic or interest living together within a larger society<a community of retired persons>

e: a group linked by a common policy

f: a body of persons or nations having a common history or common social, economic, and political interests <the international community>

g: a body of persons of common and especially professional interests scattered through a larger society <the academic community>

2: society at large

3 a: joint ownership or participation <community of goods>

b: common character: likeness <community of interests>

c: social activity: fellowship

d: a social state or condition

Such definitions are subject to changes and are highly dependent on changes and variations in culture. A particularly interesting change that has occurred around the world is that many people are more likely to refer to each other as consumers, rather than as citizens. A citizen is “a participant in a democracy, regardless of their legal status” choosing “to create the life, the neighborhood, the world from their own gifts and the gifts of others” (McKnight & Block, 2010, p. 7). On the other hand, a consumer “has surrendered to others the power to provide what is essential for a full and satisfied life.” This surrender is signified in many ways: “client, patient, student, audience, fan, shopper.” Consumerism is the “transformation of citizens into consumers.”

It was during the Clinton administration that I noticed it – it may have been in American politics longer – but that is when I noticed it. I was listening to the radio and for some reason it caught my ear. It occurred to me that many politicians no longer referred to us as citizens, but rather, as tax-payers or worse, as consumers. And it made me angry. The distinction between citizen and consumer is relevant for two reasons, the first being that the commitment that individuals bring to engaging in a community defines the community. It also determines the effectiveness of anything the community members decide to engage in. Secondly, the attitudes that the community members have of themselves influences the ways in which the community is formed, affects how they interact, and determines what goals and challenges they address,

McKnight and Block further assert that community “occurs outside systems and institutions.” The community may partake of amenities provided by a city or municipal resource supplier, but it has its own competencies and operates these independently,

within certain restrictions as imposed by those external “systems and institutions.” The key difference as elucidated by Orr is the difference between technological and ecological sustainability – particularly with respect to centralization and scale.

I define community as people with common interests living in a particular area – an interacting population of various kinds of individuals. They have common characteristics or interest in living together. They may possess a common history or set of common social, economic, and political interests and possibly even joint ownership. Community is scalable, although the relationships vary with scale. Thus, if the scale is too small or too large, the citizens may not have appreciable impacts. At the scale of the town or city it too may be too unwieldy and at the scale of a block, any actions may not have an appreciable or a lasting effect. As such, a small town or a village both are good scales for a community, and within a city, it could be a neighborhood.

A neighborhood is midway along the continuum from house to city: house – block – neighborhood – district – city. The boundaries and definitions of neighborhood vary. People within the community often define their neighborhood differently from outside entities, such as government agencies. These agencies bring their own sets of agenda, not always to benefit the community members. Such plans tend to be conceived “as an ideal” without consideration for the specific context, based on matrices that are external and often alien to the community. As such they may be large enough “to populate an elementary school and support convenience shopping and a community center” (Jacobs, 1961, p. 132). But a neighborhood is not simply a series of lines demarcating its boundaries, different use zones or proportion of green space. It involves

"living, complex organisms, capable of shaping their own destinies" and according to Amos Rapoport, "people seem to need to be able to identify with such a unit." He identifies eight categories of meanings associated with neighborhood, claiming that they "are most clearly defined when social and physical space coincide" and includes "when physical boundaries, social networks, homogeneity, local services and facilities, and symbolic as well as emotional connotations overlap and are congruent" (Rapoport, 1997, pp. 96-98).

Rapoport (1997, p. 96) explains that "meanings behind the subjectively defined neighbourhood could be categorized" as follows:

1. *Just the dwelling, the area around it being merely a matter of convenience (this might be the case with people without children, or with extensive networks based on community of interest); it may also be an area with which one is most familiar, which evokes a feeling of being near one's dwelling.*
2. *An area immediately around the dwelling, communicating identity and hence symbolizing status.*
3. *A set of people, either liked or disliked, but forming the immediate social environment.*
4. *Some ideal, such as a village-like or small town community with face-to-face associations and intimate relationships, or related to ideal central city area, such as Bloomsbury or Chelsea in London, or Greenwich Village or SoHo in New York.*
5. *A named area, widely known and accepted.*
6. *An area based on services and the people who run and provide them.*
7. *A distinctive physical area, separated from other areas by clear physical and conceptual boundaries, which depend on differences in block layout, street type, greenery or location, creating a specific cultural landscape and ambience.*

8. *An area of people subjectively homogeneous by some particular attributes, such as ethnicity, religion, lifestyle, or ideology, and reinforced by activity patterns and social networks. This homogeneity may become perceptible not only through the population, but through a variety of consistent cues creating a specific ambience...*

Rapoport (1997, p. 97)goes on to say that,

> *In general, then, neighbourhood as subjectively defined is a cognitive construct, a socio-spatial schema, altogether a combination of social and spatial factors, reinforced by name, symbolic elements and so on.*
>
> *Thus an agreed upon, clearly defined distinctive area needs at least three elements: distinct boundaries and physical character, comprehensible cues and symbols; some form of subjectively defined homogeneity with agreed upon use of streets and other settings; together with some name, image and/or identity which people can accept and with which they can identify.*

For the purpose of this paper, I define a neighborhood as communicating identity with face-to-face associations and intimate relationships. It could be a named area and this is reinforced by activity patterns and social networks. The neighborhood was the unit of community that was used in the Cape Verde project. It also led to the development of a concept tentatively called sustainable ecological communities and a working definition:

> *A sustainable ecological community is one consisting of members who intentionally, actively and continually engage in long-term planning of how to live in harmony within their context. They attempt to use natural and human resources equitably with minimal harm to the environment and to the community's constituent members. They plan to provide for their livelihoods while maintaining their culture.*

This was reinforced by my visit to Las Gaviotas in Columbia – a community where people had made a concerted effort to be conscious of their ecological impact (Weisman, 1998).

Sustainable Ecological Community

The sustainable ecological community provided an initial construct for investigation precedents – and generating ideas for introducing contextual issues into the design studio. Equipped with this initial concept of a sustainable ecological community, it was necessary to find suitable examples. Sustainable ecological communities come in many forms and are highly influenced by context. For instance, policy influences could occur at various scales – at the regional, urban or neighborhood scales or somewhere in between. As an example, in New Zealand, environmental policy is made nationally to safeguard natural ecological systems, rather than for considering sustainable development or mitigating hazards (Act 1991 No 69, 2011). The law is intended to secure the biophysical for multiple generations. The government entity responsible for enforcing this law emphasizes safeguarding the environment, rather than providing natural resources for human use.

Kerala in India has had a socialist government for decades, which eschewed rampant development in favor of equity and social improvement. As such, many of Kerala's social indicators are similar to those of USA and they perform better on many of the human development indices (Sen A. , 1999, p. 47), (McKibben, 2007). Due to this approach and these factors, their per capita environmental footprint is tiny compared to that of the USA (Table 2).

Table 2: Comparison of Quality of life Indicators for 1991
Source (Franke & Chasin, 1994).

Indicator	Kerala	India	Low-Income Countries	United States
Per capita GNP (in $)	298	330	350	22,240
Adult literacy rate (%)	91	52	55	96
Life expectancy (in years)	men 69 women 72	60	55	76
Infant mortality(per 1,000	17	85	91	9
Birth rate (per 1,000)	20	31	38	16

There are many cities of the global north such as Boulder, Colorado; Portland, Oregon; and Seattle, Washington that have implemented strong policies to encourage greater social engagement and to reduce negative ecological impacts. Seattle has made environmental stewardship an important aspect of its affordable housing stock, requiring public buildings to acquire LEED Silver certification (Mallory, 2009), (Wang, 2009). Boulder requires developers to allocate a fifth of all new housing for lower income people without sacrificing ecological concerns (Logan, 2009).

Portland is much lauded for its participatory model, which strives to involve its citizenry in broad-based decision making (Irazábal, 2005). In a concerted effort to make urban living attractive and convenient, citizens in the Portland metro-area drew a boundary to enclose further development, and then invested heavily in alternative transport infrastructure, such as public transit, bicycle infrastructure, and pedestrian (Karlenzig, 2010, p. 307). The region is one of the few metropolitan areas in the United States that has experienced a decline in vehicle miles traveled per household.

In the global south, however, different approaches have been used. The perceived need for development makes cities in the global south such as Curitiba less participatory. However, Curitiba is included in my selection since it is considered exemplary by many conservation activists and organizations. In spite of these efforts by various cities, there are other instances where groups of people have left heavily habited areas – to start afresh in remote areas. Some of these are utopian experiments. They are instructive because often the impetus for their formation is a desire to correct many existing problems in long-settled communities. Las Gaviotas is presented here as one such experiment.

Other examples illustrate great initiative on the part of community members. For instance, in Charlottesville, Virginia attempts at a sustainable ecological community was instigated by enlightened participation, including civic society and the private sector (Quale, 2009). In that case, it was spearheaded by several groups including the local university – specifically a few teachers and their students. But there are many organizations that operate at the local level. They try to fill gaps in the social safety net. Many of these are formed by people with strong ties to the communities within which they work. They take advantage of personal networks and improvise solutions. Most often the scope of their work is limited to one or a few neighborhoods.

In Milwaukee, one such neighborhood organization is Walnut Way. The various organizations and individuals that were catalysts for its creation, like those in Charlottesville, have successfully created an ecologically sensitive neighborhood without strong support from government. However, these organizations and the examples of

such communities are driving social policy. Walnut Way and its partners have influenced Milwaukee's policy, Curitiba's example has influenced Brazil's national policy and Las Gaviotas has had national and international policymakers visit over the decades for lessons.

Curitiba, Paraná, Brazil

Curitiba is a mid-sized Brazilian city in the southern mountains which has few natural resources or other sources of wealth. Yet it has managed to do urban planning in a way that has been lauded as both ecologically sensitive and socially responsive. Using federal funds for flood prevention, the city integrated recreation by reclaiming abandoned industrial land to create parks (52 square meters per inhabitant) and constructed several decorative lakes (Schwartz, 2004). It is touted as an example of "decent lives" helping to produce a "decent environment." It has very important lessons for cities in Brazil, in the global south, as well as the rest of the world (McKibben, 2007).

Three interesting examples of the city's efforts illustrate Curitiba's special brand of sustainability. Curitiba's first innovation is its acclaimed bus transit system, which it extended into low-income neighborhoods, trying to incorporate the unplanned neighborhoods into the system as well as those that adhered to the city's more institutionally accepted layouts. The second initiative that is touted by Curitiba is the "Garbage that is not Garbage" program in which food is exchanged for recyclable solid waste (The City of Curitiba, 2010), (UN Cyber School Bus, 2002), (Keuhn, 2007). Thirdly, Curitiba initiated its "Slum Relocation Plan" in 1976, building low-income housing near the city center. So although it accepted income-based segregation, the intention was to

encourage proximity between upper-income neighborhoods and those of the lower-income citizens (Roman, 2006).

First innovation: the transit system, Curitiba's nervous system ties together all its gems, including the opera house, the Open University, its numerous parks and boardwalks, and other amenities. It links the various neighborhoods to the downtown, the industrial section and other employment areas. Car ownership in Curitiba is higher than many other Brazilian cities, yet they are not driven as often. The city developed a pattern that dedicated every third major street to walking and the next one for cars. The next street was then widened and reserved for buses. Thus, they were able to lower congestion and pollution levels.

[1] For the municipality of Curitiba only (over 70% of the metropolitan area). [2] Los Angeles County
Number of buses for London and Curitiba include significant numbers of articulated and double-decker buses, while those for Hong Kong include significant numbers of both double deckers and minibuses.
Source: Author's data and Murthy V.A. Bondada, ed., *Urban Public Transportation Systems*, ASCE, Virginia, 2000.

Figure 22: Urban Bus Usage Per Capita.
Source:

Second innovation: At first glance, the idea of trading food for waste sounds inspired – almost magical in its reference to nature. Like any other ecosystem, and unlike most cities, Curitiba returns waste to its regional farms in exchange for food.

Figure 23: Curitiba's Recycling Program
Source:

In Figure 23, showing five types of recycling bins, there is a bin for paper, one for plastic, one for metal, another for glass and yet another for organic matter.

Figure 24: Curitiba's Recycling Program
Source:

There is no bin for trash – the city assumes they will not produce any non-usable trash. Public or privately leased trucks (Figure 24) deliver food which is exchanged for

recyclables. Hence, the city claimed a recycling rate of 70% (Johnson, 2001), which is much higher than many richer cities around the world – San Francisco only reached that mark in 2008 (Environment News Service, 2008). By the mid-nineties they were at 90% (Keuhn, 2007).[30]

Third innovation: an effort at social integration, which is specifically the placement of lower-income neighborhoods closer to those of upper-income citizens. Curitiba has unplanned neighborhoods (referred to as favelas) like other Brazilian urban areas and cities around the world. The Curitiba Slum Relocation Program is an intriguing concept and has similarities to New Urbanism with the mixed income housing developments that have returned to fashion in recent years, but at a city-wide scale. It is also connected to traditional spatial arrangements in Curitiba and other Latin American cities where low-income citizens lived in close proximity to their more well-to-do counterparts, since the former worked as domestics for the latter.

Irazábal (2005) compared Curitiba with Portland, Oregon, another city often cited for its green credentials in the US. In spite of the advantages that Portland has; a smaller city with no informal settlements, Curitiba held its own. Curitiba has public spaces that are the envy of cities across the globe, an efficient transit system, an enviable recycling program and a laudable attempt at meeting the housing needs of its populace. However, the plight of its low-income residents – especially that of its favelitos, is still dire. Curitiba aggressively markets its style of sustainable urban planning like a commodity all over the world. Government officials, architects, and planners from across the globe come to visit Curitiba, to study its principles at a local institute which

educates people in Curitiba-style urban planning and management, even as they pursue foreign direct investment.

Although the ecological benefits are obvious and a case can be made for social cohesion, Irazábal questions whether the success of these initiatives, suggesting it is due to the apparent abrogation of social justice. In spite of the city's efforts, it is not clear that the connection between the newly relocated favelas and the industrial zones were well coordinated. Of greater interest is whether the much touted transit system also works well for the low-income citizens – especially those who live in favelas. In addition, many complain that the bus fares are too high and some dislike that the designated bus routes disallow bicyclists.

However, the greatest concern that Irazábal raises is the hegemonic nature embedded in the structure of Curitiba's urban planning and design. In spite of its institute where "public talk" is initiated (Moore S. A., 2007), Curitiba is not culturally inclusive of all its inhabitants and tends to hide its Afro-Brazilian influences. Technocrats, appointed during Brazil's military dictatorship, developed and initiated many of the city's planning, according to Irazábal. She asserts that the discursive environment in Curitiba lacks much participation in the early stages of any idea. As any idea progresses, the discourse is often paternalistic and coercive. The social justice concerns may be a function of the challenges of communal work at a large scale.

Regardless, Curitiba's planning and its approach to urban problems, indicate genuine concern for ecological and social issues. The city is interesting because the city has been on this path for over three decades. The city is in the global south and is often cited as

an example for cities in the global north, as well as for those in the south. Many of the city's initial leaders, as well as the current officials, were highly motivated designers – often architects, who brought a design sensibility to their approach to problems.

Las Gaviotas, Vichada, Columbia

Las Gaviotas is a community along the Rio Meta in the western Llanos of Colombia. The Llanos is a grasslands region or savanna, north of the Amazon that straddles the Colombia-Venezuela border. Along the Rio Meta, the frequently flooded sandy soil has long lost its fertility. Many miles to the west from the river, the land barely supports the rice crop which is ubiquitous there. From the Meta east to the Venezuelan border, most of the ground remains a river of mud during the wet season and a hard concrete-like surface in the dry. However, Gaviotans have managed to build a thriving and self-sufficient community that has generated numerous design solutions, which are relevant across the global south. Their innovations include water pumps, wind generators and solar thermal devices. These are employed in fisheries, energy generation and water supply systems.

I visited Las Gaviotas in 2009 and travel to the community was still arduous. It took me three days by bus from Bogota. The journey included a night spent in Villavicencio after a full day's ride across the Andes. We left Villavicencio shortly after midnight on the second night to drive through narcotrafficante country into guerrilla country. Soon after noon, we stopped for lunch and the paved road ended – we continued. After a hundred of miles on unpaved tracks, Las Gaviotas was another 50 miles across the open

savanna and I arrived outside Las Gaviotas after dark in the pouring rain the following night. I spent the next afternoon talking with inhabitants of the commune.

The location of Las Gaviotas is evident on maps and aerial photographs – the density of the trees in the community is striking in contrast to the barren surroundings. However, it is remote. The community was founded in the late 1960s by Paolo Lugari, a Bogota academic, former development worker and dreamer (Weisman, 1998). He drove several hundred miles east of Bogota – halfway to the Venezuelan border, across rebel-controlled land. There Lugari settled and began the community. He invited others to join him. They included various engineers, intellectuals and inventors from all over the country. They were also joined by other migrants, disillusioned by failed government-sponsored development projects and people from nearby indigenous communities.

Figure 25: Las Gaviotas: Hospital.
Source: Author's Photo.

When they first arrived, they tried various methods to enrich the soil. They discovered that the Caribbean Pine (Pinus Caribaea) from Honduras could grow there.

After a heated discussion about whether the Caribbean Pine was an invasive species, Gaviotans decided that the border was artificial and they could import them.

Figure 26: Las Gaviotas: Residence.
Source: Author's Photo.

Figure 27: Las Gaviotas: Water Purification Plant.
Source: Author's Photo.

The trees turned out to be a catalyst for rejuvenation of the undergrowth – leading to more vegetation. Soon the forest that used to be there thousands of years ago, which had been replaced by savanna, was coming back. They later discovered that the pine produced a resin that has nine industrial uses, ranging from chewing gum to paint.

Figure 28: Las Gaviotas: Resin Factory.
Source: Author's Photo.

They now have a resin factory. They also produce bio-diesel from a palm that is native to the area and they are planting more of these as well. This re-forestry program means they are sequestering carbon. Using their inventions and the natural filtering capabilities of the local sand, they also produce and bottle water, which is sold in Bogota and the rest of the country. Thus, they were not simply living with a small footprint; they were living a rejuvenating life. One interesting aspect of the community at Las Gaviotas is that they have been ongoing for over four decades. Second, the community is located in a very isolated rural area, and more importantly, the founders of the community chose to move into such rural isolation as an elaborate experiment. This evokes notions of More's Utopia (More, 2005).

Finally, many of the community's initial leaders were Bogota transplants; highly skilled, very well-educated dreamers, tinkerers and inventors. However, there has always been a strong participation of locals, including Indigenous people. Now, the community is on its third or fourth generation and many of them were born and raised

there. The community no longer has the feel of an experiment, but appears as a strong and vibrant, if isolated community.

Walnut Way in Milwaukee, Wisconsin, USA

Unlike the two preceding examples, the city of Milwaukee is not a sustainable ecological community as defined. Its institutional structures cannot be said to have intentionally expressed serious ecological concerns over time. Unlike Las Gaviotas, it was not founded on the principles of environmental stewardship. Unlike Curitiba, it has not had long-term concerted urban or regional planning to alleviate ecological degradation. However, this is changing and there are several entities within the city that embody this idea of sustainable ecological community. They include groups of individuals and community groups that have come together in an attempt to use natural and human resources equitably with minimal harm to the environment or to themselves.

Walnut Way exemplifies an attempt at an ecological community on a neighborhood scale. Its inhabitants banded together to reclaim their neighborhood. Their center is in a building that used to be a drug house, now restored and used as a community center. Their stated mission is to sustain their community through organizing their neighbors, improving the property and economic development in the area (Walnut Way, 1999). One important issue that they rallied around was that of food. Community and backyard gardens helped provide safe and fresh food economically, while improving the aesthetics of the houses and building community cohesion.

As such it is a great example of a concerted effort, taken as a group, to improve a neighborhood, while at the same time considering the environmental implications of those actions. Although these sorts of considerations are made routinely by planners and designers, what makes Walnut Way stand out is the community decided on its own to make and implement decisions on its own. The people in the neighborhood initiated the aforementioned considerations and committed to implement them and revisit these issues periodically. As such, the community sustains itself and its influence is gradually spreading to nearby neighborhoods in northern and western parts of Milwaukee. The people at Walnut Way are exemplars of how citizens can regain their neighborhood and part of their food security.

Limitations to the Sustainable Ecological Community Principles

The sustainable ecological community is presented as a working set of principles, in keeping with the architecture education tradition of using precedents. It is assumed that context alters the nature and emphasis of these principles. In an attempt to address global ecological crises, insisting that people living in the global south should bear greater responsibility for curbing the effects of modernity's excesses raises ethical questions. On the other hand, it is quite possible and a good idea for everyone to participate in ameliorating the effects of population growth and urbanization. More importantly, we can discourage overconsumption where possible, to avoid the missteps of the past and to prevent further ecological problems.

Ecologically Sensitive Design

> *The most significant change in architecture over the last century has been the growing dependence of homes on centralized technology infrastructures for the provision of food, fuel, water, and building materials…. One BTU in twelve of world energy production is used to heat and cool the US building stock…. On average it takes as much energy to heat and cool the US building stock for three years as it took to build it in the first place. Home furnaces are the largest sources of air pollution after automobiles…. An average house uses between 150 and 200 gallons of water per inhabitant per day…. All water used in buildings, no matter for what purpose, exits as sewage. Our water and sewage are coupled in series. We quite literally defecate in our water systems in the name of personal hygiene…. The average home produces 4.5 pounds of garbage per person per day, or anywhere from 2.5 to 5 tons per year. Fibers, plastics, paper, wood, glass, metal and food scraps are usually all thrown in the same trash bin. A lot of highly organized materials in the input channels are combined in one "noisy" exit channel and dumped; disorder or entropy is maximized.*
>
> *– Sean Wellesley-Miller*[31]

All ecological problems (with rare exceptions and regardless of their particular causes), "are unintended, unforeseen, and sometimes ironic side effects of actions arising from other intentions" (Orr, 2002, p. 13). We intend to do one thing and something else occurs. Our intentions to be prosperous and healthy inadvertently triggered a mass extinction of other species, and spread pollution throughout the world. These intentions have triggered climatic change.

These ecological crises undermine our prosperity and health. Ecological problems are the result of mismatch between our intentions and ecological results – a kind of design failure. The notion that ecological problems are design failures may be bad news

because it may mean that there inherent flaws in our perceptual and mental abilities. On the other hand, if our problems are the result of design failures, better design is the obvious solution. Better design, according to Orr, is "a closer fit between human intentions and the ecological systems where the results of our intentions are ultimately played out" (Orr, 2002, p. 14).

> *I've never seen any architecture that helps to make a better world. As a matter of fact, I think architecture creates problems rather than solves problems.*
>
> *– Peter Eisenman*[32]

Ecological design includes the technologies and strategies we use in the natural world to construct culture and meet our needs. The natural world is continually modified by human actions. Therefore, culture and ecology are variables in an unsolvable equation. There is no single correct design strategy. However, human societies need design strategies to live within the regenerative capacity of our particular ecosystem. The question is whether our strategies works ecologically and can be sustained.

As human population has grown and technology has intensified, ecological design has become more difficult. "It is simpler," he states "to define the anti-social uses of sticks and stones in the age of mastodons than of bullets and billboards in the age of motors" (Leopold, 1970, p. 238). Weaving "human presence into the natural world will reduce or intensify other problems" (Orr, 2002, p. 15). These problems include "ethnic conflicts, economics, hunger, political stability, health, and human happiness."

Humans are generally more ignorant than knowledgeable about life on earth (May, 2007, pp. 208-210) and the planet has no operating manual. Orr asserts that ecological

design in not about how to make things, but rather “about how to make things that fit gracefully over long periods of time in a particular ecological, social, and cultural context” (Orr, 2002, p. 27). When humans design with ecology in mind, according to Orr, “there is greater harmony between intentions and the particular places where those intentions are played out.”

Ecological design uses current solar income, cultural and biological diversity is preserved, larger social patterns are respected, no costs are externalized and little waste is produced. Ecological design is just about not producing “ecologically benign products for the consumer economy,” but about creating decent communities for “responsible citizens and whole people who do not confuse what they have with who they are” (Orr, 2002, p. 27).

McDonough and Braungart (2002) provide a philosophical framework for use of resources that minimizes the impacts of extraction of those resources, reconsiders how they are processed and used, while minimizing or eliminating waste. As the title of the book, Cradle to Cradle suggests, it is a rethinking of the current cradle to grave paradigm of industrial production. McDonough and Braungart offer three ways of thinking about ecological design with practical implications: First is the metaphor of the cherry tree (2002, p. 72). Second is idea the idea that waste is food (2002, p. 92). Third is the notion of separating a biological cycle from a technical cycle (2002, p. 104).

Be Like a Tree

Cause just like a tree planted - planted by the rivers of water
That bringeth forth fruits - bringeth forth fruits in due season;
Everything in life got its purpose,
Find its reason in every season,
Forever yeah
– Bob Marley[33]

McDonough and Braungart (2002, pp. 72-73) invite us to consider the cherry tree. It produces thousands of delicious fruit for birds, humans, other animals, so that "one pit might eventually fall onto the ground, take root, and grow." Looking at the ground around the blossoms in full bloom in season, one might consider it inefficient or wasteful. The cherry tree produces copious blossoms and fruit without depleting its environment. Once they fall to the ground, they decompose into nutrients that nourish microorganisms, insects, plants, animals, and soil. The tree makes more of its products then it needs for its own success in an ecosystem, its abundance enriches all and provides varied ecological services. The trees behavior was developed over millions of years of trial and error. "The tree's fecundity nourishes just about everything around it" (2002, pp. 72-73).

As it grows, the cherry tree seeks its own regenerative abundance, initiating a number of positive effects. "It produces food for animals, insects, and microorganisms. It enriches the ecosystem, sequestering carbon, producing oxygen, cleaning air and water, and creating and stabilizing soil" (McDonough & Braungart, 2002, p. 78). Multiple flora and fauna live on the tree in a symbiotic relationship. After death, the tree decomposes, releasing minerals to the soil that will fuel healthy new growth in the same

place. “The tree is not an isolated entity cut off from the systems around it: it is inextricably and productively engaged with them. This is a key difference between the growth of industrial systems as they now stand at the growth of nature” (2002, pp. 78-79).

Eco-efficient buildings are big energy savers that minimize air infiltration by prevent any leaks – including sealing the windows. The buildings reduce solar gain with dark tinted glasses, cutting the amount of fossil fuel energy by diminishing their air conditioning load. Thus the power plant can reduce their emissions, and electric bills are lowered. The building is lauded for its energy saving and environmentally conscious design. Government officials and utilities executives opine that “if all buildings were designed and built this way… businesses can do right by the environment and save money at the same time” (McDonough & Braungart, 2002, pp. 73-74).

> *Here is how we imagine the cherry tree would do it: during the daytime, light pours in. Views of the outdoors through large, untinted windows are plentiful – each of the occupants has five views from wherever he or she happens to sit. Delicious, affordable food and beverages are available employees in a cafe that opens onto a sun-filled courtyard. In the office space, each of them controls flow of fresh air and the temperature of their personal breathing zones. The windows open. The cooling system maximizes natural airflows, as in a hacienda: at night, the system flushes the building with cool evening air, bringing the temperature down and clearing the rooms of stale air and toxins. A layer of native grasses covers the building’s roof making it more attractive to songbirds and absorbing water runoff, while at the same time protecting the roof from thermal shock and ultraviolet degradation. – McDonough and Braungart*[34]

The building – as designed by McDonough and Braungart's cherry tree – is as energy-efficient as the first. However, the building is part of a broader and more complex design goal: it "celebrates a range of cultural and natural pleasures – sun, light, air, nature, even food… to enhance the lives of the people who work there." Elements of the second building cost more, because for example, operable windows are more expensive. However, a nighttime cooling strategy reduces the need for air conditioning during the day. The need for artificial lighting is reduced with abundant daylight, which along with fresh air makes for a more pleasant work space.

The pleasant space is an incentive for existing employees to stay and promotes good health, which minimizes sick days. The pleasant workplace also attracts potential employees. This is very important considering that "the carrying cost of people – recruiting, employing, and retaining them – is 100 times as great as the carrying cost of the average building. Fundamentally, the building expresses the clients and the architect's vision of a life centered community and environment" (McDonough & Braungart, 2002, p. 75).

Waste Equals Food

> *Imagination is taking the strange and making it familiar. Creativity is the opposite – taking the familiar and making it strange. – John Seely Brown*[35]

Over millennia, the Chinese system of fertilizing rice paddies with biological wastes prevented pathogens from contaminating the food chain. (King, 2004). For this reason, it is still customary in rural China for guests to return nutrients after meals. Farmers commonly pay households to fill boxes with their bodily waste. Humans are the only

species that takes nutrients from the soil for biological processes without putting them back in usable form – except for some small-scale examples at the local level. Clear-cutting precipitates soil erosion. Chemical processes in agriculture and industry often lead to salinization and acidification, which depletes soil faster than nature can replenish it. “It can take approximately five hundred years for soil to build up an inch of its rich layer of microorganisms and nutrient flows, and right now we are losing 5000 times more soil than is being made” (McDonough & Braungart, 2002, p. 97).

In preindustrial cultures, people consume things, but most products biodegraded safely when thrown away, buried, or burned. The exceptions were metals, considered highly valuable and melted down for reuse. Consumptive behaviors persisted as technology advanced, even though most manufactured goods no longer degrade. In times of scarcity, technical materials regain their value; for example, reuse of jars and aluminum foil during the Great Depression. Cheaper materials and new synthetic made it more expensive to institute and maintain local collection infrastructures than to make a new aluminum, plastic, or glass bottles. Goods, such as ovens, refrigerators, and phones that people might have passed down, repaired, or sold to junk dealers are routinely thrown away. “Throwaway products have become the norm,” because it is easier to buy a new item than to send parts back to the manufacturer or find a capable repair person (McDonough & Braungart, 2002, p. 97).

For example, it is impossible for to “consume” a car. Yet, it is made with many valuable materials, which are lost or degraded in “recycling” because cars are not designed for effective recycling of its technical nutrients after use. Instead, like many

industrial products, cars have built-in obsolescence: they are designed to last until approximately the time customers tend to replace them. Even packaging materials are designed not to break down under natural conditions, often lasting far longer than the product it protected. In places where resources scarce, people reuse materials to make new products. This is an area where there are potential lessons from the global south. The natural creativity and adaptation involved in reuse of scarce materials can be a vital part of material cycles ignored by industry (McDonough & Braungart, 2002, p. 98).

McDonough and Braungart believe that for humans to prosper, we have "to learn to imitate nature is highly effective cradle to cradle systems of nutrient flow and metabolism, in which the very concept of waste does not exist" (2002, p. 103). Eliminating the concept of waste requires designing with the understanding that waste does not exist. Hence, valuable nutrients within materials determine the design: "form follows a solution not just function. We think this is more robust prospect than the current way of making things" (2002, p. 104).

Biological and Technical Cycles

Humans interact with two discrete metabolisms on the planet. The first is biological, called the biosphere and includes the cycles of nature. The second is the technical metabolism or the "technosphere" – cycles of industry. When products and materials are designed right, they can safely feed into the two metabolisms (2002, p. 104). Products composed of biodegradable materials remain in the biological cycles, while those made from technical materials stay in closed technical cycles.

Contamination between the two cycles should be avoided to maintain the health, value and integrity of both. Mutagens, carcinogens, persistent toxins, and other substances that build up to destructive levels in natural systems, should be kept out of the biological cycle. Some biologically harmful materials may be safely handled by the technical metabolism. Biological nutrients in the technical cycle would weaken the quality of technical materials and constitute a loss to the biosphere. Their retrieval and reuse would also be made more complicated by such a mixture (McDonough & Braungart, 2002, pp. 104-105).

"A biological nutrient is a material or product that is designed to return to the biological cycle – it is literally consumed by microorganisms in the soil and by other animals" (McDonough & Braungart, 2002, p. 105). Most packaging can be composed of materials that biodegrade. Shampoo bottles, toothpaste tubes, yogurt and ice cream cartons, juice containers, and other packaging, for instance do not need to last for decades – or as is sometimes the case – centuries beyond the life of what they contained. Such packaging could be designed to decompose and used as fertilizer. Cleaning products could also be designed as biological nutrients so that when they are drained, they discharge into the waterways and support the balance of the ecosystem.

A technical nutrient is a material or product that is designed to remain in the technical cycle – to return to into the industrial metabolism which produced it (McDonough & Braungart, 2002, pp. 109-110). For example, a study plastic computer case can be continually reused as a computer case – or as some other high-quality product. Other potential uses include as a medical device or as a car part – rather than

being down-cycled into soundproof barriers and flowerpots. Component steel from discarded automobiles is recycled along with various steel alloys of other products. The metal is crushed, pressed, and processed, such that the high-quality ductile stainless steel is compromised when smelted together with various other scrap steels and materials, drastically restricting their further use. To maintain the technical cycle, material, such as plastics or metals would be processed with like materials to retain their high-quality.

In this new design paradigm, customers (no longer consumers) effectively purchase the service of a product for a defined user period rather than the product itself. When finished with a product, or ready for an upgrade to a newer version, the manufacturer will replaces the old product with the newer. Materials from the old product are reused by the manufacturer as food for new products. Manufacturers would retain ownership of their materials, while continuing to develop new services (McDonough & Braungart, 2002, pp. 111-112).

Embracing this way of interacting with products – of being customers, rather than consumers, requires a shift in mindset. It was once said that using the metaphor of the moon landing to spur action to face up to our ecological challenges is misleading. The moon landing was easy by comparison, because it required only that we put a man (or two) on the moon. And as I like to say, rocket science is easy, you are just making a piece of metal fart. In the case of the moon landing, a few major farts put you into orbit and occasional bursts propel you out of that orbit. It is not without irony that fossil fuels provided the gas.

What is required to face our ecological crises is akin to a lunar mission times 7 billion – to get all of us onto another planet, because given what we know about our impact on the planet, we must begin to consider it a different planet. However, in this case, the travel does not require rocket science. This journey requires better education, better design and a complete reorientation in our way of being in the world. Oddly, the automobile industry has begun this shift, with the examples of car leasing and car sharing.

The notion of cradle-to-cradle design heeds Aldo Leopold's admonition about intelligent tinkering (Mills S. , 2010, p. 97). Cradle-to-cradle design saves the parts – and resuses them because it understands that everyone and everything in an ecosystem is a member of a community of interrelated individuals, whose importance cannot be denied in advance. Using the philosophy of cradle-to-cradle design, designers approach the challenges of solving problems and innovation with humility borne of an acknowledgement of our ignorance of the world, as Robert May pointed out (May, 2007). Now that we have an example of ecological design in architecture, with its ethical underpinnings, what remains is how to inculcate these ideas in architects. The new ethics must also become part of the foundation of our education.

Part One – Notes

[1] (Hanich & Holtzman, Cosmos: A Spacetime Odyssey. The Lost Worlds of Planet Earth: The Origins of Planet Earth are Revealed, 2014)

[2] (McDonough & Braungart , 2013)

[3] Personal conversation with Royce Michael Earnest, also in the architecture PhD program at the same time.

[4] (Carson, 1962, p. 3)

[5] (Curry, 2006, p. 106)

[6] (UNPFII, 2007) Mick Dodson is an Australian indigenous leader and Member of the Permanent Forum

[7] (Orr, 2002, p. 13)

[8] (Weart, 2009)

[9] (Adam, 2008)

[10] (Connor, 2008)

[11] (Mills S. , 2010, p. 97)

[12] (May, 2007)

[13] (Ryerson, 2010, p. 159), (Holdren, 1973, p. 36)

[14] (Neuwirth, 2006)

[15] (Lahart, Barta, & Batson, 2008)

[16] (MacKay, 2009, p. 3)

[17] (Postel, 2010, pp. 77-78)

[18] (Jackson, 2010, p. 132)

[19] A BTU is the amount of heat required to raise the temperature of 1 pound (0.454 kg) of liquid water by 1 °F (0.56 °C) at a constant pressure of one atmosphere.

[20] (Van der Ryn, 1999, p. 9)

[21] (McDonough & Braungart, 2002, p. 104)

[22] From “I Shot the Sheriff”

[23] Carrying capacity is the maximum permanently supportable load. Cornucopian myth is the euphoric belief in limitless resources. Drawdown is stealing resources from the future. Cargoism is the belief that technology will always save us from the problems created by previous technological advances. Overshoot is growth beyond an areas carrying capacity, leading to Crash – die off (Catton, 1982).

[24] (McHarg, 1969, p. 34)

[25] (Meditations)

[26] (McEwen, 2003)

[27] (Ingersoll, 1996)

[28] (Taylor & Levine, 2011)

[29] (Berlin, 1969, pp. lv-lvi)

[30] The nagging question is how do they deliver the food in the same vehicles that take away trash?

[31] (Van der Ryn & Cowan, 2007, pp. 23-24)

[32] (Douglas, 2010)

[33] From “Forever Loving Jah”

[34] (McDonough & Braungart, 2002, pp. 73-74)

[35] (Brown, 2011)

PART TWO – PEDAGOGY: THE ROLE OF EDUCATION

Computers are useless. They can only give you answers. – Pablo Picasso[36]

In early of 2014, with the frost from a long winter on the high windows of a very old building at a Wisconsin university, a meeting was convened for academics with "interest in Africa." Present at the table were experts in various fields ranging from nursing to information systems, from history to education. The meeting was prompted by a recent visit to the university by a former Nigerian president. Many had misgivings on ethical grounds. For instance, there were mumblings about a new Nigerian law that made homosexuality a crime punishable by the death penalty. There were also some grumblings about the shady sources of the funds to the former president's institutes, with whom these academics would ostensibly be working. At the meeting, however, none of these issues were discussed. There were two items that were presented by tow attendees. One individual delivered a long and carefully-worded explanation about making sure to properly serve the university's research interests. Another individual presented an even longer, and not so carefully-worded speech about making sure that any potential funding did not interfere with the current work of the academics, nor should it interfere with any work they decided to do for this project – should any such work materialize after the meeting.

The former head of state visited to initiate academic collaboration between the university and his foundation. His main stated interests were in cultural exchange and improvements in education, in Nigeria specifically and Africa more broadly. However,

these issues were not discussed, nor were any questions raised as to whether these were important or valid issues of discussion. Other potential issues, that the various experts may have thought were germane were not discussed either. Essentially, the concerns discussed were about maintaining academic integrity and disciplinary values. The interest in the issues raised by the president and the potential issues that the various contexts that Nigeria or Africa could afford were considered to be relevant insofar as they can be formulated in ways intrinsic to the disciplines (Orr, 1992, p. 164).

The challenges posed by these two individuals had the immediate effect of shutting down the discourse. As such, a historian who specializes in West Africa never contributed to the discussion: nor did an education expert in vocational training interested in the possibilities of entrepreneurial and professional curriculum. Also silenced was a nurse who had led numerous study abroad trips to East Africa delivering much-needed health care, while students acquired field experience. The world view espoused by the two who monopolized the conversation is indicative of an educational philosophy of disciplinary initiation. Advocates of this philosophy, often point to the tradition that pervades that particular discipline. Most contend that the worthiness of a given discipline is in how it has evolved over time by its practitioners, who as a group, thoroughly and thoughtfully, “built up, challenged, revised and built up again the underlying cognitive structures and knowledge base” of that discipline (Hutchinson, 2004, p. 30). This approach seems to shun collaboration. It is fragmentary – at a time when holistic approaches are necessary.

This fragmentary approach, allows many voices to be heard, but denudes all voices of any import (Dutton & Mann, 1996, pp. 9-10). A key aspect of the postmodern condition is the disconnection from place (Orr, 1992, p. 102). Contemporary humans "reside" but do not "inhabit" the places where they find themselves. As such their knowledge of place is nearly nonexistent (Orr, 1992, p. 137). The pedagogy to address ecological devastation and social justice issues is necessarily manifold – drawing from multiple pedagogical approaches. The pedagogical approach needs to be conscious of specific contexts, instilling "an applied ethical sense toward habitat." The approach must be place-based – paying attention to the qualities of those contexts (Orr, 1992, p. 131).

Basic ecological literacy is required – for anyone living on the planet, but more so for those who engage in altering the planet (Orr, 1992), (Hutchinson, 2004). An intricate study of place is part of a study of its interrelationships with other places – as well as its position as a context within other contexts at larger scales, as mentioned in the discussion of ecological sustainability (Orr, 1992, p. 24). By thinking about ethics, one can attempt a more meaningful discussion of sustainability. Such ethical discussions of our place on the planet and our relations to ecosystems generate appropriate pedagogies for teaching these issues. It is in the very delving into the issues at stake at various scales that we determine what is important and from whence content is derived. This is particularly important for designers.

These pedagogies would necessarily embrace concepts found in Cultural Studies, which provide avenues for interrogating societal structures and cultural processes (Turner, 2003, pp. 9-32), given the postmodern condition as discussed earlier. For

instance, inequities that exist between people in different contexts can be critiqued – especially how assumed normative behaviors and institutions privilege certain groups or places over others. This would lead to a vibrant pedagogy that respects local knowledge, and accepts that local solutions can be implemented more readily and effectively than imported ones (Gandy, 2002).

In such a pedagogical approach, it would be understood that the consequences of local behavior have global effects. Designers do not only study a context and leave it as it is. By definition, they alter the environment they encounter. Critical Pedagogy is a constructivist approach to learning that uses education as a vehicle for social justice. The learner-centered pedagogy is a Critical Pedagogy that also reorients the power dynamic of the teacher-student relationship, attempting to level the hierarchical structure that relationship. Such an understanding could present challenges but could also be empowering.

Immersion and experiential learning seemed obvious pedagogic approaches to engage the design students with problems of social and ecological dimensions. Hence, the Cape Verde project began with a study abroad component. However, this learning component required developing a set of guiding frameworks. One such framework was the idea that we are constantly learning – the concept of Situated Practice.

This framework stipulates that learning is fundamentally a social process that does not just exist in the head of a learner. It is viewed as situated activity, where even peripheral participation is seen as a legitimate and the central defining characteristic of learning. Proponents of this framework contend that every individual participates

among others engaged in similar activities towards full participation in the socio-cultural practices of a community (Lave & Wenger, 1991). Another framework for experiential learning, the Kolb model (Kolb, 1984), provided a rigorous way to apply these ideas in a learning institution.

Broadly, the study abroad is immersion – an interaction with real events (as against a contrivance provided by a teacher), called a concrete experience in the Kolb model. The Cape Verde project included reflections in the form of journals, kept during the study abroad and measurements of resource flows. The students then wrote summarizing papers based on those journal entries and collected data, in which they applied known theories and speculated on the circumstances or implications of their experience – they engaged in abstract conceptualization. This lead to contemplating ways to alter the reality; that is, active experimentation – carried out mainly in the design studio. This process could be iterated several times, increasing the level of engagement.

Chapter 4 – The Architect and the Design School

> *[Architecture education is] one of the best systems of learning and personal development conceived. I would hate to us abandon a system with so many wonderful qualities and successes for the sake of some 'bold experiment in education.' – An Architecture Educator*[37]

The architect was essentially anonymous in Middle Ages Europe (Stevens, 1998, p. 19). All accolades were attributed to patrons of buildings until the Renaissance when architects began to gain notoriety. The field became more academic under French Monarchs in the late 17th century. This tradition was carried into the present by the École des Beaux-Arts. This model of architectural training is elitist and the segregation begins before the students arrive at architecture school.

The ethos of a profession is born in school, where common language and tacit knowledge that distinguish the profession is defined, including differentiation from non-professionals, to create a subculture (Larson M. S., 1977, p. 45). In this view, "tacit knowledge – the unspoken assumptions, interpretations, expectations, and conventions – may be more important to learn than explicit knowledge or skills" (Cuff, 1991, p. 43). This tacit knowledge is fundamental to a professional ethos. It affects theory espoused by the professional and its use.

A review of earlier studies showed little correlation between success in professional school and success in practice (Hoyt, 1965). However, more recent studies show success in college to be more predictive of better salaries (one of the things considered earlier by Hoyt), in the first few years after graduation (Jones & Jackson, 1990). It is not clear whether this is causative or that colleges are more competitive, as such predictive of

successful people. Hoyt concluded that “the primary role of the professional school may be socialization, not training.”

Cuff indicates that students learn “the roles, values, vocabulary, assumptions, and set of reasonable expectations appropriate to the subculture” of the profession. This still does not address why some successfully socialized students are not successful in practice. She suggests that this is due to “the general mismatch between the ethos of professional ideas and values (emphasized in schools) and the circumstances of professional work” (Cuff, 1991, pp. 44-45). This mismatch is not unique to architects and manifests during professional practice. It is quite common for cults and cult-like groups to experience disruptions in periods of transition (Armstrong, 2000, p. xvi).

Such groups sit on the fence between mythos and logos. Armstrong asserts that the global transition occurring at the dawn of the twenty-first century, has its roots in the sixteenth and seventeenth centuries, when people in Western Europe began to evolve a different kind of society. This new society was based not on an agricultural surplus but on a technology that enabled indefinite production of resources. In the subsequent centuries, along with these technological advances and economic growth, there have been immense social, political, and intellectual revolutions. Hence, a completely different concept of the nature of truth has developed – one that is scientific and rational. There are many consequences from this. One is the dearth of myth in modern society.

Much of the sense of mythos has been lost in the West, while logos has become dominant, which may explain the architect’s desire to evoke mythos. Of course this is

complicated by the increasingly complex nature of buildings and other products of architecture. Logos is practical and forward looking, unlike myth, which looks back to the beginnings and to the foundations. Logos forges ahead and tries to find something new: to elaborate on old insights, achieve a greater control over our environment, discover something fresh, and invent something novel. In the pre-modern world, both mythos and logos were regarded as indispensable. The architect, it seems, resides in the pre-modern, and sits on that fence between mythos and logos.

Architecture too often misses the opportunity to engage in real day-to-day issues – drawing much of its clientele from the well-to-do and reserving their expertise for high-end residences and large-scale institutional projects. While it is difficult to determine what percentage of buildings are designed by architects or what their real impact is on the built environment (LaBarre, 2008), it is clear that architects are far removed from people without much wealth. Like other endeavors involved in culture generation, architecture has been and continues to be the province of upper and upper middle classes. An examination of biographical data indicates that family advantage, schools and social connections are important for success of architects (Williamson, 1991, p. 4).

Family connections and well-heeled classmates at ivy-league schools are pivotal for gaining commissions. However, the segregation begins prior architecture school. Making a Bourdieusian argument, Stevens (1998, p. 44) asserts that culture does not purport to obliterate class by preventing the recognition of class. Rather, it legitimates class as “a system of class symbols that reveal one’s class position at every turn.” Stevens (p. 190) found a high proportion of private school students among entrants to University of

Sydney's architecture school with similar proportions in the UK.[38] Thus, the class difference does not manifest in passing university courses but in the entrance rates – lower income students simply were not applying to architecture programs. Many architecture schools and firms have made a commitment to "diversity." However, those efforts have not translated yet – for instance, black women only accounted for 0.2% of licensed architects in 2007 (McCann, 2007). This may be due to several factors, such as black women and other such groups lacking easy access to mentor-pupil relationships. Regardless, apart from Asians, other minorities are under-represented in the profession (Cuff, 1991, p. 8), (Dixon, 1994).

The Boyer Report, on the other hand, found the architecture academy to be rich in diversity (Boyer & Mitgang, 1996, pp. 49-52). The report found different types of architecture programs with diverse philosophies, missions and scholarly approaches. Yet, the authors were concerned "by a tendency to imitate the most prestigious and wealthiest research institutions" (Boyer & Mitgang, 1996, p. 53). According to Cuff, architecture accepts a multiplicity of theories, but as Stevens points out, architecture schools teach and transmit a single culture, that of the dominant classes. Excellence and achievement is defined in terms of that culture, and thus, "the educational system of necessity favors those who have already been inculcated from birth, those for whom the dominant culture is as natural, familiar, and easy as walking" (Stevens, 1998). The promulgation of this singular culture is exacerbated by the implicit assumption that students are broadly homogeneous, which ignores the differences in experiences and circumstances that students bring. For instance, a student who grew up with family

stories of college days is very different from a student who was not raised similarly and therefore does not know what to expect.

Finally, Cuff comments on the loss of design as negotiation between important aspects such as the desire for pleasing aesthetics and the needs of the client and other such dualities (Cuff, 1991, pp. 10-11). Cuff elucidates several dilemmas such as those between the individual and the collective, art against management, and one generalist versus several specialists. Of greatest interest in this work is a fourth concern, which is the dialectic between "design as decision making versus design as making sense of a situation." Cuff perceives an imbalance in the profession and proposes bringing these dualities back into tension. This imbalance also begins in the design schools.

The Boyer Report

In a seminal report (Boyer & Mitgang, 1996), delivered to the American Institute of Architects convention in Minneapolis, Mitgang outlined a direction for architecture education and practice that addressed the imminent challenges faced by the architecture profession. The independent study, commonly called "The Boyer Report" in honor of Ernest Boyer, was commissioned by the American Institute of Architecture Students (AIAS), the National Conference of Architectural Registration Boards (NCARB), the National Architectural Accrediting Board (NAAB), and the Association of Collegiate Schools of Architecture (ACSA). The final document was structured in seven essential goals.

An Enriched Mission

Schools of architecture were urged to embrace the education of future practitioners as their primary objectives. Such practitioners should promote the value of beauty in society. Their training should include the clear and convincing communication of the value of beauty to the public – not just to the rarified few, such as architects and elite clients. They should be dedicated to the rebirth and preservation of cities and build for human needs and happiness. Their training should prepare them to create "healthier, more environmentally sustainable architecture that respects precious resources" (Boyer & Mitgang, 1996, pp. 27, 35).

Boyer and Mitgang stress that more frequent contact with clients and community members should be inculcated into curriculum and design problems posed to students, including a greater emphasis on how the built environment affects people. Furthermore, they recommend that preservation and renovation be given equal footing as is given to new creations. They also call for greater understanding among practitioners and students of the ecological consequences of the construction, use and disposal of buildings.

Diversity with Dignity

At the same time the Boyer Report supports "a landscape of architecture programs in which the multiple missions of schools are celebrated, and the varied talents of architecture faculty are supported." What all such programs would have in common is a rewarding "scholarly climate that encourages excellence in research, teaching, the application of knowledge, and the integration of learning" (p. 27). They contend that the

extant multiplicity of design philosophies, present across architecture programs, is an asset for the profession, and therefore, should be preserved (p. 49). They recommend improving the teaching skills of instructors, at all levels of experience and supporting greater interaction "among practicing architects, teachers, and university administrators about the special goals and strengths of architecture education" (p. 62).

Standards without Standardization

This set of goals are somewhat murky – not that the sentiment is not well-placed, but it is one of those things that is difficult to communicate. It is not clear what they mean when they say that standards should "affirm the rich diversity among architecture programs, establish a more coherent set of expectations at all schools" (p. 27). There seems an inherent contradiction here. This is worsened by the assertion that such standards "would support professional preparation, and bring into closer harmony the scholarly activities of students and faculty." This is a curious recommendation given their concern, echoed by others that many faculty members harbor design concerns and use arcane language that is confusing to students – such qualities that are often irrelevant to practice (Cuff, 1991) (Stevens, 1998).

On the other hand, they encourage greater time for electives and liberal studies – to broaden the students' knowledge of building technology and performance as well as broader issues in society and other cultures (Boyer & Mitgang, 1996, p. 67). They also recommend improving writing skills (p. 68) and better disclosure of accreditation materials (p. 72). The important thing about this recommendation is the call to provide students with basic skills for communicating in future practice, better technical skills

with regard to how buildings work and operating computer software, fundamental knowledge of environment and aesthetics, and finally how to synthesize such knowledge into actual built form.

A Connected Curriculum

The report urges schools to provide a connected curriculum. Such content would "encourage the integration, application and discovery of knowledge within and outside the architecture discipline," and make effective connections between architectural knowledge and its evolving stakeholders; practitioners, clients, community members and the whole society (p. 27). The report points out that students entering from secondary schools were particularly in need of a liberal architecture education. "Making the connections, both within the architecture curriculum and between architecture and other disciplines on campus, is, we believe, the single most important challenge confronting architectural programs" (p. 85).

The report also considers communication skills to be paramount, in order to provide practitioners the ability to speak and write clearly if they are "to assume leadership in the social, political, and economic arenas where key decisions about the built environment are being made" (p. 80). And although the authors encouraged a proper understanding of codes elsewhere in the report, they allow occasions for students, particularly in the early years, to be "freed from the constraints of budgets, codes, or clients" so as to "discover and dwell on the art of architecture" (p. 87). However, they maintain that upon graduation, students should be able, "in a single piece of design work," to integrate and synthesize "what they have learned in the professional degree

program and express their design concepts clearly, orally, in writing, and in two- and three-dimensional representations" (p. 89).

Climate for Learning

The report calls for a more supportive climate for learning. In an "open, just, communicative and caring" environment, students, staff and faculty share common goals. One critical change they suggest is in the evaluation of design projects. The adversarial, and sometimes hostile, mood during critiques was decried, even as they extolled the virtue of having peers, teachers and practitioners coming together to discuss design ideas (p. 95). Schools were urged to find ways to encourage more peer participation in these reviews. Furthermore, they lamented the social isolation of architecture students (p. 105), from other students and from society at large.

A Unified Profession

The report urges prioritizing sustained interaction between the academy and the profession to strengthen the students' education. Key to this is the creation of robust internship for recent graduates and continuing education for practitioners (p. 27). It also includes getting professionals more involved in school activities, as well as in determining curriculum priorities (p. 113). They also recommend that firms invite faculty members to their offices to exchange ideas (p. 113) and provide students with internship opportunities prior to graduation (p. 120).

Service to the Nation

The report calls on schools to encourage greater civic engagement among students – so that they may carry on this tradition in their professional lives. “Students and faculty alike should regard civic activism as an essential part of scholarship” (p. 133); faculty members are encouraged to model the best professional and ethical ideals for the students (p. 134). As such, the authors assert, they would instill values that better prepare students to be champions “for the beauty, utility, and ecological soundness of the built environment” (p. 136). This last goal is framed as a call for renewal. In light of the current ecological crises and other global issues that young people face, this one seems somewhat parochial: calling on architects to be more nationalistic while ecological and social issues seem to ignore political boundaries. However, the renewal of a citizenship ethos in the face of mass consumerism may be apropos.

One of the report’s priorities is preserving the planet (p. 43) and is grouped with the encouragement to build for urban spaces (p. 40). This underscores the connection between ecological stewardship and urbanization. While the report raises concerns about the conditions of urban areas and the effects of the built environment on people, as well as how urban areas affect the environment, the deleterious effects of increased consumption are ignored.

The report does not foresee the accelerated influences of global warming, reflecting perhaps, that architecture academics and practitioners were no sufficiently concerned with global ecological issues at the time of the report. The report’s view of the pivotal role that designers play is not extended to those impacts. On the other hand, the report

emphasizes and reiterates the need for expanded curriculum and greater integration with other course areas, such as liberal arts, as well as a greater understanding of other cultures, hitherto underserved by architects. The current ecological concerns call for adequate ecological literacy – a good understanding of place and the sources of the resources upon which we depend in that given place. This can be a springboard to understanding other places.

The opposite is also true – knowledge of another place, by contrast enriches knowledge of the place where one inhabits. Such knowledge comes from understanding the scale of impacts from resource use, as well as from the knowledge of interactions that occur in the commerce of daily life. Such issues are of particular relevance to the architects since the products of their labor (buildings) are resource intensive in all phases of the buildings' life; extraction of materials and resources, use or reuse for construction, occupancy and demolition/disposal or deconstruction for reuse. Such broad knowledge and awareness requires, as Boyer and Mitgang assert, a more robust liberal architecture education (Boyer & Mitgang, p. 85).

The Boyer Report was one among many reports that attempted to describe the state of architecture education, and like some of the other reports, it provided recommendations for improvement. These recommendations were presented above. What was unique about it was that all five organizations associated with architecture practice and education in the United States co-sponsored the report and it was not ignored by these associations. However, it is not clear to what extent their

recommendations were followed. The answer to that question would make an excellent area for further research.

The State of Design Education

> *The world needs more scholars and practitioners not only educated to prosper in their own careers but also prepared to fulfill social and civic obligations through the genius of design. – Boyer and Mitgang*[39]

One of the most salient recommendations of the Boyer report was not in fact one of their own. Rather, it was an endorsement of a recommendation from the Princeton Report (Boyer & Mitgang, 1996, p. 21), (Geddes & Spring, 1967, p. 4). The Princeton Report proposed three goals for architecture education:

1. Helping students develop competence to work within the realities of actual practice.
2. Preparing graduates to be adaptable enough to grasp, and work within "the continuing changes in social, economic, scientific and technological setting of our society."
3. Preparing students to develop their own analytical framework in which to envision a better society and built environment, "beyond present day constraints."
4. The Princeton Report stressed the need for better understanding of architecture and the built environment among non-architects.

To realize these goals, the authors of the Princeton Report "stressed the importance of ending the isolation of the architectural discipline" (Boyer & Mitgang, 1996, p. 21).

Design schools may be particularly challenged because architecture is a discipline which straddles many disciplines. However, architects do not perform much original

research on a wide basis the way other disciplines and professions do (Addington, 2013). Even though it does not generate much of its own research, it uses that developed from a wide range of fields and disciplines. These include sociology, psychology, urban planning and geography, physics and engineering, art and culture, among others. One could argue that architects do a lot of research in multiple areas, delving into whatever areas they think are relevant to any given project.

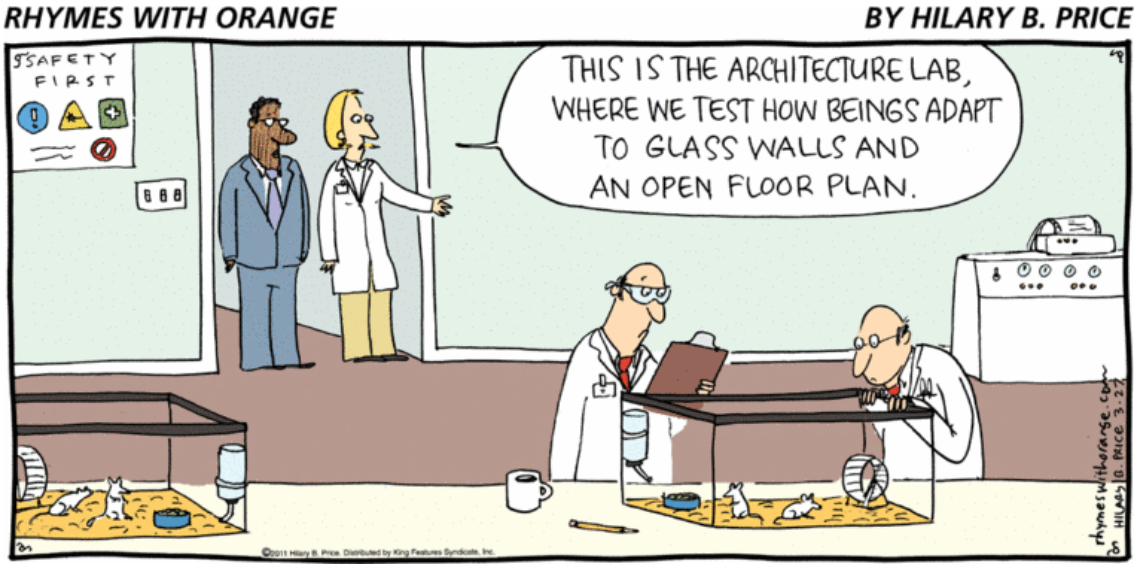


Figure 1: Rhymes with Orange: Architecture Lab.
Source: (Price, 2011).

So practitioners and students alike, investigate topics related to whatever program is at hand. If the project is a music hall, they may want to know more about that type of music by listening and observing a performance or delving into its history. They may attempt to learn the physics of sound and acoustical engineering. They may measure existing similar buildings and try to gauge their success in various aspects.

The MIT Study, which the Boyer Report (p. 23) also cites, illustrated the many ways that the design studio influences the attitudes of the architecture professional (Porter & Kilbridge, 1981, pp. 293-294, 326). In the study, many architects reported that “their

schools shortchanged them in nondesign topics." The topics the architects enumerated included management skills, how to interact with people, and "how buildings actually get built." None of the respondents in the study felt that they were shortchanged in their design training (p. 683).

The Design Studio

> *Our training in problem solving, organization, idea generation and expression provides us with almost infinitely adaptable skills. Yet the public perception of the field is one of abstraction and elitism. – An Architecture School Graduate*[40]

One of the important findings of the MIT Study was the extent to which "design education can shape attitudes about clients, users of buildings, and even fellow architects." Design students often held negative views of architects and clients, considering the former to be egotistical, elitist, insecure and indecisive. While some students intended to cooperate with clients, some felt the clients needed to be "educated," while others wished the clients could be "eliminated." Some students decided that their approach would be to deceive the client into thinking their wishes were followed (pp. 300-307).

Design education is very complex. Although there are many facets to design education, the design studio is paramount. On average, the design studio constitutes about 70% of the architecture student's credits and the average student devotes 90% of his or her time to studio work (Cuff, 1991, p. 65), (Polshek, 1981). The design studio is where the traditions and aesthetics handed down through generations are passed on – a form of disciplinary initiation (Hutchinson, 2004, p. 28). It is a venue where students

are seriously enculturated with the habits and ethos of design practice, or more importantly its mythos. The language, the attitudes and fundamental skills of an architect are developed in the studio. It is the context for building camaraderie among the students – but only with other architecture students. It involves a good deal of social isolation from other disciplines and from society. The students learn to accept complexity in problems, iterative exploration and ambiguity in solutions. Thus, the design studio provides an ideal context to encourage the aforementioned engagement – because so much time and energy is invested there and it is a readymade context for exploration. Unfortunately, the opportunity that the studio affords is often squandered.

> *It is indeed ironic that throughout the term, design instructors encourage their students to be creative, go out on a limb, take a risk – and then when it's all over most of the same instructors rely on the same technique they've been using for years. – Kathryn Anthony*[41]

The actual conditions of the design practitioner are neither included in issues seriously considered by schools, nor in their belief system. It is as though the field of the design studio, operating within the field of architecture, has very little overlap with the field of architectural practice. Due to the extensive socialization, the habitus that the practitioner operates with is substantially determined by that training (Bourdieu, 1977, pp. 77-78). Yet, the practitioner operates in a different field with different structures – structures that are treated as non-existent or irrelevant in the prior field.

The first structural aspect in this complicated field is the tendency for design studio education to be heavily dependent on precedent study. This involves looking at and learning from previous examples of work that addressed similar design problems (by a

specific canonical set of designers), and then experimenting with different ways of repeating the experience of those precedents, without overtly copying them (Stevens, 1998). Thus, the design challenge is not to find a perfect, or even a good solution, but rather, to repeat or evoke similar experiences from an existing work. This is often pursued in spite of the belief that the specific precedent is flawed in some way (Runcie, 1997).

The pursuit of those supposed past experiences from precedents, allows the practitioner to avoid facing impending changes in technology, demographics and so on: it is a kind of willful ignorance. During training for any complex field, tasks are often divided into simpler components. Many aspects of practice are difficult to simulate, in part due to the constant change, but such aspects are deemed pedagogically undesirable (Cuff, 1991, pp. 90-91).

While practice by nature, involves a full range of issues with ambiguous, complex situations that undergo continuous change, students face narrowly defined design problems, either by selective focus or schematic treatment. The student is typically completely unaware of such messy realities that the professional has to contend with. Issues such as mid-project changes, information learned during the process, cuts to the budget, or any kind of budgetary issue are rarely dealt with in studio. Nor are conflicts of interest or disagreements between parties part of the picture.

In studio there are no ambiguous roles: rarely are there any clients, consultants, planning commissions, users, neighbors or code issues to contend with. In design school, uncertainty about the problems and process are removed. Design challenges are

determined due to the potential for addressing important design questions. Suitable sites are selected for this purpose and a reasonable program is created and given to the students. The process is typically simplified in a linear fashion; one problem is solved at a time. The student works alone with intermittent feedback from a more experienced designer. A schedule is determined without regard to any empiricism – as are the expected outcomes, including level of detail and degree of completion. “It is not surprising that young professionals are frustrated by the circumstances surrounding architectural commissions and by the high degree of uncertainty they find in practice” (Cuff, 1991, pp. 90-91). As such, design education is divorced from architecture practice; concerned with abstract concepts that have little or no bearing to the real problems of the built environment, which design professionals by definition have to contend with.

In school the design challenges are “typically simple and unambiguous,” and “rarely threatened by pragmatic considerations.” This follows in the ethos that esteems individuals at the expense of the collective. That is not to say that these concerns are irrelevant. However, they are often addressed, in discourse and in design, in highly rarified language that is opaque to the non-practitioner (Rybczynski, 2011), (Porter T. , 2004). Often that ethos no longer responds effectively to everyday problems – problems that the product of architecture must address (Cuff, 1991, p. 21).

So as the practitioner moves away from the ideal of professionalism presented in architecture school, the more valuable that ideal becomes for retaining the social contract with the profession. That is to say, the further way from the architect’s reality the ideal is, the more he needs to cling to it. All the while, the world is moving along

with increased complexity – with more diverse culture, accelerated schedules, flexible and fragmented scope, as well as greater financial oversight, including reduced compensation.

The dominance of contemporary Western traditions on design education around the world has normalized a particular set of standards, even as cultural norms persist. And while design practice varies greatly according to climatic region, cultural habits or social status, design education is often inattentive to such contextual differences. As stated, the educational setting is designed to make the students cliquish, segregating them from non-architecture students, and this trait is maintained by professionals.

There are many aspects of design education that foster this cliquish behavior, including the design studio structure, the encouraged habits, the nature of the design problems posed, and how those problems are de-contextualized. Students also become very competitive and are predisposed to accept somewhat vicious critiques of their work. At the same time, the students develop a personal attachment to their work, because they learn early to consider their work as artistic expression. While students are encouraged to formulate the terms by which their work is to be evaluated, yet the work is viewed (and evaluated) on artistic merit based on historically pre-determined guidelines. Such guidelines are often divorced from the reality faced by the students or any actual people.

However, the studio system encourages camaraderie among the students, imbuing them with a strong work ethic – the bright side of heavy acculturation. Those who survive develop a design sensibility. They internalize the idea that problems are not

obstacles. Rather, they are limiting constraints. Although this may be hubristic, it does encourage creativity. Cuff presents the studio, the critique, the charrette and the competition as the four most critical aspects of design education (Cuff, 1991, pp. 118-128).

The first three of these were used in the Cape Verde project, wherein these three staples of architecture education were used in the service of addressing current issues. The emphasis in architecture school on competition, while a useful tool, is at the expense of the cooperative. Rarely are student "encouraged to work in groups on design problems explicitly intended to help them learn about the social construction of architecture, about collaboration skills, mutual satisfaction, and the like" (p. 45). The training and evaluation of would-be architects is "based almost entirely on the finished products of single individuals." Thus, the Cape Verde project rejected the competitive in favor of a cooperative ethic.

Hutchinson (2004, pp. 23-48) theorizes about the importance of place in education. In his formulation, the way the learning context is used is equally as important as where it is. He presents six philosophical orientations in teaching and discusses their relevance to place. He asserts that providing educational places that instill "solid understanding of major disciplinary traditions" and the "knowledge of and appreciation of the home country," which are the root metaphors for two of the philosophies; Disciplinary Initiation and Citizenry Education. However, he claims that Inquiry Learning has great potential to attend to individuals, including their learning styles, aptitudes and interests, while Development Congruency is particularly interested in the students' personal

development. Community Study contextualizes what is learned and nurtures an appreciation of communal spirit. Global Education is designed to "empower students to respond effectively to social and environmental challenges."

All six approaches have limitations, advantages and ethical implications, which invite critical engagement. They operate on different scales, all of which are important for meaningful learning to occur. Although Hutchinson presents possible conflicts that can arise between these six orientations, he holds out the possibility of "teaching across the philosophies." It is by attending to these different ways of orienting that design education can be further engaged in contemporary issues. The MIT Study (Porter & Kilbridge, 1981, pp. 733-734) reported that many architects were not sanguine about the architecture professions future prospects, with some referring to the field as "a dinosaur doomed to extinction."

> *One in four felt the profession was clinging to an obsolete model of the architect's role…. A similar number felt that the profession did not know how to convince others of the architect's value. One-fifth of the architects suggested that the profession was dying, and an equal number felt that society undervalued architects…. There were few optimistic predictions although some predicted that architects would broaden their functions by involving themselves in planning, land use, development, and energy-efficient design….*
>
> *– Porter and Kilbridge*[42]

Outliers

> *While architects were previously lambasted for being too demonstrative, authoritative, and naively utopian in their aspiration to effect social transformation through architecture, the contemporary moment is disquieting for the opposite reason: resigned abandonment of social concern in the bid for professional status and individual recognitions. – Darrel Crilley*[43]

The world is in constant change. As such, it seems normal that the practice of architecture will attempt to keep up and undergoes changes as well. It makes the already difficult prospect of preparing the next generation of designers an even more daunting challenge. It is also not surprising that in architecture programs around the country, there are experiments that attempt different approaches to design education. Students and faculty alike are taking the initiative to do things differently. In many cases, they are taking the tried didactic tools, the design competition, the charrette, the critique and the studio to move in unconventional directions.

Of great interest is when such tools are applied to practical challenges faced by real people – especially when the element of collaboration is introduced. What is most useful about these outliers is that they improve the opportunity for creativity among students – as John Seely Brown has said; taking familiar and available resources to make interesting innovations: making the familiar strange (Brown, 2011). This is true whether they consider their work is for artistic purposes, to solve more tangible problems or engage the human spirit.

An isolated studio is adequate (and perhaps helpful), to a highly imaginative individual. However, because it does not present the student with many strange or

unfamiliar experiences or objects, it does not encourage imagination: making the strange familiar. This sacrifices whole areas of innovation. A hallmark of many of the outliers is that they engage students in community participation where they can experience such unfamiliar contexts.

Yestermorrow

One exemplar of outliers that are germane to this thesis is Yestermorrow, a back-to-land, do-it-yourself school begun by gregarious communitarians in Vermont. There are a few design/build schools that have flowered around the world. Many of them seem to be architecture school equivalents of Outsider Art, which is now becoming more accepted among art élites (Altschul, 2013), (Sooke, 2013) – except they are devoted to outsider architecture.

Architecture, unlike other forms of artistic expression typically requires a high level of technical skill and much more labor to develop a solution. Hence, such schools pay close attention to technical skill. Yestermorrow, in particular, positions itself as bridging a perceived gap between contemporary builders and architects (Yestermorrow, 2013). They are also very interested in ecological stewardship. This is manifest in the coursework and the construction techniques that they teach, as well as in the choice of materials and design strategies that they encourage their students to investigate (Racusin & McArleton, 2012).

Studio at Large

Studio at Large is an outlier that is very integral to an architecture program in a university. However, their mission is “to promote social and material sustainability in

marginalized communities throughout the world" (Palleroni & Merkelbach, 2004, p. xi). Like all the outliers of interest here, students in the Studio at Large program learn by doing. The program is geared towards serving students with specific interest areas; ecological social design, global outreach and service in marginalized communities. Increasingly, students across disciplines come with these sorts of interests. The students in this program have reported being more reflective when they undertake the programs that take them abroad. It changes their views of architecture and of practice, as well as the way they see themselves as citizens of the world.

Rural Studio

The Rural Studio is a program of Auburn University in southwestern Alabama and is often called the "Redneck Taliesin" (Dean & Hursley, 2005, p. 7). Like Frank Lloyd Wright before him, Samuel Mockbee founded this renowned design/build program. Both men were "charismatic teachers who pried open the minds of their students with evocative stories and practical lessons instead of dry theory." Wright claimed that Taliesin had "simply shaken itself out of my sleeve." Mockbee proclaimed to his students; "Screw the theory; choose the more beautiful."

However, Wright was a proper egotist who envisioned "himself as the embodiment of the Welsh magician and bard, Taliesin and gathered apprentices in rural Wisconsin for his own greater good." Mockbee, by all accounts was humble and unassuming, and more interested in serving others. These characterizations and differences between these two also convey the contrasts between the norm in architecture education and these outliers.

Wright was domineering, while Mockbee applied a light touch, cautioning students that goodness was more important than greatness, compassion more essential than passion. Wright was the elegant, autocratic Mr. Wright. Mockbee was an egalitarian and a populist who preferred being called "Sambo." You would find the bearish, bearded, sixth-generation Mississippian driving around Hale County, the Rural Studio's home, in a beat-up red pickup, wearing old clothes and an Auburn University baseball cap. He viewed himself as an iconoclast and a subversive. The same, of course, was true of Wright.

– Dean and Hursley[44]

Chapter 5 – A Different Framework for Design Education

> *Richard Meier, my professor, kept coming over to my desk and saying 'Bill, you've got to understand. Solar energy has nothing to do with architecture.'*
>
> *– Bill McDonough*[45]

What is so remarkable about the aforementioned outliers is not that they are ecologically sensitive or socially responsive. What is interesting is that they are those things for strong ethical and aesthetic reasons. For these educators, to varying degrees, the distinction between aesthetics and ethics seems superficial. In this view beauty is not a social construction that is determined as a referent of established norms and tastes, nor is it about bucking trends and pushing envelopes. Rather it is assumed to be a basic human need and integral to the ecology.

The human response to beauty is tied to nature and instinctual – possibly related to evolutionary predispositions, because as Denis Dutton (2010) claims, certain aesthetic pleasures defy culture. Furthermore, such responses bypass the more analytical parts of the brain; we usually respond before we think about our response (Seymour, 2011). Therefore, it is not the case that making ethical considerations for ecology, society and economy will come at the expense of aesthetics. Rather, the response to the ecological, social and cultural impulses can result in a better aesthetic. Furthermore, if designers have a better understanding of all those impulses, ecological, cultural and aesthetic, as well as a clear knowledge of place, then their work will be more robust.

Ecological Literacy

> *One of the penalties of an ecological education is one lives alone in a world of wounds. – Aldo Leopold*[46]

Before the advent of the Industrial Revolution and cheap oil, most people lived in ways that were of necessity connected to place. They knew the sources for their energy, food, water and raw materials. They knew where their wastes went after those materials and resources were spent. With cheap fuel and the introduction of large centralized institutions as described by McKnight and Block (2010, p. 7), resources could be transported long distances and waste can be carted "away" (McDonough & Braungart, 2002, p. 27).

The most prescient lesson of global ecological crises is that there is no "away." As Orr points out, contemporary humans are disconnected from place – they reside but do not inhabit (Orr, 1992, p. 102). This indifference to place, he believes, is a matter of attention (p. 104); that is, we do not pay attention to particularities of place. He laments that even in the places where we are educated – the university campus, the culture of hurry and indifference prevails. Nor does the curriculum provide for serious understanding of that particular place (p. 137).

Hence, it should come as no surprise, Orr surmises, that students graduate and move from one place to another, without knowing any place. As mentioned earlier, developing pedagogy to address these issues would draw upon multiple pedagogical approaches. For one thing, the pedagogy needs be attentive to contextual qualities (Orr, 1992, p. 131), but as a part of its interrelationships with other places. First one should

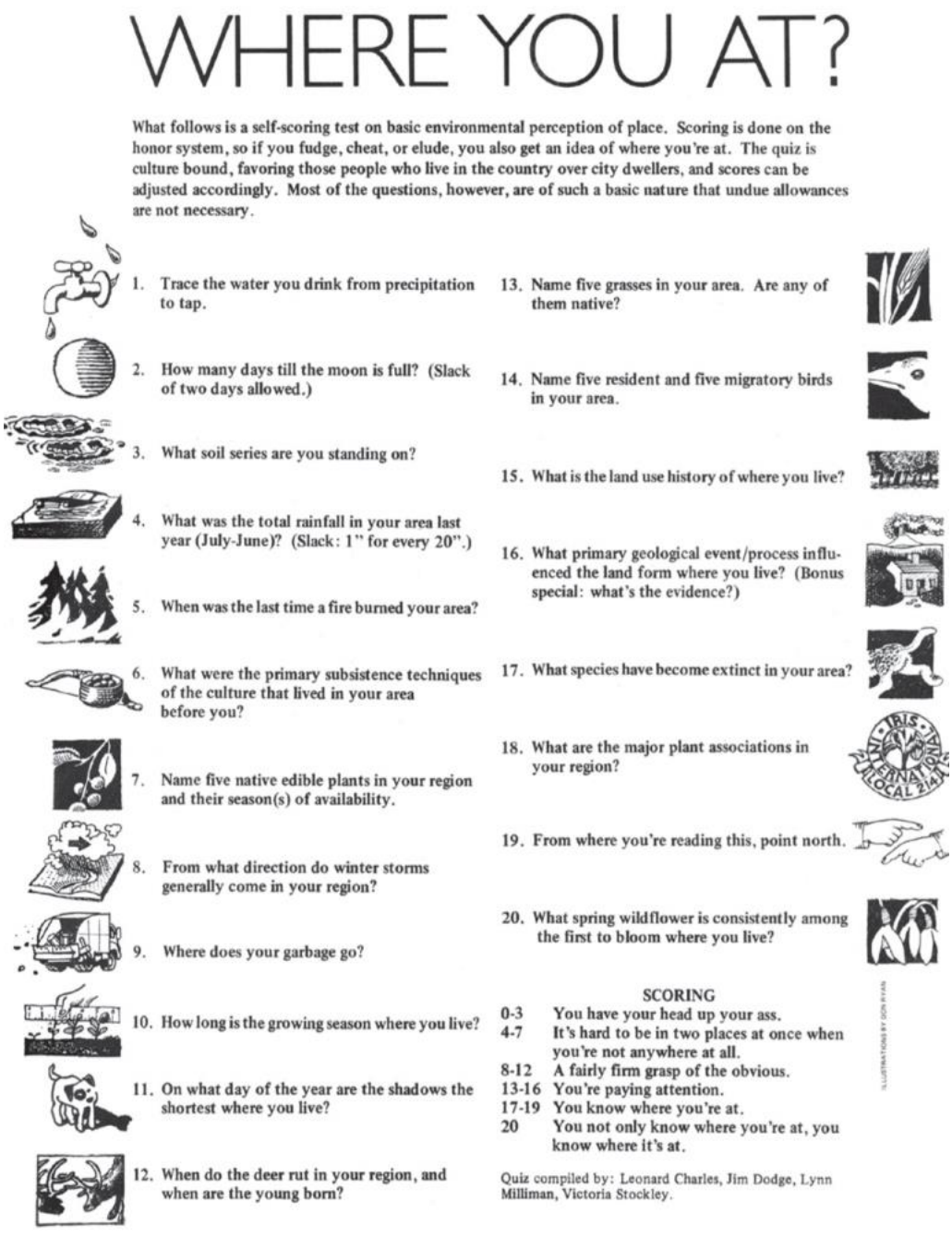
understand the surrounding ecosystems and the way humans interact with ecology. Ecosystems must be put into context with other ecosystems that adjoin, interact or encompass the ones in question (Orr, 1992, p. 24). The first step would be basic ecological literacy.

Basic ecological literacy requires inhabitants to know from where and how resources are sourced, such as the knowledge of basic soil conditions, average annual precipitation, recent area forest fires and viable vegetation. This includes understanding how humans interact with their surrounding ecosystems. One must know where one's garbage and other wastes go. This understanding would include knowledge of the most recent geological events and familiarity with local flora and fauna. The interactions between these and other aspects of place are critical to developing ecological literacy.

Answers to such questions would be necessary for any inhabitant. However, they are particularly germane for designers who alter the environment. A deep appreciation for the impact of their work on that environment is key. Conversely, a good working knowledge of the effects of the environment on the buildings is also necessary. In addition, designers would also need to be familiar with the effects of these characteristics and interactions on humans.

This type of knowledge includes some seemingly simple things such as optimal building orientation and solar shade installation to maximize solar gain in the cold season and to minimize the effect when it is hot. Such techniques appear simple and have for years been taught by rules of thumb, which in some cases turned out to be wrong.[47] The architecture school may be able to provide a context for testing such rules

of thumb. Getting these factors right could lead to buildings with great daylight and passive solar heating – thus, minimizing operating energy costs.



WHERE YOU AT?

What follows is a self-scoring test on basic environmental perception of place. Scoring is done on the honor system, so if you fudge, cheat, or elude, you also get an idea of where you're at. The quiz is culture bound, favoring those people who live in the country over city dwellers, and scores can be adjusted accordingly. Most of the questions, however, are of such a basic nature that undue allowances are not necessary.

1. Trace the water you drink from precipitation to tap.
2. How many days till the moon is full? (Slack of two days allowed.)
3. What soil series are you standing on?
4. What was the total rainfall in your area last year (July-June)? (Slack: 1" for every 20".)
5. When was the last time a fire burned your area?
6. What were the primary subsistence techniques of the culture that lived in your area before you?
7. Name five native edible plants in your region and their season(s) of availability.
8. From what direction do winter storms generally come in your region?
9. Where does your garbage go?
10. How long is the growing season where you live?
11. On what day of the year are the shadows the shortest where you live?
12. When do the deer rut in your region, and when are the young born?
13. Name five grasses in your area. Are any of them native?
14. Name five resident and five migratory birds in your area.
15. What is the land use history of where you live?
16. What primary geological event/process influenced the land form where you live? (Bonus special: what's the evidence?)
17. What species have become extinct in your area?
18. What are the major plant associations in your region?
19. From where you're reading this, point north.
20. What spring wildflower is consistently among the first to bloom where you live?

SCORING

0-3	You have your head up your ass.
4-7	It's hard to be in two places at once when you're not anywhere at all.
8-12	A fairly firm grasp of the obvious.
13-16	You're paying attention.
17-19	You know where you're at.
20	You not only know where you're at, you know where it's at.

Quiz compiled by: Leonard Charles, Jim Dodge, Lynn Milliman, Victoria Stockley.

Figure 2: Environmental Perception of Place.
Source: (Mills S. , 2010, p. 112).

Other more obviously complicated techniques for designers to learn involve life cycle assessments of materials and simulation of resource use. Many of these skills

involve understanding physics, including fluid dynamics and thermodynamics. Some of them require the use of computer software – some of which are not particularly user-friendly. The absolute accuracy of such software is limited. However, for comparative analysis, they are quite useful, such as comparing the performance of an existing building with that of a proposed design or between two alternate design solutions.

Cultural Pedagogy

> *A holistic approach to education would recognize that a person must learn how to be with other people, how to love, how to take criticism, how to grieve, how to have fun as well as how to add and subtract, multiply and divide…. It would address the need for purpose and for connectedness to ourselves and one another; it would not leave us alone to wander the world armed with plenty of knowledge but lacking the skills to handle the things that are coming up in our lives. – Jane Tompkins*[48]

Addressing ecological, social and cultural issues necessarily draws from multiple pedagogical approaches. It needs to be conscious of specific contexts, instilling "an applied ethical sense toward habitat." It must be place-based – paying attention to the qualities of that context (Orr, 1992, p. 131). An intricate study of place could be part of a study of its interrelationships with other places – as well as its position as a context within other contexts at larger scales (p. 24). By thinking about ethics, one can attempt a more meaningful discussion of sustainability. Such ethical discussions of our place on the planet and our relations to ecosystems generate appropriate pedagogies for teaching these issues. It is in the very delving into the issues at stake at various scales

that we determine what is important and from whence content is derived. This is particularly important for designers.

The remarkable thing about the pedagogic outliers presented in chapter 4 is that cultural concerns suffuse their work and Critical Pedagogy pervades their approaches. They all seem to heed Thomas Dutton's call to take concepts such as disruption (subversion and deconstruction, all part of the social justice and emancipatory lexicon of the nineteen sixties), and extend them "beyond mere formal play and ground them in real social life as a strategy for societal transformation" (Dutton T. A., 1996, p. 177).

> *The task… is to provide the conditions for individuals to acquire a language that will enable them to reflect upon and shape their own experiences and in certain instances transform such experiences in the interest of a larger project of social responsibility. This language is not the language of the metropolitan intellectual or the high priests of the post-avant-garde, although it may borrow from their insights. It is a language that operates critically by promoting a deep affinity for the suffering of the oppressed and their struggle for liberation, by brushing common sense experience against the grain, by interfering with the codes that bind cultural life shut and prevent its rehistoricization and politicization, by puncturing the authority of monumental culture and causing dominant representations to spill outside their prescribed and conventional limits.*
>
> *– Peter McLaren and Tomaz Tadeu da Silva*[49]

For Dutton and others, architecture would be possessed of social responsibility and resist dominant social trends in order to promote social justice and "radical democracy." It would work towards helping groups to achieve their own voices. It would engage in new forms of community and solidarity. Dutton (1996, pp. 159-160) also calls for the

term “critical” to be recovered and infused with progressive meanings appropriate to contemporary conditions (Palmer, 1990, p. xvi), (Fraser, 1989, p. 113).

Cultural Studies

Culture is “a set of control mechanisms – plans, recipes, rules, instructions – for the governing of behavior” (Geertz, 1973, p. 44). Investigating culture exposes normalcy and particularity of actions, as the import of actions are examined. Although culture does not reside in any person’s mind, Geertz asserts, it is possible to learn about culture because it involves shared, public “webs of significance.” In Cultural Studies, the interaction between daily life and society is explored, such that the student becomes acquainted with how social groups “produce, constrain, and transform meaning in their struggle to place themselves within society” (Dutton T. A., 1996, p. 162). As such, for students of Cultural Studies, power is a vital mode of theoretical analysis.

Signification – how interactions, power dynamics and relationships are represented, as well as their ramifications for culture and politics are also important in Cultural Studies. As such, signification is important for architecture, due to the importance of representation in design. Cultural Studies probes what is signified by particular practitioners and what is not signified – because it is avoided, ignored or assumed. It is heavily influenced by Structuralism, Semiotics and Marxism. Structuralism provided a framework that allowed for a theory of culture, without culture dissolving in language (Hall, 1980), (Turner, 1996). Semiotics supplied a vocabulary and frame that enabled analysis of nonlinguistic signs. Initially, Cultural Studies provided a robust critique of Marxism – which disparaged culture as a product of economic power. However, as less

orthodox forms of Marxism were developed, its critique of power dynamics found fertile ground in Cultural Studies (Boggs, 1976). This Cultural Studies critiques popularly held notions and construes consensus as a form of domination as powerfully as physical coercion. Such consensus is disseminated and perpetuated by the use of education, the media, law and mass culture.

Cultural Studies was developed to be pragmatic – as a way to generate knowledge about the structures we live in (Turner, 1996, p. 225). Cultural Studies are inherently cross-disciplinary, due to its history and its practical political objectives. It is committed to "understanding the construction of everyday life" in order to "change lives for the better" (p. 230). Such study is pointed at social inequities and divisions. Its methods include "textual analysis of representations," especially evidence previously disregarded by academics, subjective experiences, and social practices considered to be marginal. Furthermore, it includes making "interventions into cultural policy on urban design, media regulation, the arts industries or multiculturalism," as a way to legitimize such practices and experiences. These are all arenas where architects have great interest and major impact, because architecture has great impact on the contexts for such experiences, practices and other human interactions. Cultural Studies questions the normative hegemony of dominant groups, whether within national borders or across the globe (McLaren, 1991, p. 51). Such dominant cultural views are of interest because they tend to be invisible due to the fact that they dominate the discourse, while making other views invisible, marginal and irrelevant.

Thus, cultural processes and structures can be analyzed in a given context – historical, geographical and so on. Cultural Studies could serve to counter the acculturation that occurs in architecture schools by reframing ways of knowing. It may realign the students' allegiances from "well-heeled" clients (Stevens, 1998, p. 190), (Williamson, 1991, p. 4), towards the concerns of the broader populace and greater involvement in communities as recommended in the Boyer Report (Boyer & Mitgang, 1996, p. 35). It may engender the kind of attention that Orr (1992, p. 104) asserts is necessary for proper ecological literacy. To shy away from these cultural, social and ecological issues, and the capacity for reframing, denies the power of pedagogy. After all, "any practice which intentionally tries to influence the production of meaning is a pedagogical practice" (Giroux & Simon, 1989, p. 230).

Critical Pedagogy – a Learner-Centered Constructivist Approach to Pedagogy

The constructivist model of education is heavily influenced by the work of Piaget and Vygotsky (Slavin, 2005). Their view was that cognitive change occurred when new information caused previously held conceptions to "go through a process of disequilibrium." The social nature of learning was emphasized and they encouraged groups of students of mixed ability. Both, but particularly Vygotsky, posited that learning can occur though proximate encounters and observation, behavior modeling, apprenticeships, mediation and play. Some other constructivist approaches that have been developed from these ideas include cooperative learning (Slavin, 1990), discovery learning (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011), self-regulated learning (Zimmerman, 2002) and scaffolding (Daniels, 1994).

Some strategies that constructivists employ are reciprocal teaching, skepticism towards authors due to possible dominant culture hegemony and using group work to find alternate processes. *Scaffolding* provides an initial structure, upon which the students can build their learning activities. They can be used by faculty and students to generate learning outcomes that are relevant to the issues and processes to acquire those outcomes. The students subsequently develop into self-regulated learners. Self-regulated learners possess effective learning strategies, which they know how to use and are motivated to do so. They begin to generate content and learning strategies, independently of the faculty. Discovery learning is an important component to the approach. Learning occurs through actively testing and experimenting with concepts and principles. All of this is done in an atmosphere of cooperative learning. The strategies are used in groups where, for instance, ideas about alternative processes are shared or knowledge gleaned from various experiments carried out by different individuals to test a principle. The ideal in the constructivist approach is to go beyond making students more knowledgeable or skillful, and ultimately to become better learners. Thus, in the constructivist perspective, problem solving, critical thinking and creativity are paramount and "knowing is an active, ongoing process, not just a constant or fact to know or memorize."

> *To teach is not to transfer knowledge but to create the possibilities for the production or construction of knowledge. – Paulo Freire*[50]

A great proponent of the learner-centered approach was Paolo Freire. He promoted a libertarian education, one that poses problems, based on a democratic relationship

between teacher and student – one in which a partnership was developed between them. This approach requires the teacher to trust the student – even though he conceded that this was difficult. In this approach, both the content and teaching method are democratized. According to Freire, this would incite inquiry, creativity and critical thinking. This, he believed, would lead to a “constant unveiling of reality” and the emergence of consciousness about the world (Freire, 1993, p. 62).

Learners would also "...develop their power to perceive critically the way they exist in the world with which and in which they find themselves..." (1993, p. 64). For Freire, critical awareness in education was essential to being and knowing. His idea was to offer a system where the focus of the learning process shifts away from the teacher to the students. Education in this paradigm focuses on the present – on the people’s current existence, posing problems that attempt to assist said people in transforming their real problems (Aronowitz, 1993). The more such problems resemble those in the real world, the greater their relevance. This is a key point; the main purpose for a learner to engage in community is to learn, while attempting to solve real problems. Therefore, such an education benefits all learners; the students, the faculty and the community. It must be made clear that the main intent is not to enlist students in community improvement. Rather, it is to enlist community – its members and contexts in providing learning for the students. Any community improvement, while welcome, is secondary.

In this approach, the student, as learner is the most important part of the equation. In making the distinction between learner-centered instruction and teacher-centered instruction, it indicates that the spotlight has moved from teacher to student. This

approach requires a change in the attitude of faculty. This begins with the focus – a shift from faculty-centered to learner-centered. Weimer (2002, p. xvi) cautions that it is not student-centered, which implies a focus on student needs. This Weimer asserts frames education as a product and the student as customer. In such a framing, the faculty's role is to serve and satisfy the customer.

This student-as-customer metaphor is resisted by faculty, as it presents education as a product. Many faculty members feel that "the customer cannot always be right, there is no money-back guarantee, and tuition dollars do not 'buy' the desired grades." Learner-centered pedagogy, on the other hand, focuses attention on learning: "what the student is learning, how the student is learning, the conditions under which the student is learning, whether the student is retaining and applying the learning, and how current learning positions the student for future learning." All actions are focused on what students are doing, not what the teachers are doing (Weimer, 2002, p. xvi).

There are five key changes to educational institutions that can make them more learner-centered (Weimer, 2002, pp. 8-17). Power has great influence on motivation on learning. Freire (1993) forcefully proposed the idea that education can be a vehicle for social change – a now widely accepted tenet of Critical Pedagogy. In the constructivist approach, it is emphasized that learners actively construct their own knowledge. Knowledge cannot be given to learners. In contrast to students "passively receiving information transmitted to them from teachers and textbooks," learners actively engage in the acquisition of knowledge, building the content and constructing their own meanings (Stage, Muller, Kinzie, & Simmons, 1998, p. 35).

Learning occurs in social contexts such as a community, rich with the experiences and culture of its members (Weimer, 2002, p. 12). This approach provides learners with a problem and they can "find the content in the fields that explains, answers, or resolves the problem." This necessitates a realignment of "whole curricula, course sequences, and individual courses based on the assumptions and principles of constructivism." Content becomes more "the means to knowledge than the end of it." The point is not to cover more material but a way of developing in each learner unique modes of understanding.

Addressing current issues in a community provides realistic and meaningful contexts to carry out challenging, open-ended investigations. Each learner explores and generates multiple possibilities, some of which will be affirming while others will contradict any preconceived notions (Fosnot, 1996, p. 29). Such contradictions and affirmations are characteristic of all complex systems – ecological and social.

Providing the aforementioned context is of paramount importance and the learners do not have to wait to interact with content. This paradigm calls for a shift in the teacher's traditional role, changing the focus from the teacher to the learner. In fact, the teacher-student dichotomy is minimized in favor of everyone becoming learners. The actions of the teacher are only important to the extent that these actions facilitate learning. They no longer function exclusively as content experts, nor are they classroom managers (Weimer, 2002). If the goal of education is to create independent, autonomous (that is to say self-directed) learners who take responsibility for their own learning (Weimer, 2002, p. 15), it requires a great deal of trust – trust of and by all

learners. To this end, self-direction must be cultivated so that the learner will arrive to any task more purposefully and with greater motivation.

They are more likely to retain what they learn longer and use that knowledge better (Knowles, 1975, pp. 14-15). This self-directed learning is more "in tune with our natural processes of psychological development," and the ability to increase one's responsibility is essential to maturation. Since people are increasingly required to take more initiative in their own learning in life and in the work force (Boyer & Mitgang, 1996, p. 27), self-direction becomes a pivotal quality. Self-direction in the educational setting minimizes the occurrence of anxiety or frustration by students when they encounter challenges. It also has a similar effect on their teachers, but it also extends to their life outside the learning environment.

Evaluation and assessments should serve the goals of the learner and the learning outcomes, not simply the goals of replicating the same set of guiding prescriptions. Their primary function is to provide the learners moments to ensure interplay of action and reflection (Brookfield, 1990). Besides, tests often miss more important qualities of good citizens, such as character (Tough, 2011). Generally, efficiency is easier to measure than effectiveness (Kohn, 2000), even though the latter is more useful. It also directs the focus to how well something is being done, rather than the more important question of whether it should be done.

The paradigm proposed here suggests that educators promote an environment that actively encourages the learners to assert their independence and autonomy. Thus, they determine what the relevant social issues are and attempt to tackle them in a

meaningful way. The educator is there to facilitate and encourage, so that the experience is neither overwhelming nor hollow. The evaluation of their success can then be left up to them. They can assess if they made any headway with the problem they tackled. Currently, grading is the tool of choice for evaluation. As such, a transition away from this mindset would be beneficial. In the interim, self-evaluations and assessments can be used to inform and augment the use of grading schemes. In the context of design education, the test is often the critique. It is carried out, ostensibly, to ascertain the extent to which the design student has met the design challenge. However, the challenge is framed in ways that do not address the external issues that form the core of ecological and social challenges – external to the disciplines main concerns of aesthetics, function and material quality.

Critiques of Freire come from many perspectives – especially from those steeped in Cultural Studies. Feminist and critical theory question traditional power structures – in the classroom and the world at large, and they propose a more egalitarian view of learning. This has a marked effect on how motivated and engaged learners are. Such critics contend that it is important to think of the classroom as a microcosm of the world and as an opportunity for all learners (faculty and students) to practice their ideals (Tompkins, 1991, p. 26), in keeping with Freire's basic argument that education should provide a vehicle to engage current social issues. Feminist pedagogues point out that we have historically been successful in teaching competition to students but have been less successful teaching cooperation (Weimer, 2002, p. 10), an area where they find common ground with Freire. However, feminists and critical theorist assert that he

makes assumptions that are insensitive to local knowledge and customs and that he has a tendency to use mystical terminology.

Freire's (1993) view of education as a vehicle for social change is now largely accepted in education circles and most prominently in feminist critiques of education. Freire makes a strong case for dialogue – in part because of its utility in non-institutional settings, where learning is about conversational engagement rather than meeting curricular requirements. The learner-centered pedagogy is both a way to democratize the interaction between faculty and student, as well as a way to engage in community. This is partly due to the required reciprocity inherent in dialogue.

The leveling of the power differential in the faculty-student relationship is designed to eliminate concerns of abuse of power that may come with honest dialogue. Hence, there is a tension due to the potential abuse of such leveling. Paradoxically, it is the engagement in dialogue that affords the hope of reasonable interaction (Habermas, 1979, p. 3). In spite of these limitations, Freire believed that dialogue was much better than what he referred to as education as "banking" in which the teacher "deposited" knowledge in the student. From more traditional theorists, he has been challenged for replacing the agenda that he despises with another – or more importantly, lapsing back into the "banking" that he denounces. Nevertheless, his work provides a way to begin engagement in real world situations, allowing learners to participate in determining the content.

Perhaps, Freire's greatest contribution to design education was his interest in praxis. Although his approach encourages action with practical outcomes, he insisted such acts

be informed by values. In his approach, actions are directed towards building community and greater social cohesion. Thus, learners begin with a problem or situation, consider it in its context and decide how to improve quality of life in conjunction with their values. They then engage the situation as informed and committed actors. This notion of education as an instrument for social change is an obvious and important overarching theme in Freire's work (1998). Freire also insisted that educational activity needed to be situated in a real context.

Cultural Pedagogy and the Education of Architects

In bringing together Cultural Studies and Critical Pedagogy, the critiques from feminists and others can be addressed, making for a more robust theoretical teaching philosophy. Thus, Dutton presents a framework that he has used to teach, where he invites practitioners and academics in architecture to follow Freire's lead and "align with the oppressed" (Dutton & Mann, 1996, p. 23), (Dutton T. A., 1996, p. 177). He decries the discourse in architecture, which evoke language "as ends unto themselves" (p. 196) without regard to the effects of such use of language on society.

> *Such is the architecture of aesthetic formalism: an architecture highly subjective but without a politics of subjectivity; an architecture that valorizes individualism, desire, and pleasure but without a politics of solidarity or community; an architecture portrayed as liberatory and resistant but that is couched only within language. Such an architecture cannot be considered to be critical.*
>
> *– Thomas Dutton*[51]

Pointing to the pernicious nature of Global Capitalism, which effectively "subverts and silences people's voices, lives and futures," he encourages architects to engage people

to improve their lives. He goes so far as to encourage subverting and possibly countering "the forces of hegemony." Critical Pedagogy encourages community engagement as part of the curricular creation. Cultural Studies also has a long tradition of direct participation in community – epitomized in the work of Paul Willis (1977), who lived with his subjects off and on over three years.

Experiential Learning

Many of the founding figures of Cultural Studies started in extramural education, with working class adults (Grossberg, 1994, p. 3). Likewise, many experiential learning theorists are also marginal to the academy. This community of researchers provides great insights into the Kolb Model for Experiential Learning and Situated Practice: that is learning that occurs as the legitimate peripheral participation in the course of normal daily activity. According to Brookfield (1983, p. 16), there are two general ways that researchers tend to think of experiential learning.

The first describes when learners acquire and then apply knowledge and skills in particular context. It involves a "direct encounter with the phenomena being studied rather than merely thinking about the encounter, or only considering the possibility of doing something about it" (Borzak, 1981, p. 9). Sponsored by an institution, this type of experiential learning is often part of professional training. The other usage he observed was more learning that occurs in the "direct participation of life" (Houle, 1980, p. 221). When not sponsored by any formal institution, it is typically learning that people take upon themselves.

This learning is achieved through reflecting on their everyday experience. This is how most of us learn; it occurs without any prompting. According to Jarvis (1995, p. 75) the literature is mostly "about learning from primary experience, that is learning through sense experiences" and often excludes learning from secondary or indirect experience, which occurs through linguistic communication (Jarvis, 1995, pp. 77-80). Much of the important work around experiential learning can be attributed to Kolb and Fry (Kolb, 1976), (Kolb, 1981), (Kolb, 1984), (Kolb & Fry, 1975). With the Cape Verde project, we tried to intertwine the use of both.

Immersion and Situated Practice

> *Situated learning necessitates developing an environment to support design as a social act. "Constructionism" requires building tools for individuals to participate productively within design as a social act. In the process of formulating new educational strategies, these theories impart more fundamental challenges than the ones posited by Mitgang. – Joseph Press*[52]

Researchers in immersion and practice theory assert that, not only does learning occur in contexts of everyday activity, but that the institution of learning can be thought of as a context (Lave, 1993, pp. 5-6). The problem of context can also be approached through the temporal dimension as activity. Lave concluded from observing everyday activity that "learning is ubiquitous in ongoing activity." Such phenomena, she argues, cannot be analyzed separately from the socially material world. "Participation in everyday life may be thought of as a process of changing understanding in practice," which she asserts is the definition of learning.

Another interesting aspect of immersion is that to better learn about a context, it may be more useful to observe "highly stereotyped patterns of behavior" all around the context (Fuhrer, 1993, p. 190). Everyday activity can be highly routine or part of social and historical processes – that is cultural norms, sometimes performed without much thought. And although these activities are essentially improvisational, they are also the way future realities are created. Thus, immersion is useful in any context. These ideas suggest that immersions need not be extensive to bear fruit. Thus, learners can be briefly immersed on location and then returned to the institution to continue with their work.

> *If we removed human activity from the system of social relationships and social life, it would not exist and would have no structure. With all its varied forms, the human individual's activity is a system in the system of social relations.*
>
> *– A A Leont'ev*[53]

People engaged in everyday activities are constantly changing their understandings – in other words, they are learning. Research has shown that they are better learners in those situations. For instance, when people went shopping, they had "virtually error-free arithmetic performance." They are able to work out complex scenarios involving the quantities and prices of goods. However, without any real context, they had "frequent errors in parallel problems in the formal testing situation" (Lave, Murtaugh, & de la Rocha, 1984, p. 83). That is because meaning and event are integrally linked (Rogoff, 1982). If the purpose for doing something is removed, then the event is meaningless.

As such, there is no motivation to find the "right answer," or the answer changes due to the different context (Lave, 1993, p. 6). This has implications for a range of aspects in education. For instance, the classroom, a formal educational context, is a de-contextualized space. So while providing an abstract problem is great for exploring many design challenges, it removes meaning from the problem it supposes to address. Removal of meaning from a problem diminishes the learner's motivation. It extends to other aspects such as lesson designs, teacher-student interactions and institutional evaluations. An even more pernicious manifestation of this is when teachers and other education professionals devalue the lived experience of the students (Lynch, 1995, p. 588).

> *[A] belief that the world is divided into contextualized and decontextualized phenomena is not merely an academic speculation that can be discarded when found theoretically inadequate or incomplete. This dualistic view of the world has a lively presence in our everyday lives. – Jean Lave* [54]

For most architects, the context is very important. Usually the difference of opinion is which part of that context is privileged over another – for instance, should greater attention be paid to the climate than to the material fabric of surrounding buildings. One might pay more to the attention to the real estate situation instead of the geological conditions, while another gives precedence to the regulatory environment, over the mood on the street. Ideally the designer is paying attention to most if not all of those and more. This is particularly true in an unfamiliar context. One of the reasons for taking the learners to Praia was so they could appreciate a completely different context and not take anything for granted. It was important to tap into the innate learning that

occurs in everyday activity – coupled with the heightened awareness of being in a different place. Paying attention to everyday activities evinces how learning is ubiquitous, even if such learning is not recognized (Lave, 1993, p. 5). The study abroad part of the project was conceived so that the learners would spend most of their time with the families.

Of course, there is a danger in immersion that it could potentially "lead to misconceptions and faulty learning" (Schwille, 2000). An immersion must be "augmented by investigation of perspectives and insights gained through other resources," to avoid generalizations from a few experiences. Learners cannot assume that the few encounters that they had in the short time are universal nor can they assume that these experiences represent the norm. However, as Lave points out, brief immersions are sufficient to meet Freire's requirement to attend to current community problems.

During the Cape Verde project, they were encouraged to be inquisitive and open-minded. The hosts had the opportunity to articulate their "values, norms, beliefs and purposes," whenever they had to explain situations to their guests. For example, the learners were mystified about why many of the houses were "incomplete," with rebar sticking out the top of the flat roofs. The hosts explained that when finances allowed, they hoped to expand upwards. As such the flat roofs were floors of potential second levels. Meanwhile, in some cases they were used for drying laundry and for keeping livestock. Learning also happened in the other direction. Thus, the hosts worked on their language skills as well and showed interest in the cultural norms of the hosted learners.

Kolb Model

Any framework that advocates concern for current affairs, necessarily, would include climatic, social, cultural, political and economic issues. As such, learning by definition would be contextual and subjective. The model laid out in Figure 3 provides a framework for realizing a constructivist learner-centered approach to education. It would provide for deeper engagement with place and culturally specific practices. According to Kolb and Fry, the learning cycle could begin at any of the four points. During learning one could cycle through the process and should really be considered a spiral.

It is designed to create an interchange between concrete experiences of real things with abstract concepts (Svinicki & Dixon, 1987). That interaction is mediated by reflective observations and active experimentation. Some concrete experiences are activities in a laboratory, field observations, simulations or games, problem sets and examples. Keeping logs or journals are forms of reflective observation – as are discussions or brain-storming sessions and posing rhetorical questions.

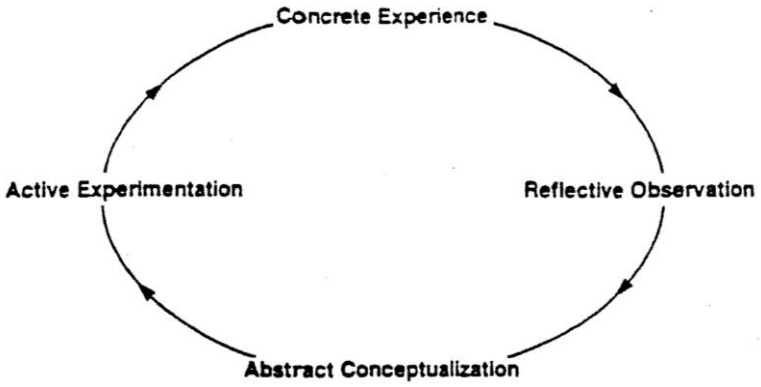


Figure 3: Experiential Learning Cycle.
Source: (Svinicki & Dixon, 1987)

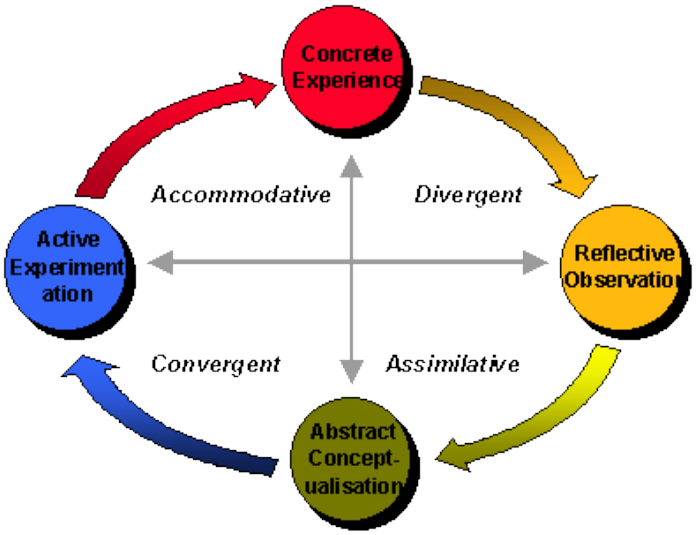


Figure 4: Four Kinds of Knowledge
Source:

Abstract conceptualizations include lectures, papers, model building, hypothetical projects and use of analogies. Simulations, case studies, lab work, field work and even homework are ways to engage in active experimentation.

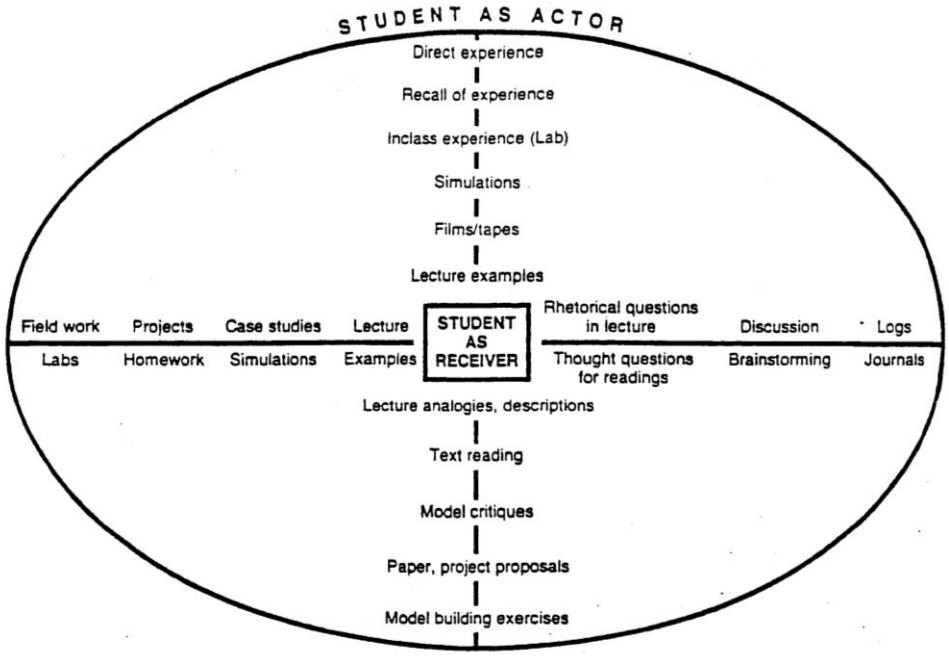


Figure 5: Degrees of Direct Learner Involvement.
Source: (Svinicki & Dixon, 1987)

As Figure 5 shows, the degree of direct student involvement is on a spectrum. This is related to the degree to which a learner is self-directed, versus how much they are simply student receivers of content. The more self-directed they are, the more they can influence the operation of the learning cycle. The further away from the center of the circle, the greater the level of risk of loss of control of content by the teacher. However, the more self-directed a learner is, the richer the learning experience. A mix of such activities along the spectrum allows learners to have various experiences. Conversely, wherever a learner falls naturally along this spectrum, somewhat determines the degree to which he or she can engage and the sorts of activities chosen to engage in. Thus, it is important to help students become more active self-directed learners. However, they can choose how independently they wish to work and how much direction they require.

Critiques, Extensions and Applications of Kolb

One very important way that Kolb has been applied is to allow for divergent and convergent thinking to operate in the same paradigm (Atherton, 2011). The convergent involves problems that have “right” and “wrong” answers, while divergent knowledge is more about creativity. The former is in the bottom left-hand quadrant of the chart, with abstract conceptualization and active experimentation while the latter is in the opposite corner between concrete experience and reflective observation (Figure 4).

The remaining two quadrants were assigned to the styles originated by Piaget with the accommodative in the top left and Assimilative opposite from it (Atherton, 2011). Assimilation refers to material taken in from the environment, while accommodation is the change that the receiver’s mind undergoes. These two work together. This is why it

is all the more mystifying that people in different disciplines have been classified into the different quadrants. In this process, for example, creative people such as artists were put in the divergent quadrant, but lawyers were considered convergent. Mathematicians were assigned to the assimilative and teachers in the accommodative quadrant. Kolb also contended that these activities can be better tailored to the learning styles of the learners (Table 1) – whether they are more active or more like receivers.

Table 1: Learning Styles and the Kolb Model.
Source: (Tennant, 1997).

Learning style	Learning characteristic	Description
Converger	Abstract Conceptualization + Active Experimentation	· strong in practical application of ideas · can focus on hypo-deductive reasoning on specific problems · unemotional · has narrow interests
Diverger	Concrete Experience + Reflective Observation	· strong in imaginative ability · good at generating ideas and seeing things from different perspectives · interested in people · broad cultural interests
Assimilator	Abstract Conceptualization + Reflective Observation	· strong ability to create theoretical models · excels in inductive reasoning · concerned with abstract concepts rather than people
Accommodator	Concrete Experience + Active Experimentation	· greatest strength is doing things · more of a risk taker · performs well when required to react to immediate circumstances · solves problems intuitively

Assignment of learners was also related to whether a learner's learning style is more kinesthetic or more textual, more visual or more auditory. This notion of learning styles has been challenged (Tennant, 1997, p. 91), (Willingham, 2008), (Pashler, McDaniel, Rohrer, & Bjork, 2008). This dispute is among education theorists, cognitive psychologists and neuroscientist, and centers around the validity of learning styles.

While some find this validity apparent, others point to the lack of evidence for its efficacy. There is interesting work linking the model to different centers in the brain (Zull, 2002). A more interesting aspect of Zull's work is that it seems to illustrate how the brain is physically changed in the act of learning. Learning, it turns out, is similar to eating, exercising or engaging in many pleasurable activities which stimulate neurons causing the brain to make more neurons.

Unfortunately, the controversy about learning styles has not been resolved. One issue these researchers all agree on is that certain skills or kinds of knowledge are better learned using one style versus another. As such, any mechanism for systematically creating different learning experiences is useful. A way to side-step this controversy and yet make use of the styles is to avoid the assumption that different people have different learning styles – which may or may not be true. For our purposes, the model was used to think about how to provide different kinds of learning experiences. As such, it can be a useful "handle" for educators to provide rich learning environments.

The Kolb model has been critiqued as being too text reliant – and not context sensitive enough. Its focus is internal and counter to the emphasis on practice of the other theoretical frameworks employed in the Cape Verde project. Thus, the model may ignore potential cultural differences in the way learning is approached (Anderson, 1988). Rather than considering this a disadvantage, I argue that it can be employed in different contexts with different results. This depends on not having predetermined content. In keeping with Freire, the content is generated by all learners as part of the learning process.

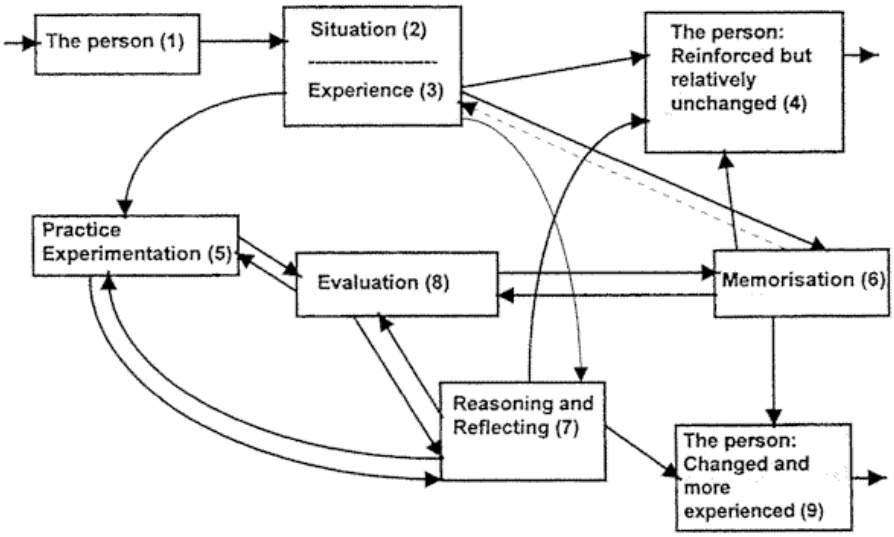


Figure 6: Potential Trajectories of Learning.
Source: (Jarvis, 1994).

Jarvis proposed a modified model (Figure 6), to address critiques of Kolb. Depicted explicitly as a spiral, it more obviously illustrates the possibility of multiple outcomes, especially when learners actively engage in content creation. Jarvis' model is also useful for charting a learner's trajectory through a learning situation more explicitly than other such models. The first stage is the person and the second is the situation – perhaps a reference to the genes/environment dichotomy. As such, it focuses on the particularities of the context – ecological literacy and attention to specific culture can occur. The third aspect is the experience of that person in that situation, highlighting the individual nature of experience. Thus far in the model, it allows for Freire's desire for contextual engagement and Lave's insistence that learning always occurs and is particular to the context. It is also at this point that the opportunity to determine content can occur.

As they choose the content, learners can expand understandings of cultural differences, social practices and structural forces, as well as investigate issues inherent

to the place and its connectedness. They would choose from these and other current issues, because immersion makes such current issues relevant. From there, any number of possibilities exists, with learners engaging in different learning experiences and achieving different learning outcomes.

Formalizing the Teaching Philosophy

The various pedagogic ideas explored earlier in this chapter, and the difficulties and opportunities associated with design education discussed in chapter 4, generated some initial research questions:

1. Is it possible to draw out learners' interest in ecological, cultural and social issues? Did the project engender the desired engagement of current issues – the environmental, cultural and social issues? How can that be achieved in a design school – what are the mechanisms to do so?
2. How useful is immersion in meeting these goals? What are the qualities that make Cape Verde, the context for this project, ideal for such an immersion? Did such immersion enhance the learners' ability to engage in the aforementioned issues?
3. Did these issues influence their ideas about design? Was such engagement evident in their analyses, syntheses and design approaches? How did this manifest in their work – both in the documentation/analyses phases and in the design/synthesis phases?
4. Finally, are there immediate, intermediate or long-term changes in the learners' attitudes to these issues? Did it inform their plans for their academic and professional careers? Did it have an effect on their design philosophy or outlook in life? Do the learners make connections to larger global issues?

Design Education for a Different Set of Challenges

The teaching philosophy developed here incorporates the foregoing theoretical approaches. First, a proper understanding of place is necessary for any pedagogy to be relevant in this time of ecological crises. The connection to place (that is ecological literacy), is the first step for an architect. It includes an understanding of the natural forces that prevail there and the species that inhabit that place, as well as its interrelatedness with other places. This graduates one from a mere resident to an inhabitant of a place. One would also develop an appreciation of the differences between renewable and non-renewable resources – and more importantly, what part of the renewable resources are "natural capital" and which parts are "interest." Van der Ryn and Cowan (2007, p. 37) assert that ecological design offers three critical strategies for addressing the loss of natural capital.

The first, conservation, slows the rate of depletion currently underway. The second, regeneration, is an expansion of natural capital, repairs damaged ecosystems and recreates lost habitats. Thirdly, stewardship is taking very good "care in our relations with other living creatures and with the landscape." As such, for architects, ecological literacy begins the broadening of their understanding of place and its interconnections to other places. Hence, the learners would be immersed in place and required to map resource flows.

Cultural Studies approaches allow for subjective observations of the place, because better cultural awareness is equally important. It supplies a primary basis for empathy necessary for stewardship. Critical Pedagogy, implemented to encourage learners to

participate in generating content, gives them ownership of the learning processes. Hence, they can participate in charting the direction of the learning, and are more motivated to do so. Together, Cultural Studies and Critical Pedagogy provide frameworks for engaging with people and current issues as an integral part of their education.

The Kolb model ensures that different kinds of learning occur without labeling participants as particular types of learners. It also provides a framework for how learners can take control of content as encouraged by Critical Pedagogy and engage in the reflections called for by Cultural Studies. Such reflections could be on any and all situations, because, in accordance with Situated Practice, all activities engaged in by learners are learning opportunities. Kolb provides a framework for the faculty to continually ensure that learners have a rich learning experience.

In Table 2, Hutchinson (2004, pp. 28-29) categorizes different approaches to education with regard to the understanding of place and its importance within that approach (2004, pp. 28-29). For Hutchinson, the root metaphors are important clues for the approaches to education in these broad categories. More importantly, these metaphors are indicative of the attitude of the teacher about how education happens.

Table 2: Educational Philosophy and the Pedagogy of Place (Hutchinson, 2004, pp. 28-29)

	Disciplinary Initiation	Citizenship Education	Inquiry Learning	Developmental Congruency	Community Study	Global Education
Root Metaphor	Discipline/ Understanding	Nation/ Patriotism	Student/ Self-development	Student/ Developmental Experience	Neighborhood/ Community Membership	World/ Social Activism
Aim	Instill solid understanding of the major disciplinary traditions.	Instill solid knowledge of and appreciation for home country.	Heed the learning styles, aptitudes, and interests of individuals.	Heed the developmental experience of the individual.	Nurture a solid knowledge of and appreciation for the local community.	Empower to respond effectively to social and environmental challenges.
Place Focus	Strong focus on place-related sub-disciplines. The wisdom, structure and methodologies of each discipline are emphasized.	Strong focus on nation/state boundaries and the structure of government. Character education is emphasized.	Strong focus on inquiry, problem solving and reflections on experience. Learning activities relate to student interests experiences and personal goals.	Strong focus on developmental experience of place, including home, found spaces, favorite places, pathways, roots and the developing spatial sensibilities.	Strong focus on the natural and built environment of the local community, its innermost workings, cultural artifacts, history and people's. School/community partnerships.	Strong focus on contemporary social issues and current events. Structural inequities between regions studied. Critical thinking and social action skills taught and practiced.
Knowledge Acquisition	Follows a transmission path. For the uninitiated, knowledge is inculcated. Strong disciplinary focus.	Follows a transmission path. Knowledge is inculcated. Strong societal focus.	Follows a transmission path. Knowledge is actively constructed. Balances and individual/societal focus.	Follows a transformation path. Knowledge is actively constructed.	Strong individual focus. May follow a transmission, transaction or transformation path. Strong societal focus.	Follows a transformation path. Knowledge is actively constructed. Strong societal focus.

Table 4 (contd.): Educational Philosophy and the Pedagogy of Place

	Disciplinary Initiation	Citizenship Education	Inquiry Learning	Developmental Congruency	Community Study	Global Education
Values	Value of scholarly inquiry is absolute. Intellectual, aesthetic and moral judgments derived from scholarly enquiry and promoted over subjective values.	Values are absolute. Patriotism and nationalism are promoted. Tradition and individual responsibility to society are emphasized.	Values are relative. Cooperation and social participation are promoted. Individual self-development through reflection on experience and values clarification approaches is emphasized.	Values are relative. The congruency of curriculum with developing sense of place is emphasized. Lessons honor the way the world is seen.	Values are relative and rooted in the local community context. Social participation and contributions to community development are emphasized.	Values are relative. Critical reflection and social criticism are promoted. Environmentalism, social justice and civil rights are emphasized.
Curriculum	Core curriculum can be explicitly communicated. The sovereignty of segregated disciplines is emphasized.	Core curriculum that can be explicitly communicated.	Student-centered curriculum derived from the aptitudes and interests of the individual.	A developmentally congruent curriculum derived from each individual is developing sense of place.	Community centered curriculum that is derived from the local neighborhood context.	Global curriculum derived from a comparison of disparate regions of the world.
Instructional Path	Inculcation of disciplinary knowledge.	Inculcation of national knowledge and values.	Reflection on experience.	Congruence with developmental experience.	Immersion into the local community.	Problematizing global challenges
Scale of Place	Privileges the study of disciplines over an allegiance to any particular scale of place.	Privileges the study of the nation.	Privileges the aptitudes and interests of the individual learning in a classroom community. Also privileges diverse place contexts including the esoteric, macro and micro.	Privileges the developmentally sensitive placed experience of the individual.	Privileges the study of the local community and neighborhood.	Privileges the global, the intersection of local and global and interconnections/structural inequities between regions.

Much of what occurs in architectural education is the first category; disciplinary initiation and is more about socializing the architect, as well as inculcating of disciplinary knowledge (Cuff, 1991, p. 43), (Hoyt, 1965), (Stevens, 1998, p. 190), (Williamson, 1991, p. 4). Hutchinson points out that Disciplinary Initiation, as described by Cuff, is inadequate to meet contemporary challenges faced by designers and others. The authors of the Boyer Report recognize the need to have a more liberal architecture education (1996, p. 85).

The Boyer Report also recommends civic engagement for practitioners, students and faculty in architecture, to address the tendency towards disciplinary initiation. However, this recommendation is in the context of national service. And while it is laudable to encourage citizenship over consumerism, citizen education seems inadequate in the face of ecological issues that do not respect borders. Likewise, many social, political and economic issues tend to ignore borders, in an age of mass media and global capital.

An interconnection of these various forms of curriculum could meet the goals of the Boyer Report and go beyond. In fact, they would far exceed those goals by providing a more robust response to current ecological and broader social challenges, while meeting the ever-present professional demands.

The Boyer Report calls on architects to engage more in community, to be leaders in defining the built environment and for more ecological consciousness. However, it is couched in terms of architects needing to be advocates for beauty in the public realm. The tone of their recommendations, once again, elevates the visual aesthetic over all other concerns. And while such aesthetic concerns are important and architects should

advocate for beauty in the public realm, they should also be encouraged to consider the ecological effects of design decisions – including on humans. Put another way, the desire for beauty in the public realm and its effect on humans, is a subset of the effects on humans of what architects do, which is itself a subset of the effects on nature.

The advantage of Hutchinson's framework is in its description of place focus and scale of place. These two qualities inform the relevant issues touched upon in ecological literacy, Cultural Studies and Critical Pedagogy. To avoiding fastening strongly to the first approach and to take advantage of the beneficial aspects of the others, multiple approaches could be employed. And while that may diminish disciplinary purity, it provides a more robust educational experience. Besides, disciplinary purity may not be such an issue in architecture, considering how much architects borrow from research done in other disciplines (Addington, 2013). It is advisable to take advantage of aspects of inquiry learning, developmental congruency, community study and global education, in addition to disciplinary initiation or citizenship education.

To illustrate why broad understanding and interdisciplinary learning are beneficial, one only need to look at the long history of the use of lead. The Romans used lead to make their pipes that carried water through the aqueducts – even though they knew that "contact with lead inevitably poisoned people, rendered them sterile and drove them mad" (Hanich & Holtzman, 2014). They lined their public baths and vats and cooking pots with lead. The reasons for such blatant disregard of public and environmental health are related to the usual reasons why things often do not change; inertia and convenience on the part of the general populace.

Equally important were the functional reasons, such as lead being very malleable, but also for aesthetics, such as its use to sweeten wine. It was equally difficult to persuade the American public of the dangers associated with lead in gasoline. And while the necessity of establishing that the levels of lead in the atmosphere were not normal was best carried out within disciplinary tradition (Tatsumoto & Patterson, 1963), citizenship became important in making it meaningful for the populace. Most importantly, it was the ability of the researcher to think broadly about community and global issues, and engage in personal inquiry that encouraged Patterson to persist in his investigations.

The decisions he made to study the topic, to persist in spite of withdrawal of funding from his clients and to go public, testifying in the US Senate, indicate ethical decisions that he made. Such decisions are often beyond the purview of Disciplinary Initiation. For an average student, there are few academic opportunities that prompt such an impetus, to have challenging ethical considerations. Thus, experiential learning becomes very important, to provide learners with opportunities to expand beyond disciplinary initiation models – to take knowledge that is steeped within a discipline and apply it in real situations where its import and impact can be appreciated.

Part Two – Notes

[36] (O'Toole, 2011)

[37] (Boyer & Mitgang, 1996, p. 5)

[38] Even though data are scarce in the US, he claims that the trends are similar.

[39] (Boyer & Mitgang, 1996, p. 149)

[40] (Boyer & Mitgang, 1996, p. 136)

[41] (Anthony, 1991, p. 129)

[42] (Boyer & Mitgang, 1996, pp. 23-24)

[43] (Dutton T. A., 1996, p. 193)

[44] (Dean & Hursley, 2005, p. 7)

[45] (McDonough, 2009)

[46] (Curry, 2006, p. 139)

[47] It is understood among designers that horizontal shading devices work well on the south side in the northern hemisphere and the reverse is true in the southern hemisphere, where they work well on the north façade. It was also a long-held belief that vertical shading worked well on the western and eastern elevations. What this meant in practice was that often multiple vertical shading devices were installed. However, it has been demonstrated that a single wing wall will provide some shading I the summer and allow solar gain in the winter (Utzinger, 1979, p. 165).

[48] (Tompkins, 1996)

[49] (Dutton T. A., 1996, p. 160), (McLaren & Tadeu da Silva, 1993)

[50] (Frerie, 1998)

[51] (Dutton T. A., 1996, p. 196)

[52] (Press, 1988, p. 233)

[53] (Leont'ev, 1981, pp. 46-47)

[54] (Lave, 1993, p. 6)

PART THREE – CASE STUDY: THE CAPE VERDE PROJECT

> *To demonstrate that people on earth today are much closer than ever, a member of the group suggested a test. He offered a bet that we could name any person among earth's one and half billion inhabitants and through at most five acquaintances, one of which he knew personally, he could link to the chosen one… – Frigyes Karinthy*

This experiment as described by the author Karinthy in his story, "Chains," was carried out by the social scientist John Milgram (Barabási, 2009, pp. 26-30). The experiment showed a median of 5.5 links between random people in 1967 Omaha, Nebraska and the wife of a Harvard Divinity student in Sharon, Massachusetts. This idea was introduced into popular culture by the play called *Six Degrees of Separation* (Guare, 1990), and later the film (Milchan, 1993), followed by the party game *Six Degrees of Kevin Bacon*. People in the early 21st century, connected with social media and aware of ubiquitous global positioning mapping, have an innate understanding of this. These splits and overlaps in philosophical considerations are present in architecture, with attendant difficulties and opportunities. Yet, many philosophies seem to insist on a universal truth, but there is little agreement on what it is. What this experiment illustrates is that all humans are connected, even though as the experiment sample expands to encompass the whole world, the degrees of separation increase.

However, the way modern technology, such as the worldwide web and mobile phones, minimize the effects of geographic distance, the number of separations decrease again. This also illustrates an aspect of complex networks – namely, that when

two or more such networks intermingle, even though the result is often a more complex network, they usually result in more connectivity. That said, while the average college student in a Western university at the beginning of the 21st century may be connected to people across the globe, they lack unmediated access to the issues faced by the majority of the world. Thus, students lack a proper understanding of the issues presented to them in their classes, but more importantly, students are not involved in the framing of what the problems are. Likewise, they are not privy to the mechanisms that generate the circumstances that led to such issues.

Most people – citizens who live in varied places around the globe – are not consulted when large scale development, infrastructural and environmental changes are planned and implemented around them (Hamdi, 1991), (Neuwirth, 2006). Likewise, architecture students are also not engaged in this process. Instead, they are trained specifically to avoid these unserved groups. Considering the growth of such groups and their impact (Gaston, 2010), it behooves designers to attend to such issues. The teaching philosophy being developed here offers learners an understanding and appreciation of complexity. It is an attempt to connect them to people – something the typical design studio does not afford them. In an increasingly interconnected economy, avoidance is no longer an option.

This dissertation is about running a study abroad program and then teaching an associated design class. It was initiated during a discussion with my advisor. This meeting occurred soon after the earthquake in Haiti (BBC World News, 2010). We were discussing whether architects were relevant during such occurrences – and more

importantly if we had any ideas about long-term responses. I was still unsure what my contribution to the growing field of ecological design in architecture would be. The conversation went in several directions. I mentioned that some of my students had insisted that we "do something." I discussed several places where I could organize a study-abroad program for students – to engage them in the questions raised by a complex context like Haiti. It was then that Cape Verde was first mentioned as a possible site. My advisor said that I needed to get the proposal in by Monday – that was Thursday.

The Idea

The idea involved taking design students to a remote location where they can experience a complex system of challenges, followed by a semester in a studio where they could come up with solutions to those challenges. The question was how to challenge students to rethink their approach to design. I proposed that education could include engagement in the current and pressing ecological, social and cultural issues.

Impetus for Study Abroad – Haiti

Haiti has experienced a very complicated history, with many fluctuations in its political stability. This is due in great part to corrupt leaders and powerful external enemies. At the same time, Haiti has experienced centuries-long deforestation, resulting in many environmental problems. These include; erosion, floods alternating with droughts, poor quality and availability of soil and water, among others (Diamond, 2005, pp. 329-357). Haiti occupies one-third of the island they share with the Dominican

Republic, with twice the population. Haitians inhabit the drier, more mountainous, western part of the island. Add to that a series of historical events, such as the long exploitation by the more powerful French, two centuries of post-independence hostility from France and the USA, as well as many decades of despotic rule and political instability.

Like much of the world, Haiti's economy and society is fossil-fuel based – all of which is imported. The price of imported fuels has a greater impact on low income citizens, leading to a practice of turning the remaining forest trees into coal for fuel and for income. As such wood is not a common building material in Haiti. Hence, home builders in Haiti were inevitably forced to use concrete construction. Because steel is expensive, such buildings often lacked reinforcing. In the earthquake of early 2010, many buildings collapsed and the experts pointed out that this was due to the lack of reinforcing steel in the concrete.

If Haitians had access to wood for house construction, there may have been more destruction but fewer fatalities. The island nation experiences numerous hurricanes and the storm surges that usually follow flood the low lying areas, often causing more damage than the storms, and leading to numerous casualties and fatalities. Erosion, unmitigated by an adequate number of trees exacerbates such flooding.

Haiti also lacks good sanitation system in any of its cities (Knox R. , 2012). Those who can afford it build septic tanks and those who cannot are compelled to discharge their waste wherever they find convenient. This ends up in the surface and ground water, from which the population sources its drinking water (Wampler, 2011). Composting

toilets could provide a viable alternative. The urine collected could be added to vegetable irrigation and dried feces could be used for tree planting to bring back the forest. Use of scarce water is reduced and the existing water (ground and surface) is not contaminated. The forest can again ameliorate the effects of erosion and provide other ecosystem services.

Trees can then provide a source of wood for building materials and other wood products to help generate income. Likewise, the plants and vegetables could be a source of income, minimizing the necessity for burning trees for coal. Thus, the local decisions in a house or community to provide private or public toilets have national and global implications. In recent years, several non-governmental organizations (local and international) are collaborating on such solutions in Haiti (SOIL, 2008). Such organizations provide models for collaboration between people from the global south and north. Designers can bring more holistic approaches to these sorts of collaborations.

The Hypothesis

Projects that engage participants strongly in the context, (socially, culturally, ecologically and otherwise), are more effective in encouraging students to think about available resources and the impact of architecture on the world. It is also more likely to motivate them to expand their knowledge and engage critically with issues and contexts, to become more ecologically literate and more active in social justice.

Chapter 6 – Research Design

The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise – with the occasion. As our case is new, so we must think anew, and act anew. We must disenthrall ourselves, and then we shall save our country. – Abraham Lincoln

The Cape Verde project is part natural experiment, part action research, part ethnography, part community based participatory research and somewhat emancipatory. It is a natural experiment because it was not conceived for a dissertation, but for specific educational goals and as part of a broader theoretical discourse on design research and teaching. It was in part action research because the researcher was actively engaged in affecting the participants: I as the teacher was actively trying to change the students in major ways.

The ethnographic part of the project was mostly in the work of the students. However, I as researchers used the field data that they collected. This included quantitative and qualitative data. Furthermore, the learners were interviewed by me and others, and that is also part of the data. Because the learners produced design proposals that will be returned to their host families, there is an element of community based participatory research. The project's claim to being emancipatory resides in the fact that it is intended to transform the primary participants, from students into learners, to make them more actively engaged in current issues, and to change their design approaches. This experiment was carried out in two stages:

The first component of the Cape Verde project was the immersion in Praia, where the students experienced ecological, social and cultural issues first-hand. The learners

witnessed the challenges faced by their hosts and how those challenges were met. The learners measured resource flows and participated in the daily activities of the host family.

The second component was the design studio, where the learners developed their responses to their experience of Praia. The learners were encouraged to develop their own design approach that included their own aesthetic positions, their own technical approaches and material choices. Their decisions had to be justified within the context, on the basis of how well they attended to the circumstances of their clients, their host families, and how well they addressed the ecological, social and cultural issues in Cape Verde.

In total, there were 15 students who went to Cape Verde, with 14 undergraduate students and one graduate student. The graduate student entered his thesis semester immediately after returning from Cape Verde and did not participate in the studio. Another two students enrolled in different studios. Therefore the data presented here is the data from the twelve who participated in both the study abroad and the studio.

As mentioned earlier, the Cape Verde project was conceived as a way for architecture students to recognize the impacts of humans on ecosystems and to respond to the social justice issues of the day. The idea that the project could become the topic of my dissertation had not occurred to me. It was an opportunity to provide a context for design students to be more relevant to current issues. As such, the research design was not as well-planned as it could have been. Hence, it could be considered a kind of natural experiment. My advisor, Professor Utzinger suggested the measurement

of resource flows. We came up with the list of equipment that each student would be given, including the data loggers which he already had. The tools were given to the students on the first full day in Praia.

The data loggers were programmed by Utzinger before leaving the U. S. They measured temperature, luminosity and humidity at 20 second intervals. We thought that giving each student a sketch book and requiring a list of specific assignments would ensure a certain amount of journaling. We decided to get a tape measure so they can measure the house and sketch it. The tape measures had both metric and English units to give them help familiarize them with lengths. We also knew we wanted to run computer simulations of the existing buildings and the design proposals in studio. For that reason, and because this was an international project, we decided that the drawings would be in metric units. Each learner was required to sketch their host family's house, in order to create a computer model when studio began. The next tool in the kit, therefore, was a 15 cm (half a foot) long metric scale. Finally, in anticipation of possible electric light outages, each learner was given a wind-up flash light and radio. It was suggested that they leave that as a gift to the family when we returned to the U. S.

In addition to measuring the building and resource flow, the learners were required to spend as many dinners with their host families. They were told to observe as many aspects of the family dynamic and Cape Verdean society and culture that they could. Thus, their assignments were basic ethnographic work.

Research Questions

Research questions addressed the aforementioned frameworks:

1. Ecological Literacy
2. Cultural Pedagogy – Cultural Studies and Critical Pedagogy
3. Experiential Learning – Situated Practice and the Kolb Model

This generated some important research questions:

1. Is it possible to draw out learners' interest in ecological, cultural and social issues?
    A. Did the project engender the desired engagement of current issues – the ecological, cultural and social issues?
    B. How can that be achieved in a design school – what are the mechanisms to do so?
    C. Did the learners attempt to become more ecologically literate?
    D. Did the learners attempt better cultural understanding?
2. How much of a learner-centered experience was it for the learners?
    A. Did the learners participate in creating content?
    B. How were learning activities cycled through the Kolb model?
    C. How useful is immersion in meeting these goals?
    D. What are the qualities that make Cape Verde, the context for this project, ideal for such an immersion?
    E. Did such immersion enhance the learners' ability to engage in the ecological issues?
    F. Did it provide useful learning about the culture?
    G. Did it include unconventional representations and evidence, to describe and illustrate subjective experiences and social practices?
    H. Did it include opportunities to critically engage in the context?
    I. Would this sort of immersion be useful closer to home, or is the remote nature of the immersion important?

3. Did these ecological, social and cultural issues influence their ideas about design?
    A. Was such engagement in those issues evident in their documentation and analyses, or in their syntheses and design approaches?
    B. How did this manifest in their work– both in the documentation/analyses phases and in the design/synthesis phases?
    C. Was there evidence in their narratives, journals and other recorded data to indicate that the learners were discussing or engaging these ecological, cultural and social issues?
    D. Did it also influence the "outcomes" of the design class?
    E. What was the connection between larger issues and the learner work - their analyses, syntheses and designs?
4. Finally, are there immediate, intermediate or long-term changes in the learners' attitudes to these issues?
    A. Did it inform their plans for their academic and professional careers?
    B. Did it have an effect on their design philosophy or outlook in life?
    C. What was the change in their writing and discourse with regard to these issues?
    D. Did it help the learners make connections to larger global issues?

Data Collection &Analysis: Outline of Approach

This study makes use of a flexible design research strategy. It is part case study, since the observation of the learners during the study abroad program and the design studio is, in essence, an attempt to develop detailed, intensive knowledge of a single case. It is a case study of the situation: learning that occurred during the study abroad and design studio. There are thus, two contexts: the study abroad location and the design studio. Techniques for collection of data were mostly qualitative – primarily through interviews, observation and analysis of documentation, culminating in a narrative description of

events. These were followed by subsequent interviews at the end of the project and one year later. The main context of the case study was the learning occurring during the study abroad and in the design studio. Therefore, primary sources were considered those data that demonstrated when learning occurred. Due to the pedagogic approaches employed, the reflexive reporting of the learners on their learning constituted the demonstration of learning.

Some of the data analyzed was gathered by the learners, the participants in the case study. However, the focus is on their interpretation of that data. They, for their part, were engaged in ethnographic study. They used quantitative methods; measurement of physical conditions and observation of material evidence and simulations. They also used qualitative methods, such as narrative auto-ethnography while immersed in the community. They lived in the homes of the families that they were studying and participated in the activities that they were observing or measuring. Finally, there is an element of grounded theory, since there is also an attempt to generate a theory that could inform the teaching of design, especially design that engages ecological and social issues. The following is a list of the data sources:

Primary Data

The primary data in this work are the interviews and writings of the learners. I also conducted exit interviews at the end of the design studio in the spring of 2011 and year-later interviews in the spring of 2012. Narrative pieces were interspersed throughout the time-line of the project. These were their reactions to the following:

1. The first data points were entry essays of about 4 to 9 pages, written by learners prior to the beginning of the Cape Verde Study Abroad program. These were written in response to a book chapter that discusses the history of urban growth and sustainability, as well as the changing interrelations between cities and their surroundings (White & Whitney, 1992).
2. The second data points were the first set of interviews; carried out in Cape Verde by the CI.DLOT[55] staff captured in video recordings. The video recordings were made by a filmmaker who accompanied us on many of our excursions.
3. The third data points were summaries of the learners' journal entries that they made the week they returned from Cape Verdes. These narratives were written by the learners as a web log.
4. The fourth data points were the narratives that accompanied the analysis and documentation of the existing conditions of their host families homes and neighborhoods. This summarized their experience and impressions of those existing conditions, alongside that data they gathered. These form half of the project book which is pending publication.
5. The fifth data points were the writing by learners about how their experience and impressions in Cape Verde affected their design decisions as indicated by their end-of-studio presentations. This forms the other half of their project book.
6. The sixth data points were interviews of learners immediately following the design studio in spring of 2011.
7. The seventh data points were interviews of learners recorded a year after the end of the project in spring of 2012.

A key observation is how the learners' outlook with respect to ecology and culture changed. This would indicate change in knowledge of place and how much they attempted to determine the content in the course. Both of these are driven by the context, the experience of immersion itself and current affairs – the social and ecological issues with their local and global implications. The narratives and analyses by

the learners were quite subjective. Even the quantitative data are partial, because it occurs in a short period of time – two and half weeks, in the dry season. As such, it cannot be seen as representative. Furthermore, any local instances of global processes were included. Any distinctions between local or global processes were equally subjective, since they were intermingled within the context. Besides, the contrast may be irrelevant because "where would one locate the global in order to study it?" (Tsing, 2005, p. 3).

Secondary Data

The secondary data are mostly from the work of the students. They include the quantitative data documented by the learners while in Cape Verde, including drawings, charts and other material used to describe and illustrate the existing conditions. They also include descriptive and illustrative materials for their design responses when they were in the studio. The existing conditions data collected by work of the learners could be put into four categories;

1. Contextual issues – site, geographical, geological, climatic and other issues of interest to the learners.
2. Standard design practices – typical materials, practices and spatial uses and other practices of interest to the learners.
3. Resource production, use and disposal – energy, water, food, waste and other resources of interest to the learners.
4. Access to social services – transportation, communication, clinics, schools and other services of interest to the learners.

Important aspects of this are the data that the learners collected: how that described and illustrated the context – helping them to know the place. Another question is how

they determined the content, by what additional data they collected and how certain types of data were privileged over others – in the presentation of the quantitative data and in their qualitative characterizations of those data, as well as their impressions of them. Also important is how much incidental information entered their data and narratives – the amount of situated practice information they acquired. Also of interest is how their descriptions of their hosts' social practice involved situated practice. Finally, there is the degree to which the learners engaged in richer learning experiences by using multiple learning types. For instance, the immersion itself could be considered a series of concrete experiences in the Kolb model. Their design proposals would broadly fit into Kolb's characterization of active experimentation.

The learners' proposed designs for their host families, with the diagrams, drawings and other graphical representations, are also secondary sources. In addition to these individual design responses, the learners worked in teams to developed community-wide design responses and prototypes of equipment that could help alleviate the resource challenges faced by their host families.

These secondary data served to round out the primary data – providing more contextual richness.

1. Journals written by learners while in Cape Verde with:
    A. Observations of resource flows – water, energy, food and waste
    B. Observations of everyday social interactions and cultural behaviors
    C. Observations of the material conditions – including artifacts, either considered art or everyday objects, within host families' homes, in the neighborhood and elsewhere in Cape Verde

2. Measurements taken by learners of:
    A. resource use in existing buildings of their host families
    B. the temperature and luminosity of the house
3. Graphic and diagrammatic representations, including measured drawings, by learners of:
    A. the existing buildings of their host families
    B. the building proposed by the learners
4. Simulations run by learners that compared the following:
    A. existing buildings of their Cape Verdean host families
    B. building proposed by the learners

Supplemental Data

These data include observations of their activities in both contexts. There were numerous photographs taken by the learners and my advisor, Professor Utzinger. Most of these were taken while in Cape Verde but a few were also taken in the design class. There were also video recordings made by the aforementioned filmmaker at random and whenever we went on group trips during the Study Abroad. Some of these recordings occurred during periodic meetings at the University of Cape Verde or on trips outside Praia for visits to experience the culture and history of Cape Verde. The main purpose of the supplemental data was to help establish the mood of the learners, where necessary if the primary or secondary data lead to conflicts, inconsistencies or anything inconclusive.

1. Photographs taken by and of learners while in Cape Verde in lectures, during tours and meetings
2. Audio and Video Recordings of learners while in Cape Verde in lectures, during tours and meetings

Data Analysis and Results

The analysis focused mostly on the primary data – the interviews and writings. Sometimes secondary and supplemental data was presented to enrich the findings from the primary data. Much of the secondary data included analysis, because it is mostly data collected by the learners. Hence, their subjective reporting was embedded – done in a self-reflective way. The supplemental data (photographs and other video recordings of the learners while in Cape Verde), were mainly to observe how they responded in social settings, including how they reacted in social settings.

Reporting & Interpretation

The data are reported in multiple ways, in response to the multiple ways that they were gathered. The main way is through narrative exposition of the events that unfolded in the course of the study abroad program and the studio, as well as the event that the students reported in the year-later interviews. Interpretation was ongoing and occurred as the data was being collected. Instant evaluation and interpretation was necessary for the ethical reasons in the first part of this document, the evolving pedagogical goals as determined by all involved in the Cape Verde project.

Presentation of Findings

The whole endeavor and the findings are presented mostly in narrative form, bolstered with excerpts from the various data sources mentioned previously. The narrative includes some comparative illustrations, to show how the views of learners on ecological, cultural and social issues, as well as their design approaches evolved or

differed from those of their peers. They are presented in a way to shed light on the research questions that address those issues. Thus, the presentation continually makes reference to those questions. References to relevant literature and the data sources are also made where necessary.

Validity

Validity is traditionally difficult for research that depends strongly on qualitative research; however, this should not be a concern in this case for several reasons. Cape Verde was an ideal context because the learners were able to assess or estimate the resource flows with decent accuracy or plausibility. The relatively small size of Cape Verde allowed for such assessments. It was also ideal because it possessed many characteristics of many urban areas in the global south. Thus, the project is very specific because it was designed to focus very strongly on the context.

Validity was addressed with triangulation, face validity and catalytic validity. Triangulation of the various data sources has been discussed above. Patterns and counter-patterns will be discussed in chapter 9. Face validity was not achieved by explicit checking with participants on their earlier responses. It was achieved rather, by "recycling" the "tentative analysis" of earlier data with the students during the year-later interviews (Guba & Lincoln, 1981, p. 110), (Reason & Rowan, 1981, p. 248).

The most important form of validity in this dissertation is catalytic validity (Reason & Rowan, 1981, p. 240). Much of the discussion in the chapter 9 is of this nature. The Cape Verde project was conceived to "conscientize" the students (Freire, 1993, p. 67). Equipped with better knowledge of reality, they are better able to transform it. The

author makes no pretense of researcher neutrality. Beyond the assumption that observing a phenomenon alters it, the Cape Verde project was undertaken with the explicit intention of altering the participants' world view (Lincoln & Denzin, 2003, p. 191).

Generalizability

The project can be replicated in other contexts, precisely because the work that learners did within the framework is heavily dependent on the context. In a different context it would also depend on whatever individual predilections the learners bring to bear, as well as the group dynamic. The design studio could remain an ideal context for this investigation, since it is part of an educational institution – but a setting where experimentation is encouraged. The design studio is similar to a science laboratory since it allows for the investigation of quantifiable phenomena, but it is also like an art studio where inquiry into the less tangible occurs.

Evaluations and Reflections

Evaluation and assessments served the goals of the learner and the learning outcomes, not simply the goals of replicating the same set of guiding prescriptions. Learners, individually and in groups, determined the course of action. Sometimes the learners were assigned to groups but mostly they selected to join one or more groups, based on their interest in projects. Learners reflected on the project – mainly giving their sense of the experience, what they learned, and how they learned.

Critically, they opined on the extent to which the fully contextualized immersion took the ecological, cultural and social issues into account. They discussed if and how

the learner-centered, constructivist approach helped to provide a richer learning experience. For instance, was there a change in the power balance between teacher and learner? Did such a change engender learner participation in generating content and charting the direction of the learning? In addressing these and other research questions, what lessons can be learned?

Cultural Immersion: Cape Verde Study Abroad

When the idea was originally discussed, there were several possible contexts in the global south where this project could have been located. Most of the potential sites were considered because of personal contacts and connections. But as time went by, and with further study, Praia became more inevitable as a site. While Praia exhibits many of the characteristics of cities of the global south, characteristics which are discussed below, Praia had three other traits that made it an ideal choice. First, colleagues at the University of Cabo Verde were ready to collaborate on the project, including finding host families. Second, although Praia exhibits typical characteristics of growing cities in the global south, the city is small, under 200,000 residents. Its small scale meant that students could be dispersed throughout the city while maintain a connectedness and the ability to conceive and experience the entire city in a few weeks. Third, Cape Verde is a stable democracy.

Praia

Praia is representative of the global ecological, social and economic issues discussed earlier and the challenges of resource use. While more examples of unsustainable urban areas are found in the global north, much of the current urban growth is occurring in the global south. There does not seem to be any way of stemming that flow. As such, a better understanding of ecologically responsive ways of building community necessitates the investigation of these issues in such cities like Mexico City, Rio de Janeiro, Mumbai, Dhaka, Lagos or Cairo and other places in the global south.

> *These cities account for a high share of the world's resource use, energy consumption and environmental pollution. Many have a global reach and draw their resources and energy from distant lands, with enormous aggregate impacts on the ecosystems of those lands.*
>
> *– World Commission on Environment and Development*[56]

Urban areas and their suburban satellites are large contributors to the emissions and a large percentage of people in more developed countries live in cities. This is a source of concern – and an expanding one: In recent decades, world-wide urban population has grown 20-30%.In 2003 it was estimated half of humans will live in urban areas by the year 2015 (UN-Habitat, 2003). That “invisible milestone” was crossed sometime in 2009 (UNDESA/Population Division, 2009). However, because of the densities of large urban centers, it has been argued that they are more ecologically sensitive (Owen D. , 2009). For instance, New York City’s per capita ecological footprint is less than 30% of the American average (PlaNYC, 2007). However, one must consider that cities have global relationships and impacts (Wheeler, 2009, p. 854).

Hence, claims of sustainable cities ignore the indirect impacts of a large metropolis and merely illustrates how much more untenable suburban living is. When growth occurred in more developed countries it was almost all rural to urban migration, while in less developed countries, 60% of urban growth is due to the natural growth of the cities. Although urban growth in less developed countries has been more rapid, it has come without the concurrent industrialization witnessed in more developed countries (Landsberg, 1981), (Givoni, 1991). This means that the prospects for high technology solutions, under consideration in the global north, are less likely in the global south. Furthermore, a large percentage of this urbanization involves informal settlements and the interactions that support these communities occur in the informal economy (Schneider & Enste, 2000). Problems that exist in the global south that are much rarer in the north are concealed households, explosive urban growth, displacement due to conflict and natural disaster (Hamdi, 2010, p. 8) – although as the effects of Hurricane Katrina in Louisiana and other nearby states showed, even these distinctions are becoming less sharp. Other forms of displacement such as social isolation, gentrification and socio-cultural homogenization are common urban phenomenon in the north and the south.

Likewise, there exists in all cities, various forms of social problems, such as; poverty, inequality, inequity, inadequate infrastructure – the difference tends to be one of degree. Furthermore, they also have ecological degradation in common – and here once again, there are differences of type and scale. In the north, ecological damage is most often associated with a century and half of industrial pollution and development,

leaving a legacy of toxic damage, while in the south it is more a question of break-neck rapid growth in population and (in some cases) industrialization. As such, even if the technology is not as polluting as the technology of the past, the sheer speed and magnitude of the industrial growth threatens to overwhelm the ecosystem (MacKay, 2009), (Smil, 2010).

Sustainable Development

It was long assumed that after an initial uptick, population declines with industrialization, due to health improvements, greater affluence and longer life-spans (Knox, Agnew, & McCarthy, 2008, p. 36).The population growth models for recently industrializing nations such as Brazil, Russia, India and China indicate that they will not follow that trajectory quite so well. Russia experienced a precipitous decline apparently unrelated to its recent prosperity. It may be related to the pace of privatization and the dissolution of the social safety net. The other three continue to grow – especially India. Certainly there are many factors, but the bottom line is that they have not followed the trajectory predicted by economics models. There is no easy explanation for the trends in the countries of Southeast Asia either. The traditional method of technology transfer has proven to be problematic as well, and ideas about changing the mindset of people are best approached cautiously.

> *To open to civilisation the only part of our globe which it has not yet penetrated, to pierce the darkness which hangs over entire peoples, is, I dare say, a crusade worthy of this century of progress… – Adam Hochschild*

This sentiment expressed by King Leopold II (Hochschild, 1998, p. 44), did not raise many eyebrows when it was uttered in 1876. Even now the sentiment can be understood as well-intentioned – Leopold's ulterior motives notwithstanding. What followed from Leopold's statement was the first genocide of the 20th century, resulting in over 10 million killed – millions more maimed and lamed if they did not meet the routine quotas for various resources. The recent labor-related problems with garment workers in Bangladesh and technology workers in China, illustrate the persistence of these issues (Butler, 2014), (Moore M. , 2012). The broader lesson is that any attempts at development must be made carefully.

However, development will occur in the global south, as I have already argued. There are obvious ethical problems if more developed countries were to propose denying or curtailing economic growth to less developed countries. That would, in effect, be like pulling up the ladder behind them once they had climbed up. Besides, there is the colonial legacy of more developed countries having tapped the resources of less developed ones. Protestations that the colonial period was brief ignore that it coincided with, and therefore supported, the immense industrial growth that occurred in the last two centuries. However, if the current rates of consumption continue (or accelerate as they appear to be), available resources will not support such development. Also, the planet's ability to recover from the effects human consumption will become diminished.

As resources are stretched, existing infrastructure may deteriorate in the global north, forcing people to live in ways similar to those in the global south. As such, it will

be necessary to understand how to continue to live in those circumstances – without the guaranty of on-demand amenities such as clean pipe-borne water. It is clear that the human race cannot continue to use resources at the current rate. Even if peak oil predictions (Hubbert, 1956) are inaccurate as some have argued (Demin, 2000), it still does not negate the fact that per capita and overall rates of consumption are increasing (Smil, 2010).

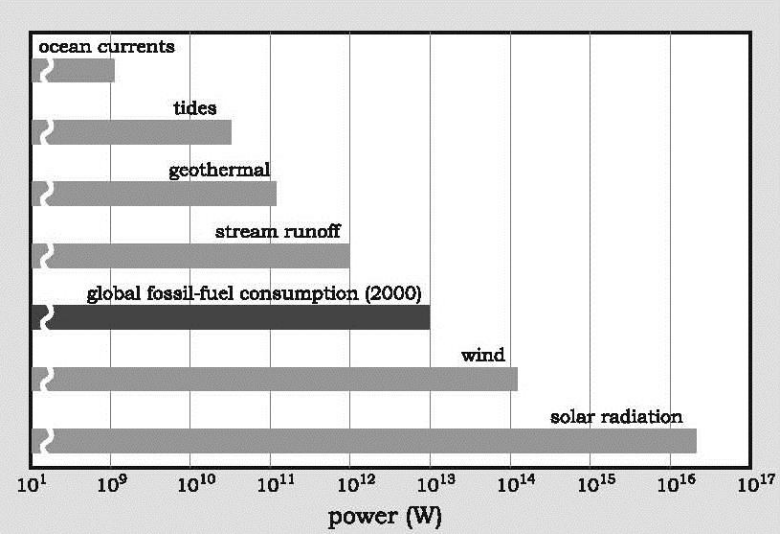


Figure 1: Global flux of renewable energies compared with global fossil-fuel consumption. Source: (Smil, 2010).

As Figure 1 shows, the current power consumption rate is higher than the known potential for most renewable sources except for wind and solar. Further, Smil claims that technological hurdles still remain before those two can rise to meet that need. Contrary to popular belief, renewable sources are not completely benign (Smil, 2010), as they also have the potential for ecological and other detrimental effects. More importantly, it is not clear their full potential will be realized due to the power densities of those sources. Then there is also the time required to ramp up such technologies – not to mention the political and economic hurdles that need to be overcome.

Yet, the rates of consumption are still rising, meaning that even more resources will be required. As such, there are lessons to be learned from life in cities of the global south, where access to energy and other resources is tenuous, intermittent or non-existent. Every day people in urban areas of the global south manage to acquire these resources or live without them. Their way of life can be instructive to those in the north who have long forgotten how to do without these resources. And because the population in those areas is growing at phenomenal rates – as are their rates of consumption, they present good studies in scarcity and resourcefulness.

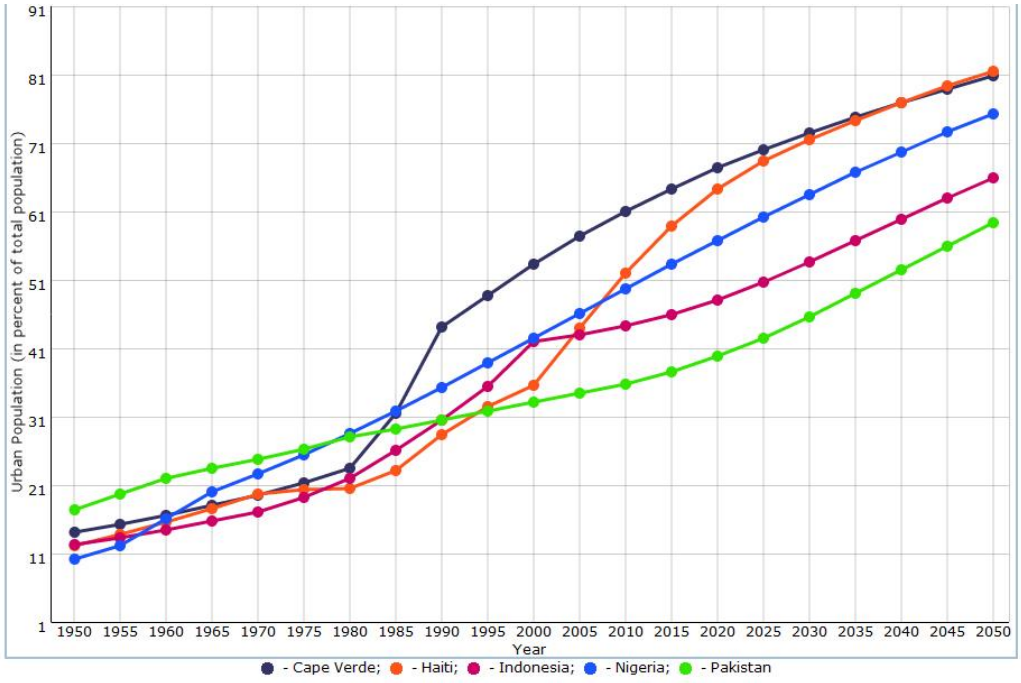


Figure 2: Urban Population in Cape Verde and Other Countries.
Source: (UNDESA/Population Division, 2008).

Praia was chosen because it is representative of other global south cities such as Mumbai, Karachi, Cairo, Lagos, Jakarta, Shanghai, Port au Prince, Rio de Janeiro and Mexico City. These cities have explosive growth in population and much of that growth is in settlements begun by regular citizens and not neighborhoods planned by their

governments. They often have no access to city services and are not directly part of the city social and political life. Services are provided and commerce is typically carried out in the "informal" sectors of the economy (Schneider & Enste, 2000).

Praia has all the difficulties and problems, as well as the assets and opportunities present in the other cities, without the mega-city status. Its population growth is similar: Cape Verde had an urban population of 14.2% in 1950.By 2010 it was at 61.1% and is expected to top 80% by 2050 (UNDESA, 2010).This trend is similar to that in many other countries as shown in Figure 2.

Figure 3: Comparing Praia with other cities.
Praia, CV, (top left with a density of 1,400/km^2), Port au Prince, Haiti, (bottom left – 26,122/km^2), Milwaukee, WI, (top right – 1,400/km^2), and Portland, OR (bottom right – 1,720/km^2) Source: Google Maps and (Brinkhoff, 2013)

Figure 3 shows the satellite maps of Praia, Port au Prince, Haiti, Milwaukee WI, and Portland, OR. All cities are shown at the same scale and provided with associated

population densities. The whole city of Praia occupies an area equivalent to the downtown area of Milwaukee and a few near neighborhoods.

It is a very walk-able city. Thus, learners could be placed in different neighborhoods around the city. They could learn about the resource use of their host families, acquire a feel for Cape Verdean culture by observing their neighborhood and yet have a sense of the broader social and economic context of the city. Furthermore, 42% of Cape Verdeans live in Praia, 41% of Haitians live in Port au Prince, compared to 8% of Americans living in its largest metropolitan area, New York (World Bank, 2014).

Many of Praia's neighborhoods were not planned by the city government. These communities do not thrive in spite of negligence by city government – they are indifferent to the city government. The city administrations are often hostile to the very existence of such settlements and some cities actively try to destroy them. A case in point: Inferno in Praia has been subject to attempts by city officials to demolish the homes of its inhabitants. Inferno does not appear on any official or tourist maps of the city – officially it does not exist. This may be understandable as this is a fairly new community without access to any city services, such as water or sewer systems. However, Calabaceira and Eugenio Lima both of which have many such services and have been settled for decades with bustling populations in the thousands, do not appear on the maps either. Buses and taxis stop at the edge of Inferno. In Inferno, people use the nearby mountainside as a public toilet. Water can be purchased once a week from a water tank in the neighborhood but it is not enough to meet the

community's needs. A burst pipe that traverses the community is the more reliable source.

Figure 4: Student Assignments by Neighborhood.
Source: CI.DLOT.

Most homes have electricity but the usage is minimal – a light bulb, a refrigerator and sometimes a television. Regardless, Inferno is a close-knit and safe community. There are no crime statistics but anecdotal reporting indicates that they feel safer than their neighbors in the government-planned neighborhood of Terra Branca just to the south. These sorts of characteristics can be found in similar neighborhoods in other cities. Instead of such hostility as exemplified by the city officials, we should be learning from them. One of the purposes of this research is to learn what potential neighborhoods in Praia like Inferno, with a strong sense of community, have of

becoming more sustainable and ecologically based, while improving their access to resources.

The more we looked at Praia, the more it recommended itself. Cape Verde is a West African nation made up of ten islands. It provided a context where resource flows can be relatively easily observed, measured or at least estimated with decent accuracy. By limiting the bulk of our experience to Praia, with a few excursions to the rest of the island of Santiago, we felt that it would give the learners a good sense of the culture and environment. The relatively small size of Praia, in terms of area and population allowed the learners to get a good sense for the city in half a month. The immersion involved living in homes, where learners observed the culture, engaged in social commerce and documented resource flows.

Study Abroad

> *The language barrier was huge. You have to enter into this foreign space - somewhere where you don't know anything about the culture, the language. You're going in blind and just observing everything for the first time. So I think that you're very aware of what's going on and you can see everything that there is - or at least more of what there is. – Learner*

The traditional anthropological view is unattainable. One is never fully immersed because one cannot abandon one's habitus for the duration of the immersion (Stevens, 1998, pp. 52-53), (Bourdieu & Wacquant, 1992). One brings it along, using it to reflexively engage a new field – even as that habitus is altered in the new field. This is fundamental to the pedagogical goals. The appreciation of such subjectivity by the learners meant they were more likely to respect local knowledge, in the form of

evidence, subjective experiences and social practices typically disregarded or considered marginal. Equally important, the immersion was designed to disrupt the doxic environment of the design student (Stevens, 1998, p. 56) – to alter their uncontested and accepted "daily lifeworld."

We visited Cape Verde during the winter session. We documented observations of the built and natural environment as a context for social relations and potential sustainable resource uses. Our local partners were the Research Center in Local Development and Territory Planning at the University of Cape Verde (Centro de Investigação em Desenvolvimento Local e Ordenamento do Território, Universidade de Cabo Verde or CI.DLOT). The host families were assigned by CI.DLOT. Students were allowed to select their buddy from the group and we tried to assign each buddy pair to the same or adjacent neighborhoods. The students lived with families in various Praia neighborhoods and attempted to understand how Cape Verdeans use the land and sea to provide shelter, food, energy, water and other resources.

Study Abroad Itinerary and structure

The itinerary for the study abroad program in Praia is presented in Table 1 . While the itinerary was specific, events were somewhat unpredictable. For instance we were scheduled to arrive in Praia at 11.30 am. However, because the plane was late, we did not arrive until 3.30 pm. As such, the scheduled briefing of students and time to get acquainted with host families could not occur. The students were hurriedly driven to their host families' homes and summarily dropped off, the last of them deposited after sunset.

Table 1: Study Abroad Itinerary – Week 1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
	3	4	5	6	7	8	9	
Early Morning			– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	Early Morning
Morning [08.00-12.00]	**Depart from Milwaukee** 09.30 …; Meet at Mitchell Airport. Please try to make it… espcially if the wether is bad. So check the weather on Saturday and make sure you have a fool-proof way to get to the airport. We will try and get on earlier flight(s).	**– 11.25; Arrive in Praia** Host families receive the students in the airport. **12.00-12.30; Briefing by Naya - give initial information - what to look out for, general layout and precautions**	08.00 – 12.00; Meet for 4 hours; cover what we need/how we will work. Discussion of data – what we already know and framing questions; history, culture, climate, standard design practices, resources, systems, infrastructure, etc…	08.00 – 09.00; Meet for 30 minutes; briefing – prepare for day's activities.	08.00 – 09.00; Meet for 30 minutes; briefing – prepare for this day's deliverables.	9:30 Trip to Rui Vaz(with the families/only one family member)	08.00 – 09.00; Meet for 30 minutes; briefing – look over previous day's data (homework) and prepare for this day's deliverables.	Lunch Time
				09.00 – 12.00; Student work; engage in the assigned research for the day – approximately 3 hours	09.00 – 15.00; Student work; engage in the assigned research for the day – approximately 6 hours. Lunch at student's discretion and expense	Monte Tchota (walking) caminhada passeio (caminhada monte tchota a rui vaz)	09.00 – 15.00; Student work; engage in the assigned research for the day – approximately 6 hours. Lunch at student's discretion and expense	Afternoon [14.00-17.00]
Lunch Time		12.30-13.30; Students go to their respective houses - drop off luggage	12.00 – 14.00; Phone calls home/Free time.	12.00 – 14.00; Lunch with group at Café Sofia		13.00 –…; Lunch at Quinta da Montanha Restaurant		
Afternoon [14.00-17.00]	Boston - in transit	13.30-15.30; Welcome lunch in Cidade Velha	14.30- 17.30; Welcome workshop Campus Palmarejo CIDLOT + Africa 70 + CMP	14.00 – 15.30; Palmarejo UniCV Students presentation about Praia				Late Afternoon [17.00-20.00]
		15.30 – 18.00; Tour of Cidade Velha.	16.30…; Coffee break CIDLOT DAHCV	16.00 – 18.30~; Tour of Praia.	15.30 – 17.00; Meet for 1 hour; debrief – the day's activities and prepare for the morrow.	17.00~; Return to Praia.	15.30 – 17.00; Meet for 1 hour; debrief – scan some notebook entries. Discuss day-trip for the next day.	Dinner [20.00-22.00]
Late Afternoon [17.00-20.00]		18.30 - 19.10; Meeting with the UniCV students that will help in the fieldwork;	18.00 – 20.00; Free time.		17.00 – 19.00; Phone calls home/Homework/Free time.	17.00 – 20.00; Phone calls home/Homework/Free time.	17.00 – 20.00; Homework/Free time.	Evening [22.00…]
Dinner [20.00-22.00]		19.20 - 22.00; **Phone calls home…** Dinner – spend time with host family (meal-time will vary).	20.00 - 22.00; Dinner with host family…	19.00…. Happy-hour at Espaço K	20.00 - 22.00; Dinner – spend time with host family, dinner/socialize (meal-time will vary).	20.00 - 22.00; Dinner – spend time with host family, dinner/socialize…	20.00 - 22.00; Dinner with host family…	Dinner [20.00-22.00]
Evening [22.00…]	**11.50…; Depart from Boston** Depart Logan Airport for Praia, CV.	22.00 – …; Student free time… recover from flight… settle in.	22.00 – …; Free time after dinner – students are encouraged to attend cultural/social events.	**21.00: Students staying in inferno advised to head home before this time - no bus, no taxis, general safety**	22.00 – …; Student homework – organizing data gathered during the day and free time.	22.00 – …; Student homework and free time.	22.00 – …; Free time.	Evening [22.00…]
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	

Table 5 (contd.): Study Abroad Itinerary – Week 2

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
	10	11	12	13	14	15	16	
Early Morning	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast	Early Morning
Morning [08.00-12.00]	08.00 – 09.00; Meet for 30 minutes; briefing – prepare for the day's activities.	08.00 – 08.45; Meet for 30 minutes; look over homework and assign new work.	08.00 – 08.45; Meet for 30 minutes; look over homework and assign new work.	08.00 – 09.15; Meet for 1 hour; looking over data so far collected and determine what else is needed – scan notebooks.	08.00 – 08.45; Meet for 30 minutes; check for data that we don't already have.	08.00 –…; Trip to "Rabelados" (Calheta São Miguel)	08.00 –…; Trip to Tarrafal Visit to the concentration Camp (2USD for ticket) Beach time	Morning [08.00-12.00]
	09.00 – 12.00; Visit to Electra (electric power company)	09.00 – 15.00; Student work; engage in the assigned research for the day – approximately 6 hours. Lunch at student's discretion and expense	09.00 – 15.00; Student work; engage in the assigned research for the day – approximately 6 hours. Lunch at student's discretion and expense	**Holiday in Cape Verde Democracy Day 09.30 …; Free day – spend some time with host family, friends (old and new) join in festivities, observe and enjoy the life around you, have fun… We will have suggestions of places to go and visit**	09.00 – 15.00; Student work; engage in the assigned research for the day – approximately 6 hours. Lunch at student's discretion and expense			
Lunch Time	12.00 – 14.00; Phone calls home/Free time.					12:00; Lunch at Rabeladus	12.00 –…; Lunch at Sol e Luna Restaurant which is on the beach	Lunch Time
Afternoon [14.00-17.00]	14.00 – 15.30; Meet for 1 hour; debrief – the day's activities.					14.00 –…; Trip to Porto Madeira(Santa Cruz)	16.00 –…; Trip to Assomada	Afternoon [14.00-17.00]
	15.30 – 20.00; Phone calls home/Free time.	15.30 – 17.00; Meet for 1 hour; debrief – scan some notebook entries.	15.30 – 17.00; Meet for 1 hour; debrief.		15.30 – 17.00; Meet for 1 hour; debrief – scan some notebook entries.	Visit to Porto Madeira arts monuments	16.30 –…; Breif visit to the National Natural Park of Serra Malagueta	
Late Afternoon [17.00-20.00]		17.00 – 20.00; Phone calls home/Homework/Free time.	17.00 – 20.00; Free time		17.00 – 20.00; Phone calls home/Homework/Free time.		17:00-…; Snack Panorâmico Restaurant (Assomada). Return to Praia.	Late Afternoon [17.00-20.00]
Dinner [20.00-22.00]	20.00 - 22.00; Dinner – spend time with host family, dinner/socialize (meal-time will vary).	20.00 - 22.00; Dinner with host family…	21.00 - 22.00; Dinner with host family (arrange time with host family if attending conference)		20.00 - 22.00; Dinner – spend time with host family, dinner/socialize (meal-time will vary).	20. 00 –…; Cultural Dinner with perfomance of "Batucadeiras"- traditional music and dance crew	20.00 - 22.00; Rejoin host family – dinner. Free time after…	Dinner [20.00-22.00]
Evening [22.00…]	22.00 – …; Student homework – organizing data gathered during the day and free time.	22.00 – …; Student homework – organizing data gathered during the day and free time.	22.00 – …; Student homework and free time.		22.00 – …; Student homework – organizing data gathered during the day and free time.		22.00 – …; Free time.	Evening [22.00…]
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	

Table 5 (contd.): Study Abroad Itinerary – Week 3

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
	17	18	19	20	21	22	23	
Early Morning	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	– 07.30; Breakfast (with host family). Morning Chores.	**Leave Boston** 06.00 …; Depart from Logan Airport.		Early Morning
Morning [08.00-12.00]	08.00 – 08.45; Meet for 30 minutes; look over work and determine what to do for presentation.	08.00 – 08.45; Meet for 30 minutes; look over presentation.	08.00 – 08.45; Meet for 30 minutes; debrief – scan some notebook entries.	08.00 – 09.15; Meet for 1 hour; make sure we have as much data as possible – scan notebooks.	**Departure day**	**Arrive Milwaukee** 07.45 …; Arrive at Mitchell Airport.		Morning [08.00-12.00]
	09.00 – 14.00; Student work; presentation preparations – 5 hours. Lunch at student's discretion and expense	09.00 – 12.30; Workshop with the families (closure meeting). Coffee-break at 10 p.m.	09.00 – 12.30; Closure meeting with the students. Coffee-break at 10 p.m.	**Holiday in Cape Verde National Heroes Day 09.30 …; Free day – spend some time with host family, friends (old and new) join in festivities, observe and enjoy the life around you, have fun… Final group lunch- "Cachupa" - traditional meal, cooked by the host families**				
Lunch Time		13.00 – 14.00; Lunch break.	13.00 – 14.00; Lunch break.					Lunch Time
Afternoon [14.00-17.00]	14.00 – 15.30; Meet for 1 hour; debrief – the day's activities. Rehearse presentation.	14.00 – 17.00; Student present work – approx. 1 hours. Students field questions – approx. 1 hour.	14.30 – 17.00; Closing faculty+CDLOT meeting…					Afternoon [14.00-17.00]
	15.30 – 17.00; Wrap up presentation preparations – approximately 1 hour.				**16.00; Depart for Boston**			
Late Afternoon [17.00-20.00]	17.00 – 20.00; Phone calls home/Homework/Free time.	17.00 – 20.00; Phone calls home/Free time.	**18.00-20.00; Conference proceedings** - optional for students…					Late Afternoon [17.00-20.00]
Dinner [20.00-22.00]	20.00 - 22.00; Dinner – spend time with host family, dinner/socialize (meal-time will vary).	20.00 - 22.00; Dinner – spend time with host family, dinner/socialize…	20.00 - 22.00; Dinner with host family…		20.00; Arrive in Boston late evening - We will once again see about going on earlier flight(s)			Dinner [20.00-22.00]
Evening [22.00…]	22.00 – …; Student homework and free time.	22.00 – …; Free time after dinner – students are encouraged to attend cultural/social events.	22.00 – …; Free time after dinner…		Otherwise, we will bed down at the airport.			Evening [22.00…]
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	

This operation was carried out with some confidence because each student was provided with a mobile phone and instructed to call if necessary. I received one call from a student who informed me that he had just relieved himself on the side of the mountain and was happily showering under the stars. He was just calling to thank me, he said.

Typically, architectural study abroad itineraries include visits to buildings designed by important architects, as well as sites of important cultural value. These sites serve as important precedents in design education. Therefore, architecture students are very attentive tourists at such sites. Visits to culturally significant sites were also important for the Cape Verde. The itinerary included Cidade Velha (Old City), which was the first Portuguese settlement on the archipelago and site of the trans-Atlantic slave trade, as well as the nearby fort which overlooks the town. Also on the schedule was a visit to the concentration camp where independence fighters were detained by the Portuguese colonial authorities during the war of independence in the 1970s. There was also a visit to Porto Madeira, an art colony in the mountains and lunch at Rebelados. The latter is an intentional community where the people attempted to live in more traditional ways. The buildings at Rebelados are constructed of pre-modern building materials. Equally important, were tours of the desalination plant, the power generation facility and a landfill – selected for their relevance to better ecological literacy. During the weekends and holidays, the learners spent time with their host families, traveling to visit relatives, going to the beach or attending parties or parades, engaging in the social and cultural activities typical to each family.

Also included in the itinerary were several lectures at the University of Cape Verde. The lectures were delivered by local architects, planners, geographers and others, many of whom lectured at the university. In addition to the visits to the cultural sites, these helped provide context to the students, to avoid overgeneralization of their own experience as the norm for all Cape Verdeans.

Tools of the Trade

Figure 5: Tools of the Trade
The learners were encouraged to travel lightly and to leave electronic devices, such as phones and laptops at home. Besides a few changes of clothes and some personal effects, they each had 5 tools and instruments: 1) A sketch book. 2) A tape measure. 3) A metric scale. 4) A temperature, humidity and luminosity data logger. 5) A wind-up flashlight and radio. Source: Mike Utzinger.

The structure of the study abroad program differed from usual architectural tours. The learners were required to measure and sketch their host families' houses. The learners carried with them a sketch book with alternating lined and blank pages, enabling them to sketch on one side and to take notes on the facing page. They also brought a tape measure, in centimeters and in inches, to slowly acclimatize them with

metric units, and a metric scale to help them draw their sketches to scale. Their field drawings and architecture drawings were to be done in metric. They were each equipped with a data logger that measured temperature, humidity and luminosity at 20 second intervals. Finally, they each had a wind-up flashlight/radio in case of power failure.

Working

Figure 6: Learner Doing Chores.
Source: Learner's photo.

The learners participated in household chores with host family members. This was important to add richness to the resource and material data that they were collecting. Each learner measured and sketched the house they lived in. Then measured and recorded the resources flows into the house. In addition to measuring the building inside and out, they assessed the conditions of the home. They observed the material make up of buildings and their structural integrity.

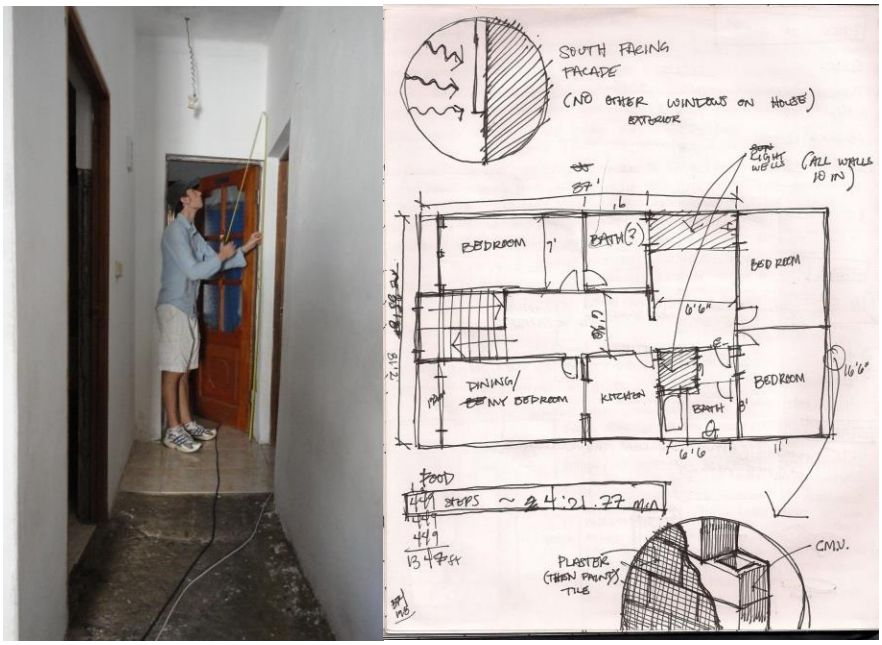


Figure 7: Measuring and Sketching Existing Conditions.
Sources: Learner's photo and notes (excerpt from journal).

Figure 8: Learner Measuring Outside.
Sources: Mike Utzinger.

Figure 9: Learner Observes Unfinished Construction.
Source: Learner's photo.

The learners were advised to notice things that were different from what they are accustomed to, as well as things that they felt were unique about their neighborhoods or homes. Learners were also encouraged to attempt to discover what the opinions of their host families were, with regard to those material conditions. Equally important was availability of resources necessary for life, such as food, water and energy. They also assessed practices around waste. As such, they counted light fixtures, appliances, plumbing fixtures, as well as the number and volume of water collection and waste disposal receptacles. They measured how much water was used in the household and how it was acquired. Whether the water sources were in the home or outside, the nature of those sources were described.

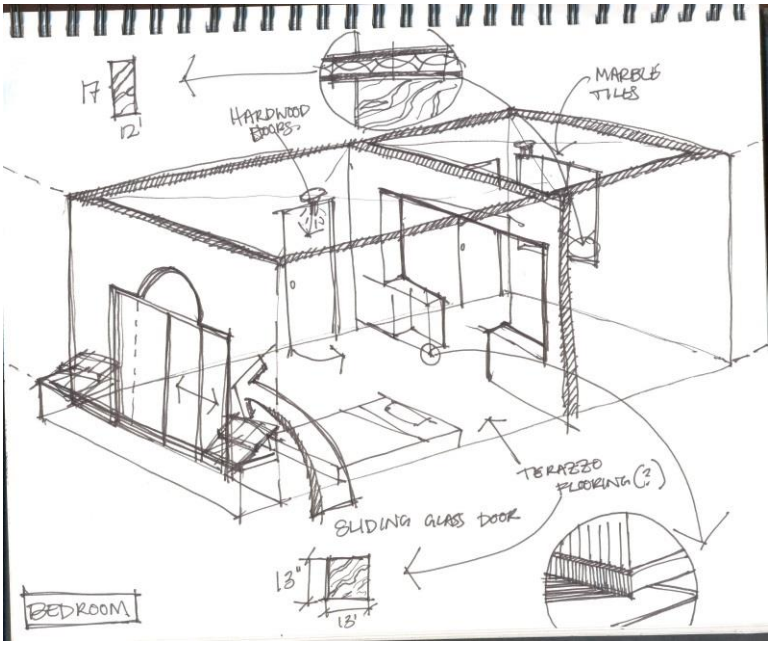


Figure 10: Material Properties.
Source: Learner's notes (excerpt from journal).

The learners noted the necessary distances traveled to access water. Some accompanied their hosts to collect water, to better appreciate the chore. They determined the amount of electricity use and whether they were "legitimate" connections from the power company. They measured the amount of cooking fuel and determined the closest sources of food – which included stores, markets and food grown on site.

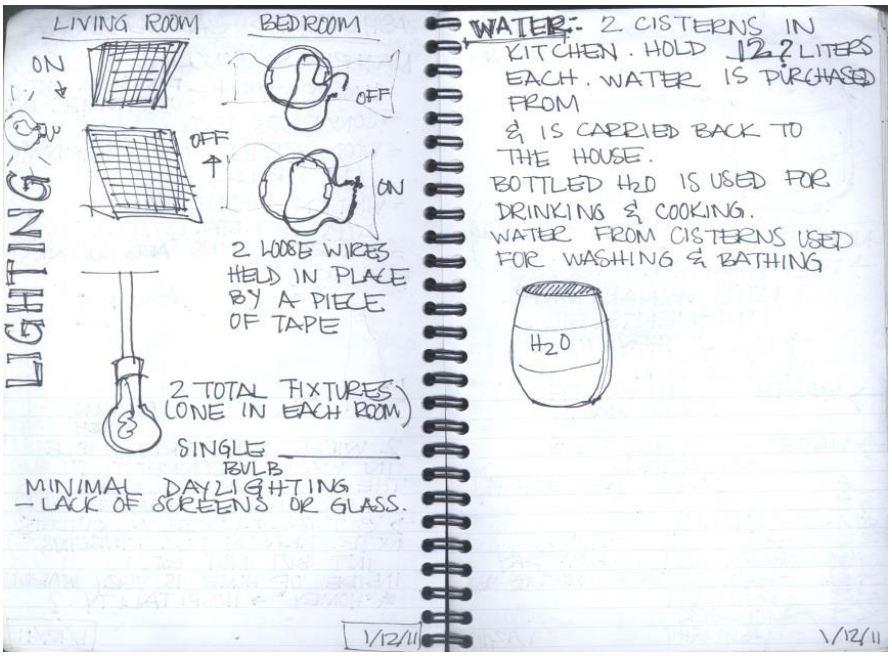


Figure 11: Resource Flows
Source: Learner's notes (excerpt from journal).

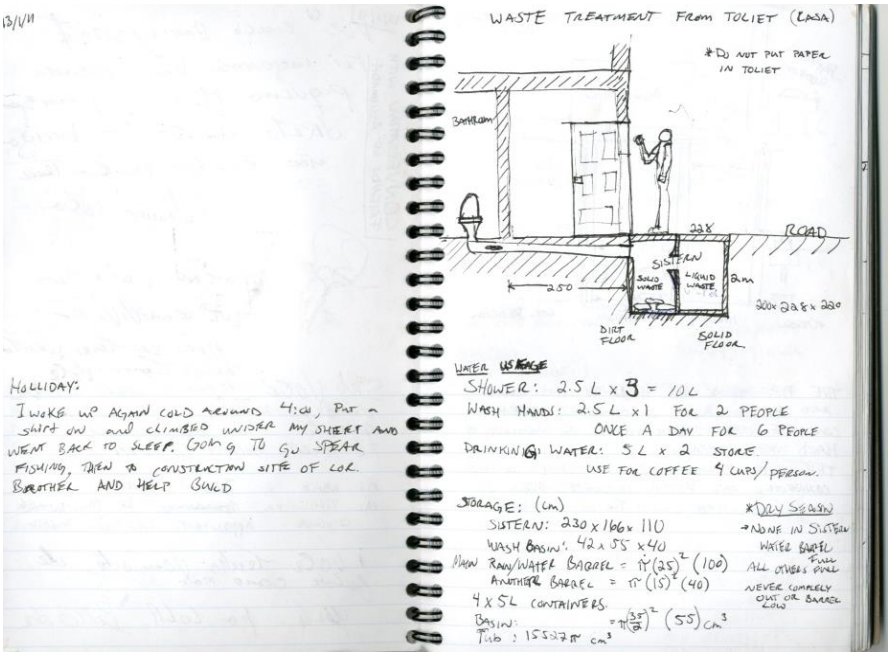


Figure 12: Waste
Source: Learner's notes (excerpt from journal).

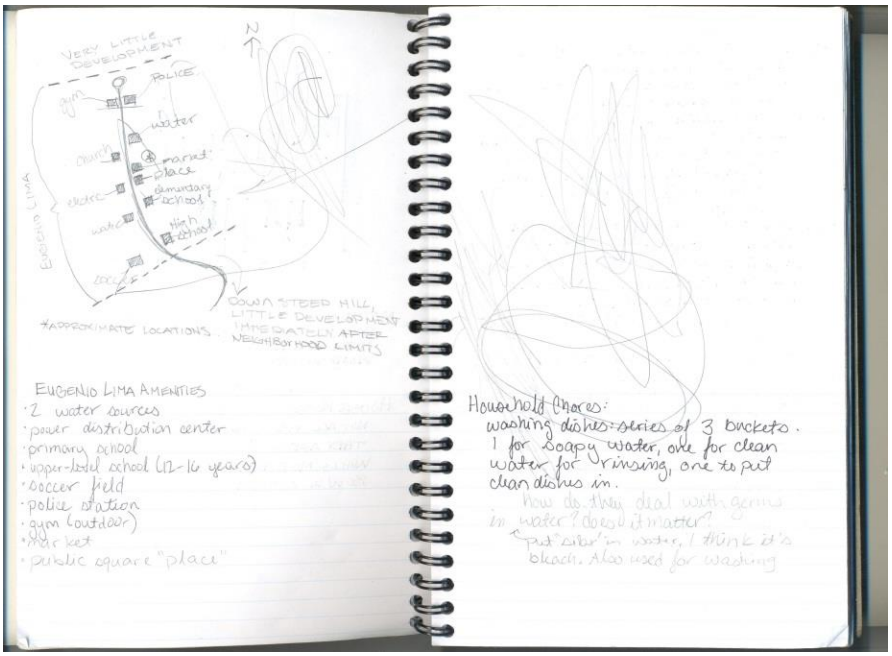


Figure 13: Neighborhood Map with Access to Services.
Source: Learner's notes (excerpt from journal).

They observed and recorded waste production, disposal and/or reuse. Furthermore, the learners were required to map the availability and proximity of various social services and infrastructure in their neighborhoods. These ranged from transportation facilities to community centers and from schools to clinics. The list included many optional items and learners were advised to include things that they felt were particularly of importance to their host families in some way.

Meeting

Figure 14: Learners Meeting in Different Settings.
Source: Learner's photos.

Many meetings were planned for the learners. These included orientation meetings by the local facilitators with fellow learners, host family members and Cape Verdean students. They were allotted ample time to meet with whoever they wished to. These meetings ranged from very formal lectures, with explicit topics, agenda and so on, to informal gatherings to check in on each other and exchange ideas and discuss the ongoing experiences.

Touring

Figure 15: Learners Touring Various Locations of Interest
Source: Learner's photos.

There were two general kinds of tours. One type of tour was a bit touristic. It involved a road trip around the island and a few other short drives to visit various sites of historical and cultural significance. It gave the learners a sense of Cape Verdean identity. They included a traditional village, an artists' colony and the concentration camp were independence fighters were held by the Portuguese during the independence struggle. The other type of tour was to resource supply and infrastructure locations, such as the power station, the desalination plant and a masonry factory.

Being

Figure 16: Enjoying their Host Families and Life on the Island
Source: Learner's photos.

The learners were encouraged to spend time with their host families, to explore their neighborhoods and get to know the city, the island and its people.

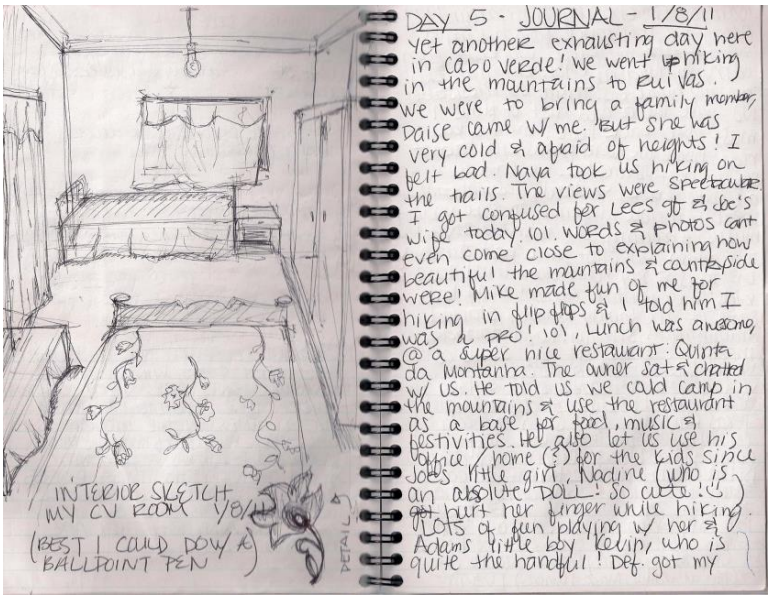


Figure 17: Impressions of Home
Source: Learner's notes (excerpt from journal).

Critical Design: Cape Verde Studio

> *I think there was something about the Cape Verde studio; maybe because of the experience of Cape Verde and because we were made to work together, to explain it to each other and to figure it out together. In other studios, there is always the interaction back and forth working on a project and we critique each other. But in Cape Verde studio there was something there that made it more natural.*

The studio required each learner to design a residence for their host family. They were to do this in ways that were both ecologically sensitive and culturally relevant, and integrated into the fabric of that neighborhood. The designs also had to address; (1) alternative energy production, (2) rainwater collection, purification and distribution, (3) waste treatment and disposal. The learners were also introduced to abstract concepts ranging from literature to films (Anderson, 2010), (Architecture for Humanity, 2006), (McKibben, 2007), (Neuwirth, 2006), (Wexler, 2007). Many of these sources were about various social and ecological issues, often in different contexts. During the month of March, the learners were presented with a series of design charrettes to help them transition from documentation and analysis into synthesis and design.

While the study abroad had considerable structured, to ensure that the learners focused on ecological, social and cultural issues, the studio was much less so. The framework for studio involved all the usual elements of a design studio; twelve hours of required in-class time, desk critiques and occasional reviews, as well as charrettes. And while each learner was required to produce design work for their host families, they were allowed to determine what that meant for each of them. The learners were urged

to respond to the specific contextual issues and the circumstances of their clients. Thus every design decision had to be justified on the grounds that it was an ecologically responsible act, that it was socially and culturally relevant, and economically feasible. So, they had to make a plausible case for the availability of building materials and the relevant construction methods. They needed to have a plan for resource provision and waste management. . They also had to exhibit an understanding of the ecological effects of each design decision, from aesthetic and material choices to issues of resource acquisition and comfort within the home. To bolster their case for decisions related to comfort, they were required to simulate the energy load for the existing building and for their designs on the computer.

Documenting the Study Abroad

Upon returning to Milwaukee, the learners finalized the information gathering process. The first order of business was to produce a document of their stay in Cape Verde. Each page of the book has the Portuguese translation on the facing page. These included detailed narratives of their experience based on their journals, in which their subjective perspective of what occurred was written down.

Rather than clear the site and redesign, I made the choice to renovate because my family would have nowhere to live if their home was knocked down. On top of that the home is in great condition. I chose to give my family amenities that they do not currently have, such as catching and containing clean rainwater, a toilet facility, and a new gardening strategy.

During my short stay in Inferno, I was touched by how people in the community live. I did not see people moping around, or disheartened. I saw a community growing, expanding, and thriving. All of the people that I met were glad to live where they did, and I could see why. The community was a real community. The homes, schools, and stores were all constructed by the residents, and their families. This informed me, when I returned to the United States, I had to design in a way of construction that anyone can build. So if I designed a structure, home, or system, I would have to be able to construct it myself. If I could not build it, how could I expect it to be a feasible building project in Inferno?

The second hurdle for designing in Inferno was the fact that many if not all families were on a tight budget. Using reclaimed, recycled, and landfill bound products would be ideal for any non-structural systems.

Figure 18: Narrative about Host Family
Source: Excerpt from studio document

It also provided them a venue to let the voices of their host families come to the fore. Their narratives were full of reflections on the occasions, events and interactions they had with their host families.

Ao invés de limpar o local e redesenho, fiz a escolha para renovar porque minha família não teria nenhum lugar para viver, se sua casa foi derrubada. Em cima do que a casa está em ótimo estado. Optei por dar a minhas famílias facilidades que não atualmente têm, como captura e contendo água pluvial limpo, um banheiro e uma nova estratégia de jardinagem.

Durante a minha curta estadia no Inferno, eu fui tocado por como vivem as pessoas da Comunidade. Não vi pessoas, deprimido, ou desmotivada. Eu vi uma comunidade crescendo, expandindo e prosperando. Todas as pessoas que conheci ficaram felizes de viver onde eles fizeram, e eu podia ver o porquê. A Comunidade foi uma verdadeira comunidade. As casas, escolas e lojas foram todas construídas pelos moradores e suas famílias. Isso me informou, quando voltei para os Estados Unidos, tive de design em uma forma de construção que qualquer um pode construir. Então, se eu projetei um sistema ou estrutura, casa, eu teria que ser capaz de construir-me. Se eu não poderia construí-lo, como eu poderia esperar que ele seja um projeto de construção viável no Inferno?

O segundo obstáculo para projetar no Inferno foi o fato de que muitas se não todas as famílias estavam em um orçamento apertado. Usando recuperado, reciclado e produtos de aterro limite seria o ideal para qualquer sistema de não-estruturais.

Figure 19: Narrative about Host Family
Source: Excerpt from studio document

The document has as many or more images of family members smiling, as it has of the buildings and their drafted representations of them.

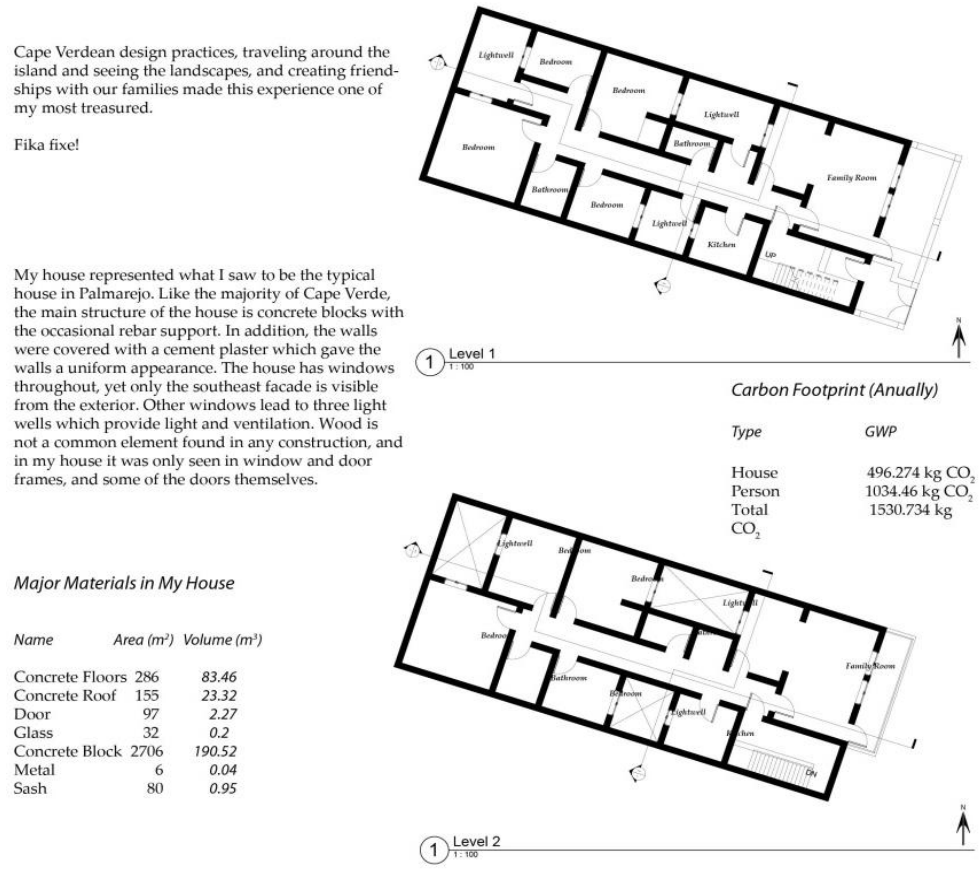


Figure 20: Floor Plans
Source: Excerpt from studio document

The learners produced drafted drawings showing the existing conditions of the host families' houses. These drawings were based on the measurements taken and sketches made while still in Cape Verde. Each learner was equipped with a temperature and luminosity sensor. This charted the daily temperatures and the amount of daylight the homes received during the study abroad.

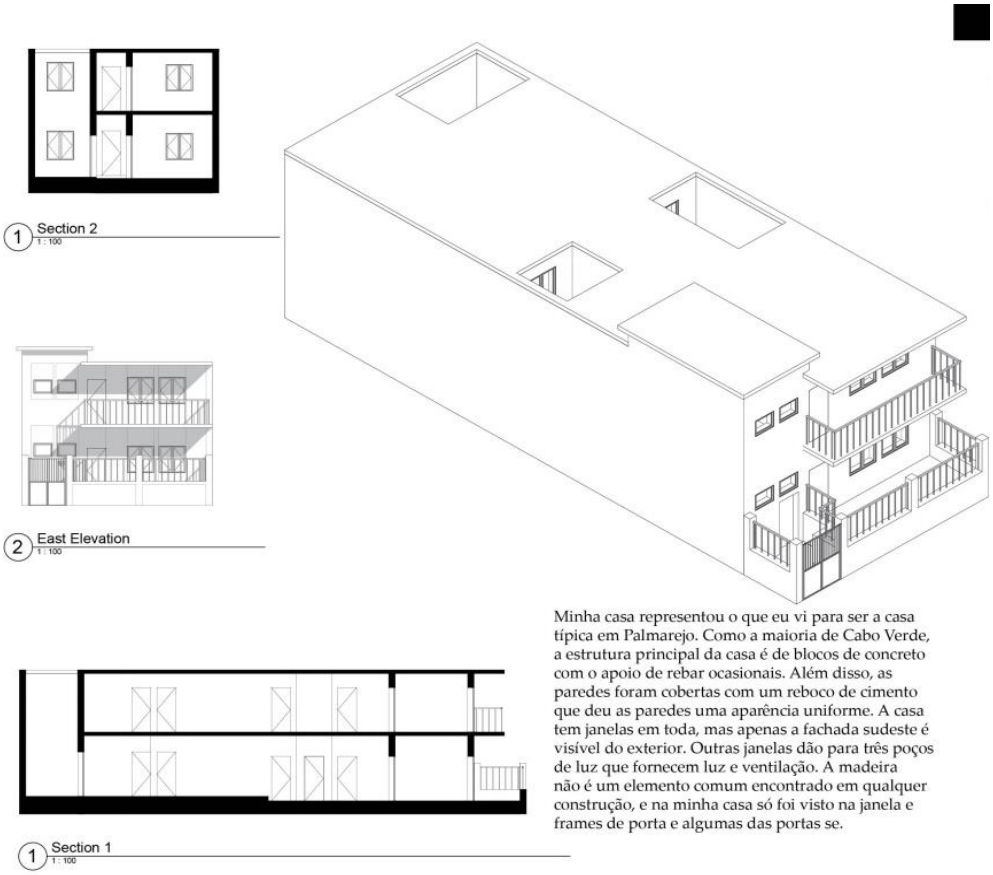


Figure 21: Sections and Axonometric.
Source: Excerpt from studio document

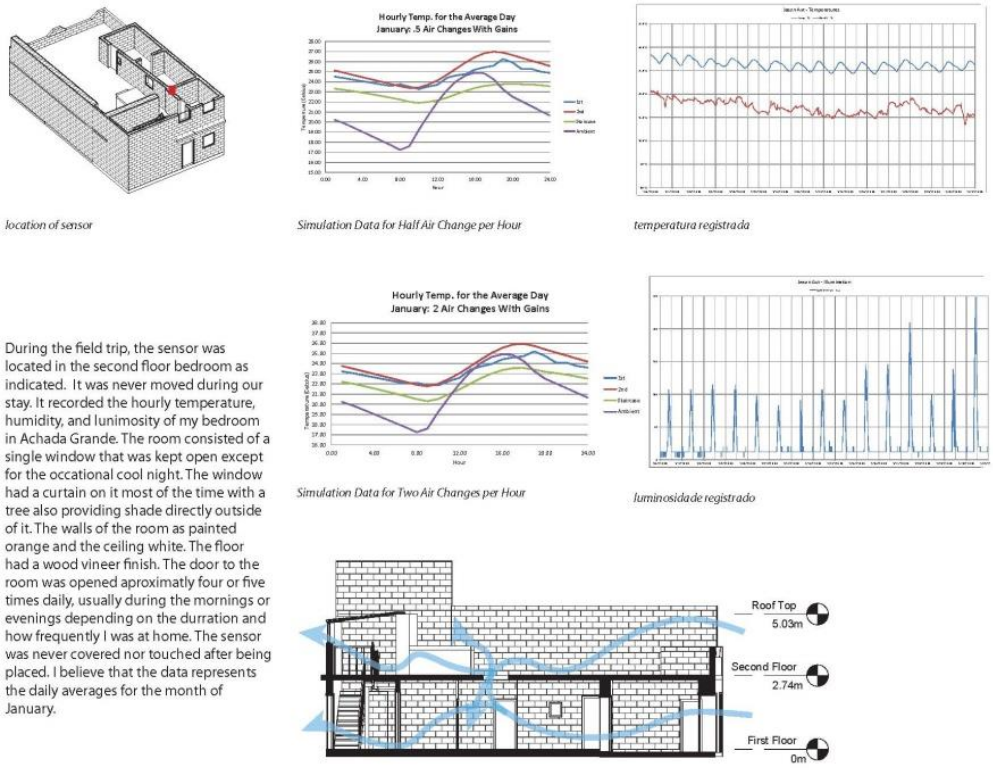


Figure 22: Chart from Sensor and Simulation Data
Source: Excerpt from studio document

In addition to the drafted drawings, the learners performed computer simulations of the existing buildings so get a sense of their energy performance. The learners illustrated what they learned about resource flows. The use of unconventional representation and evidence to describe and illustrate subjective experiences and social practices extended beyond the homes of their host families. They were only too keen to show the various food items they ate in the homes and in restaurants.

Electricidade

	Lâmpada	Tomadas
Quarto 1	1	2
Quarto 2	1	2
Quarto 3	1	2
Sala de estar	1	2
Espaço comum	1	3
Banho 1	1	
Cozinha	1	4
Jardim	1	0
Alpendre	1	0

Aparelhos

Frigorífico	1
Micro-ondas	1
Grill elétrico	1
TV	2
Stereo	3
Celular	4
Telefone	1
Lâmpadas	3
Fã	2

Combustível (Culinária)
12,5 kg tanque de propano (Custo = 2.017 Escudos por tanque)

Água
Métodos de coleta

- Andar com o navio para baixo a fonte de água
- 260 ritmos = 780 pés = 238 metros de uma maneira
- Um navio = 25liters
- Várias viagens para encher o recipiente de 125 litros
- Reservatório de água elevado no jardim (5,2887 cu metros)
- Caminhão traz água para encher o tanque
- Fornece água para quatro torneiras: cozinha, Casa de banho, fora, espaço comum

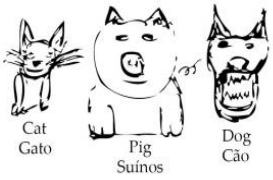
Armazenamento
2 - L 125 azul barris
2 - 150 L azul barris

Alimentos
Grampo de amido/hidratos de carbono:
Arroz, feijão, banana, batata, inhame, milho, pão
Proteína: Frango, carne de porco, peixe

Comentários
O uso do fogão foi o principal método de preparar uma refeição. Para ferver a água para o arroz ou a panela fritar frango e carne de porco. Peixe inteiro foi preparado em um grelhador eléctrico dentro de casa.
A comida era minha parte favorita da experiência, pois eu adoro comer e adoro experimentar coisas novas.

Água em Safende é um grande desafio, já que ele precisa ser trazido até Morro todos os dias. Eu só usei a água para banhar o que me fez perceber que eu só preciso de cerca de 4-5 L de água para me lavar e enxaguar. Nos Estados, eu uso 6 vezes o montante, cerca de 30 L para um duche de 5 minutos.

Elton with vessel - Elton com navio



Waste Mangement: Typical animals in Cape Verdean homes
Gestão de resíduos: os animais típicos em casas de Cabo Verde

Grilled Fish - Peixe Grelhado

Water Tank - Reservatório de água

Figure 23: Use of Resources in a Home.
Source: Excerpt from studio document

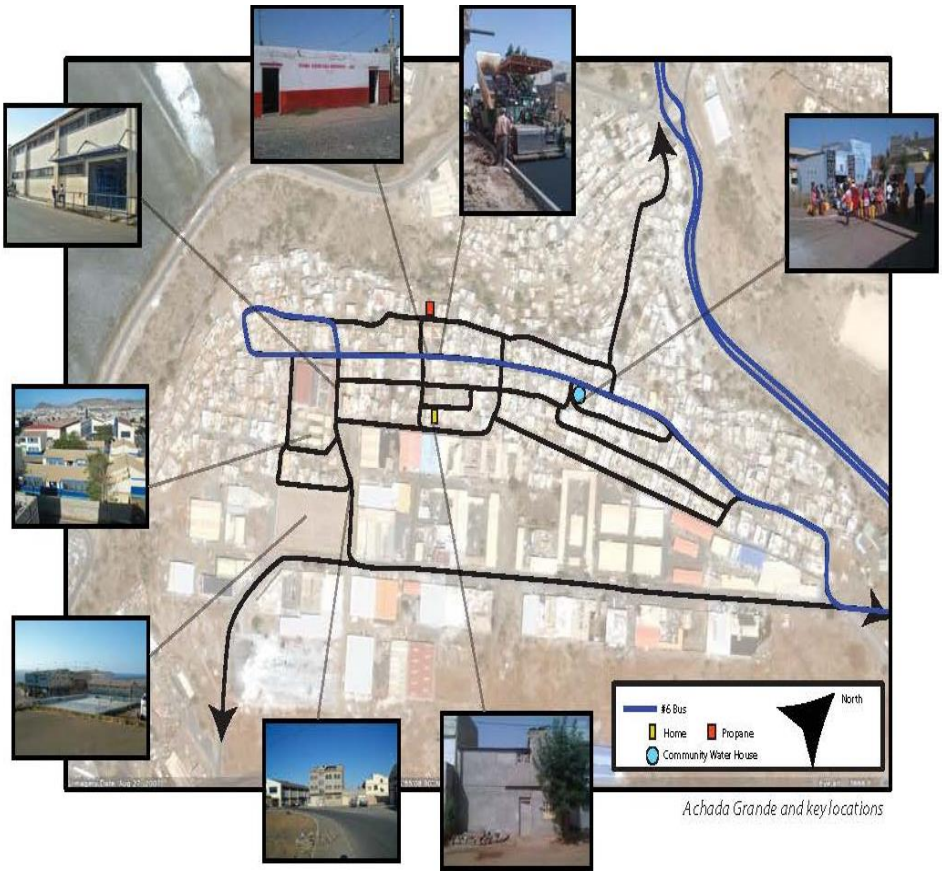


Figure 24: Mapping the Neighborhood.
Source: Excerpt from studio document

The learners produced maps of their neighborhoods but these were layered with their own subjective experience. They were engaging somewhat in the kind of exercise that Jameson (1990) describes where one discovers one's own process for cognitive mapping. This documentation of the existing conditions was the formal presentation of the quantitative data they collected in Cape Verde on resources and materials. It was also the culmination of a series of reflective observations carried out by the learners from before they left for Cape Verde. They were required to analyze all of their quantitative data and put it in context of their qualitative experiences.

To me, it seemed like their education was coming from the television and not from the schools. This opened up discussion with Lourenco about the drug business and the gang activity in Achada Grande. He then verbally explained the phrase "cash or body" to me. He said that anyone in his community with an expensive car probably is selling drugs. I can see this becoming more of a struggle in the near future in Achada Grande.

Passos para Platão a partir Sucapedia

Influência americana na Internet Café

Água transportada por burros

Naya exiting the Concentration Camp

The Road Past the School

entrada da escola, em Achada Grande

Oldest tree in Cape Verde

Houses at Revolatos

Soccer & Basketball in Achada Grande

Aeroporto de Boston Logan

Figure 25: Photos of a Learner's Experiences.
Source: Excerpt from studio document

Charrettes

The charrette is frequently a "scenario of all-night endurance tests, hard work, and dedication" with design students "temporarily sacrificing everything for the sake of their projects" (Cuff, 1991). The charrettes in the Cape Verde project were not designed for that purpose, but rather, to help the learners to transition from focusing on documentation and analysis to synthesis and design. A more important goal was to facilitate and encourage greater agency among the learners. The goal was to encourage learners to take greater control of the class and begin to create in ways they deemed relevant for their clients and for their own learning. The quick exercises that lasted for a few hours in some cases to a few days in others provided opportunities for disruptive thinking.

In some cases the learners were notified. Some were surprise exercises that challenged their improvisational abilities. The design challenges posed to the learners were varied. Some were abstract in nature, but specific. For instance, the learners were asked to design their ideal abode – this called upon their own subjective understanding of the meaning of home. Some assignments were contextualized, calling on learners to account for what they know about the neighborhood where they lived in Cape Verde.

Some of the charrettes were individually done, while others were done in pairs or larger groups, to provide more opportunities for collaboration. Sometimes the format for presentation was very rigid, while at other times, learners were encouraged to represent their work in any way they chose – in ways that best presented their ideas. In some cases, creative and imaginative solutions to related problems were discovered.

Such knowledge was applied to the specific design problems they were working with later in the term. More interestingly, they often led to generation of content. That is, the learners realized that there may be a problem that the instructor had not foreseen, if not for the experience of the immersion.

Perhaps, such a problem could not have been anticipated without the freedom during the charrette to improvise and imagine. For instance, while working on a group charrette for the neighborhood of Inferno, they realized that most of their host families had in-house food production in common – for family consumption or for sale. They decided it should be incorporated into their community design, as well as into individual houses. Some of the learners began to wonder exactly what would look like.

The learners decided to build an aquaponics system out of salvaged materials, without notifying the instructor. The longest charrette required the learners to work in two large groups – each consisting of half the class. Each group selected one Praia neighborhood of interest. Then they had to produce ideas for supplying that neighborhood with sustainable amenities. These included renewable energy, water and food sources and environmentally friendly ways to handle waste.

The first charrette was assigned on a Friday at the end of the documentation period, and was due at the beginning of the next class period. That amounted to four days of work. The assignment was an individual project and the design problem was to design what the learner considered to be an ideal home. The goals of the assignment were to allow for individual creativity, to begin to develop a design sensibility for the studio project, and most importantly, to develop critical questions about the meaning of home.

Table 2: Design Charrette 1
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 1
Assigned: Friday, 2011 – 03 – 04, end of class period Due: Tuesday, 2011 – 03 – 08, beginning of class period Please place them up on the wall or floor in the hallway outside the door by 2.00 pm on Tuesday. Please hide your identities on the 7 items and the sheet. Instead, assign yourselves numbers using your birthdate, (yyyymmdd), Rules of engagement: None Format: 7 discrete items Design problem: Design your ideal residence Questions: …

During this assignment, the learners were not restricted to any particular site, and were allowed to avoid consideration of any other potential constraint, excluding the suspension of the laws of physics. The design response ran the gamut, from a cocoon like abode, meant to suspend form a tree to a classic American home, from a host family's house in Cape Verde to a collapsible hammock-like thing meant to house a single occupant in any weather or terrain.

The second charrette was assigned on the same day as the first. However, its due date was almost four weeks from when it was assigned, because it was a group assignment. More time was allocated in part to address potential group dynamic difficulties. Charrette 2 was posed with many design constraints. It was very specific. The class had to pick a neighborhood and design neighborhood-wide systems for energy and water provision, as well as a neighborhood system of waste disposal.

The solution had to meet the constraints of the climatic, geological and ecological conditions of Cape Verde. The resource had to be locally sourced and had to work in the context. In addition to presenting the scheme, the learners were required to show faculty a strategy for convincing community members of their design's efficacy. The

assignment required that the learners contemplate six questions as they decide upon their design solution (Adopted from Neil Postman (2000, pp. 42-53)):

1. *For what problem is this the solution?*
2. *Whose problem is it?*
3. *What new problems might be created by solving this problem?*
4. *Which people and what institutions might most seriously be harmed the solutions?*
5. *What changes in language are being enforced by such changes and what is being gained and lost?*
6. *What sort of people and institutions acquire special economic and political power because of these changes?*

Table 3: Design Charrette 2
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 2
Assigned: Friday, 2011 – 03 – 04, end of class period (this is the only assignment where you will have more notice than one class period) Due: Tuesday, 2011 – 03 – 29, beginning of class period Please place them up on the wall or floor in the hallway outside the door by 2.00 pm on the due date. Rules of engagement: This is a team project. All students will work together, with students from the relevant groups bringing their expertise to bear on each system. Format: Use the following format; 8 ½ high by 11 wide sheets (landscape-orientated), with margins: 1"on the left and right, ¾" on the top and 2" on the bottom. Students may use any media on flat surfaces or photograph work done on other media to fit this format. Students are encouraged to use recycled media and surfaces. Design problem: Design a system of community amenities each for two neighborhoods in Praia: Energy production/storage/net metered systems Water supply/storage systems Waste disposal/reuse systems The solution has to meet the constraints of the climatic, geological and ecological conditions of Cape Verde. The resource has to be locally sourced and they have to work in the context – that is, you have to make a case that the community members would accept it and have a strategy for convincing them if not. The designs should be illustrated using the presentation format described above. Questions: I will answer questions about this until 4.00 pm the day before the due date. Six questions you need to answer about each design solution (Adopted from Neil Postman (2000, pp. 42-53)): 1. For what problem is this the solution? 2. Whose problem is it? 3. What new problems might be created by solving this problem? 4. Which people and what institutions might most seriously be harmed the solutions? 5. What changes in language are being enforced by such changes and what is being gained and lost? 6. What sort of people and institutions acquire special economic and political power because of these changes?

At some point in the subsequent week, the class selected a neighborhood; Inferno, because they agreed that it posed the greatest challenges. Soon, they decided they wished to work on two neighborhoods. The learners stated that they wished to also

work on a different neighborhood. I do not recall which neighborhood they picked and what the stated reason was – what made it different from Inferno. They may have picked Kobon, because it was in the river bed, while inferno was on the side of a mountain. They may have selected Safende, because it was across town with different growth dynamics than Inferno. They may have neighboring Eugenio Lima, because it was an older community, and hence, faced different challenges. They may have also wanted to introduce some competition in the studio. There did not appear to be a dispute among the learners

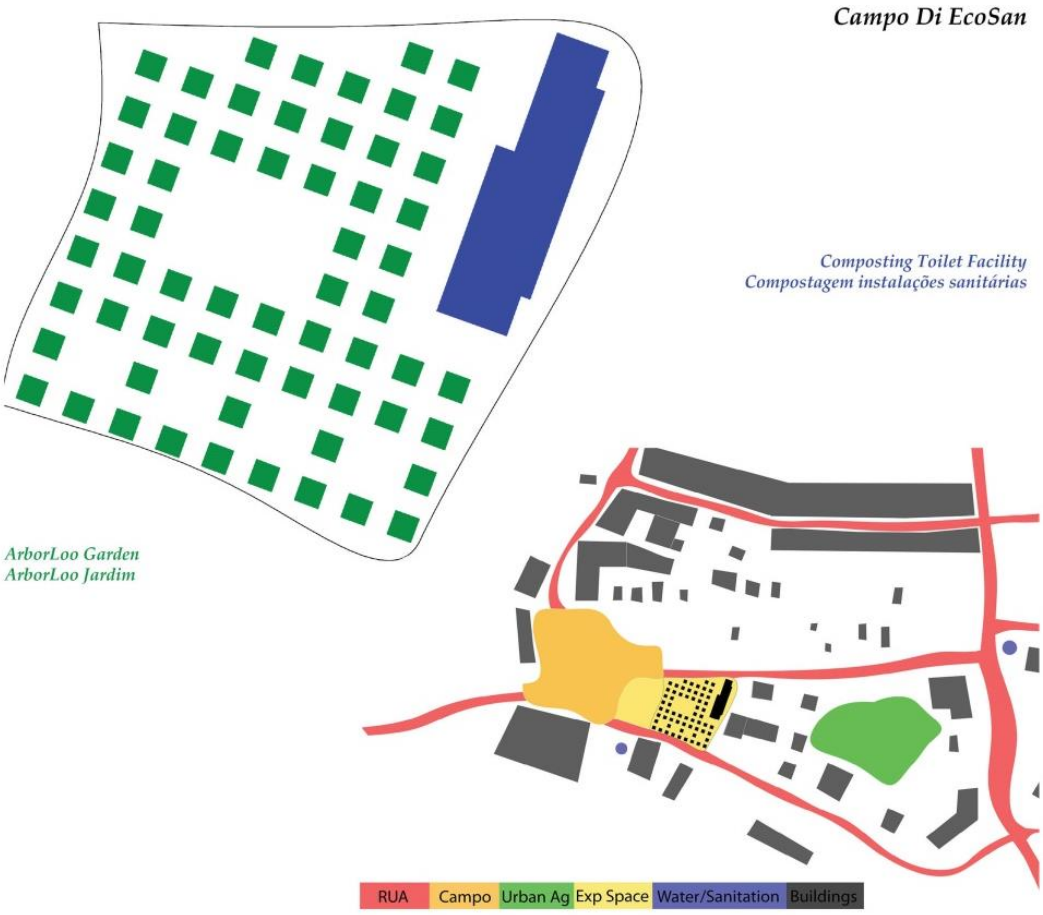


Figure 26: Charrette 2 – Inferno: Neighborhood-wide Waste Management
Map of Compost Toilets/ Phased Tree Planting Scheme as part of long-term resource supply scheme. Source: Excerpt from studio document

As an example, Figure 26 shows how the proposed waste management system for Inferno is integrated with the waster sourcing and a food provision scheme. Food provision was not a requirement, but almost all the students developed one for their host families following this charrette.

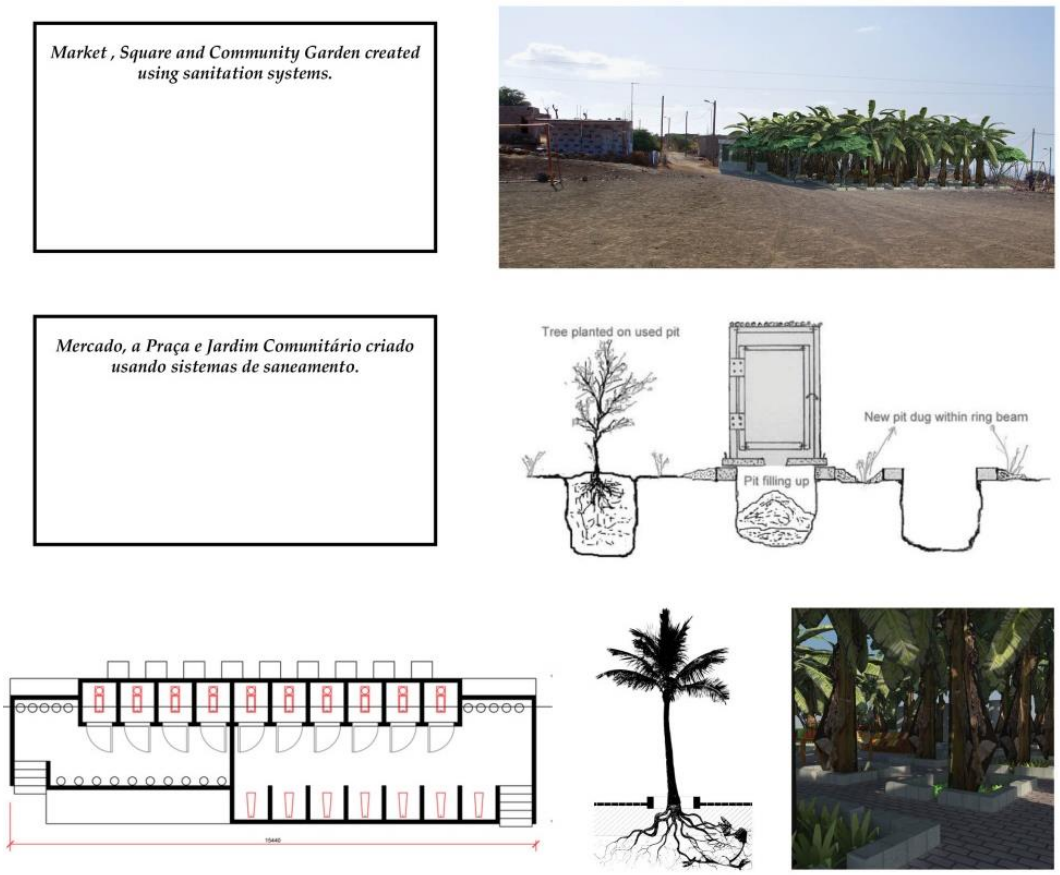


Figure 27: Charrette 2 – Inferno: Neighborhood-wide Waste Management Plan, Sections and Renderings. Compost Toilets/ Phased Tree Planting Scheme. Source: Excerpt from studio document

The waste system is a phased plan, starting with arborloos – holes in the ground, with movable enclosures. Once the hole is full, a tree is planted and another hole is dug. The enclosure is moved to the new hole and a new toilet is established. With this scheme, the barren landscape of Inferno is slowly covered with an arboretum of sorts. The

learners proposed that the trees could eventually provide shade for a market and fruit trees for sale.

An amusing aside about this charrette was that one member one of the groups had to go out of town during the last week. He and his teammates decided that the best way to bring him up to speed was to have him present for them. Hence, he had to be well-prepared. It was an instance where the learners were using a technique that had use often in Cape Verde and in studio, which was to explain something to one learner and then watch as he or she explained it to another learner.

In general, charrette 2 was a very successful; an example of how ideas generated in charrette explicitly manifested in later work. One learner surmised that;

> *Infrastructure is easy, creating a community, nearly impossible. I really do believe that Inferno is actually missing fewer of the pieces than we are. This begs several questions. How much infrastructure is needed or even desired? Will developing the infrastructure destroy or erode the community? Where is the balance between infrastructure and community if in fact there is a relationship? What level of expansion, development, and density should be pursued? These questions have had a large impact on my own thoughts and studies of slum upgrading and poverty alleviation. – Learner*

The third charrette was given to the class at the beginning of the studio session and due at the end of the 4-hour period. This individual assignment was intended to help the learners process their relationship to their host families, requiring the production of "a work of artistic expression" that illustrated that relationship. This assignment had no parameters whatsoever with regard to presentation or content. It was intended to be a

spontaneous and improvisational aesthetic expression. The learners were encouraged to work in any medium. The results were mixed – most of the learners discovered that working with no constraints was infinitely challenging.

Table 4 Design Charrette 3
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 3
Assigned: Tuesday, 2011 – 03 – 08, beginning of class period Due: Tuesday, 2011 – 03 – 08, end of class period Please place them up on the walls or floor near your work-space. Rules of engagement: None Format: 7 discrete items Design problem: Generate a work of artistic expression illustrating your feelings about your host family and neighborhood. There is no presentation format for this assignment. Questions: … Answers: You decide – please state your assumptions, interpretations and justifications on a separate single sheet of paper.

Table 5 Design Charrette 4
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 4
Assigned: Tuesday, 2011 – 03 – 08, end of class period Due: Thursday, 2011 – 03 – 10, beginning of class period Please place them up on the wall, floor and other flat surfaces in the studio by 2.00 pm on the due date. Rules of engagement: None. Format: Use the following format; 8 ½ high by 11 wide sheets (landscape-orientated), with margins: 1"on the left and right, ¾" on the top and 2" on the bottom. Students may use any media on flat surfaces or photograph work done on other media to fit this format. Students are encouraged to use recycled media and surfaces. Design problem: Design a community space – school, classroom, bus stop, clinic, market, park, playground, public toilet, water collection point, kiosk, bar, etc… or combination (try out interesting combinations). Use it to investigate notions of scale – what kind, size and nature of place or event can be considered to have communal import. Represent this in the work. Present plans, sections and elevations. Students are encouraged to redefine what these mean. Questions: I will answer questions about this until 4.00 pm the day before the due date.

Charrette 4 was an individual design problem for a community space. A range of community spaces were suggested, from schools or classrooms to markets and playgrounds, as well as water collection points, shops and bars. However, they were encouraged to expand, refine of redefine what those things are or what it means to be a public space. In the process, learners were encouraged to investigate notions of scale and to question what spaces and events are, can be or should be considered communal.

Table 6: Design Charrette 5
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 5
Assigned: Thursday, 2011 – 03 – 10, beginning of class period Due: Thursday, 2011 – 03 – 10, end of class period Please place them up on the wall, floor and other flat surfaces in the studio by 2.00 pm on the due date. Rules of engagement: In this project, students will work together in buddy pairs. Format: Use the following format; 8 ½ high by 11 wide sheets (landscape-orientated), with margins: 1"on the left and right, ¾" on the top and 2" on the bottom. Students may use any media on flat surfaces or photograph work done on other media to fit this format. Students are encouraged to use recycled media and surfaces. Design problem: Working in buddy pairs, students design a residence with a specific site in Cape Verde. This site must be on a site of a third student's host family (use his/her data on the T-drive). It must respond to the climatic, geological and ecological conditions of Cape Verde. Materials have to be locally sourced and work in that context. Present plans, sections and elevations. The designs should be illustrated using the presentation format described above.

In charrette 5, the learners worked with their buddy. The pair were assigned to a third learner's host family, and required to design a residence for that site. Hence, the assignment required the pair to make sense of the documentation made by the third learner. The constraints included responding to the context, in terms of the climate, available resources and access to materials. Although, they produced typical architectural drawing, plans sections and elevations, the learners were encouraged to use recycled materials for their presentation.

The sixth charrette was another class-period long assignment. Working individually, each learner proposed a way to ameliorate some environmental aspect in a building including control of daylight, air flow, temperature and humidity. They were also constrained to locally sourced materials and required to address Neil Postman's prerequisite questions. The local sourcing requirement meant that high tech solutions were more difficult to justify. The learners understood that such solutions would be difficult to find in Cape Verde and harder to maintain. The learners had determined at this point that high tech solutions were not affordable for any of the host families,

Table 7 Design Charrette 6
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 6
Assigned: Friday, 2011 – 03 – 11, end of class period Due: Tuesday, 2011 – 03 – 15, beginning of class period Please place them up on the wall, floor and other flat surfaces in the studio by 2.00 pm on the due date. Rules of engagement: Individual project. Format: Use the following format; 8 ½ high by 11 wide sheets (landscape-orientated), with margins: 1"on the left and right, ¾" on the top and 2" on the bottom. Students may use any media on flat surfaces or photograph work done on other media to fit this format. Students are encouraged to use recycled media and surfaces. Design problem: Each student designs an element of a building for the site of his/her host family. These include devices for controlling light, wind, temperature, moisture, etc… It must responds to the climatic, geological and ecological conditions of Cape Verde. The materials have to be locally sourced and they have to work in the context. Students should be prepared to discuss its effectiveness in his/her existing house and potential use in a new design. Present plans, sections and elevations. The designs should be illustrated using the presentation format described above. Six questions you need to answer about each design solution (Adopted from Neil Postman): 1. For what problem is this the solution? 2. Whose problem is it? 3. What new problems might be created by solving this problem? 4. Which people and what institutions might most seriously be harmed by the solutions? 5. What changes in language are being enforced by such changes and what is being gained and lost? 6. What sort of people and institutions acquire special economic and political power because of these changes?

Charrette 7 was another exploration of the possible without constraints. Learners were asked to present their ideal neighborhood in any medium and explicitly list their criteria for what it means to be an ideal neighborhood. Learners were also allowed to mention two precedents that address those stated criteria. As in many of the charrettes, discussions included issues of scale, community, resources, access to social services, and the culture/feel of the neighborhood.

Table 8: Design Charrette 7
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 7
Assigned: Tuesday, 2011 – 03 – 15, end of class period Due: Thursday, 2011 – 03 – 17, beginning of class period Please place them up on the wall or floor in the hallway outside the door by 2.00 pm on Thursday. Please hide your identities on the 7 items and the sheet. Instead, assign yourselves numbers using your birthdate, (yyyymmdd). Rules of engagement: Individual project. Format: 7 discrete items Design problem: Design your ideal neighborhood. Questions: … Answers: You decide – please state your assumptions, interpretations and justifications on a separate single sheet of paper. In your presentation, discuss issues of scale, community, resources, access to social services, and the culture/feel of the neighborhood – mention 2 existing examples anywhere that have some attributes and difficulties your design attempts to address.

The eighth and final charrette was an explicit request for the learners to merge their aesthetic sensibilities with their concerns for the environment.

Table 9: Design Charrette 8
Source: Author's notes.

Cape Verde 2011 Studio – Design Charrette 8
Assigned: Thursday, 2011 – 03 – 17, beginning of class period Due: Thursday, 2011 – 03 – 17, end of class period Please place them up on the walls or floor near your work-space. Rules of engagement: Individual project. Format: No format Design problem: Generate a work of artistic expression that represents ecological sensitive. You must collect one of each of the following to use in this work. 1. One building unit 2. One discarded item made from a hydrocarbon 3. Something hard to measure Questions: … Answers: You decide – please state your assumptions, interpretations and justifications on a separate single sheet of paper. Remember that charrette 2 is due Thursday the week after the break.

By the end of the charrette period, the classroom was completely (and successfully) out of faculty control. Learning was spontaneously occurring. The learners were generating content, deciding what the problems were, and proceeding to solve them.

Studio Work – Individual Projects

The experience as illustrated by the analysis of existing conditions informed the design decisions. They created the content based on what they witnessed and their discussions with their host families.

Safende

> *Safende is considered an informal community in the northern area of Praia. Despite this label and its seemingly haphazard layout of buildings, Safende is extremely well organized and has a very developed sense of place. Despite not having a paved road running through Safende, circulation through the neighborhood is extremely easy due to a network of small pathways. This area has problems with water runoff in the rainy season, and has an extremely small amount of vegetation. – Learner*

The learner proposed a phased process with small incremental changes. The phasing respected the material conditions of the host family. The learner made the case that the design proposal and its phased implementation were economic feasibility for the host family and made use of available construction materials. The design also respected the culture of the place, while recognizing the potential hazards faced by the community. The opportunities and challenges discussed in his observations of the existing conditions inform the design response.

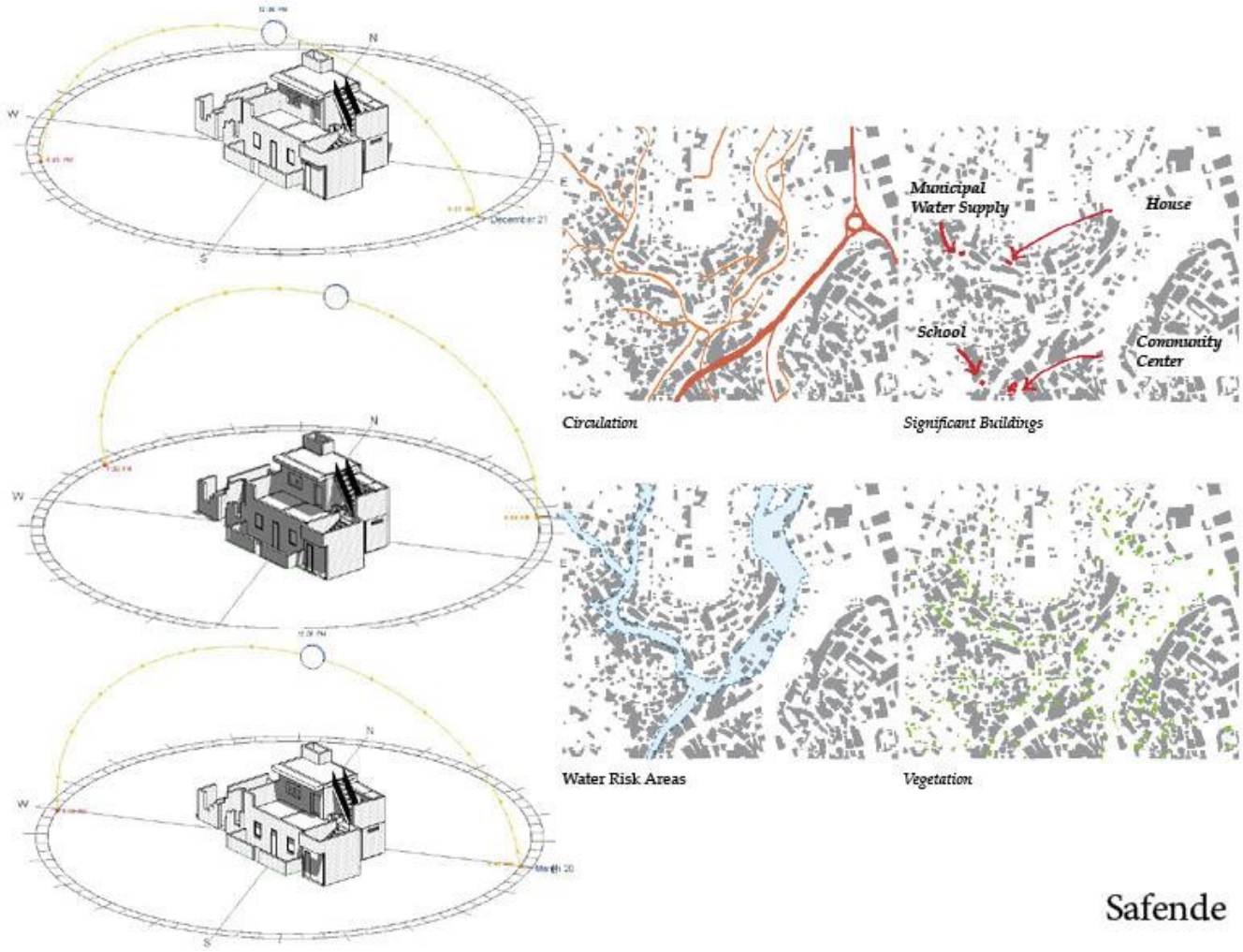


Figure 28: Individual Learner Work – Safende; Context and Site Conditions.
Source: Excerpt from studio document

Figure 29: Individual Learner Work – Safende; Existing Conditions.
Source: Excerpt from studio document

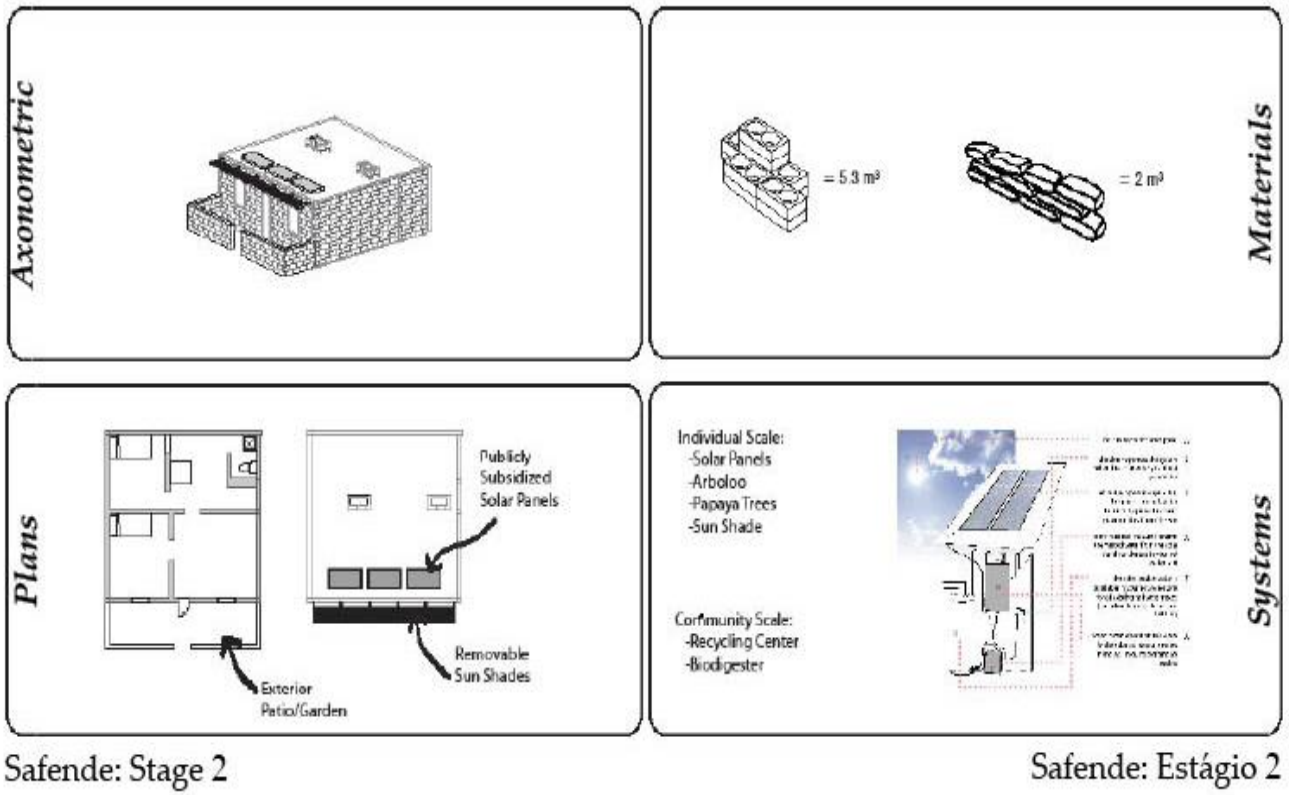


Figure 30: Individual Learner Work – Safende; Stage 2 in Incremental Renovation
Source: Excerpt from studio document

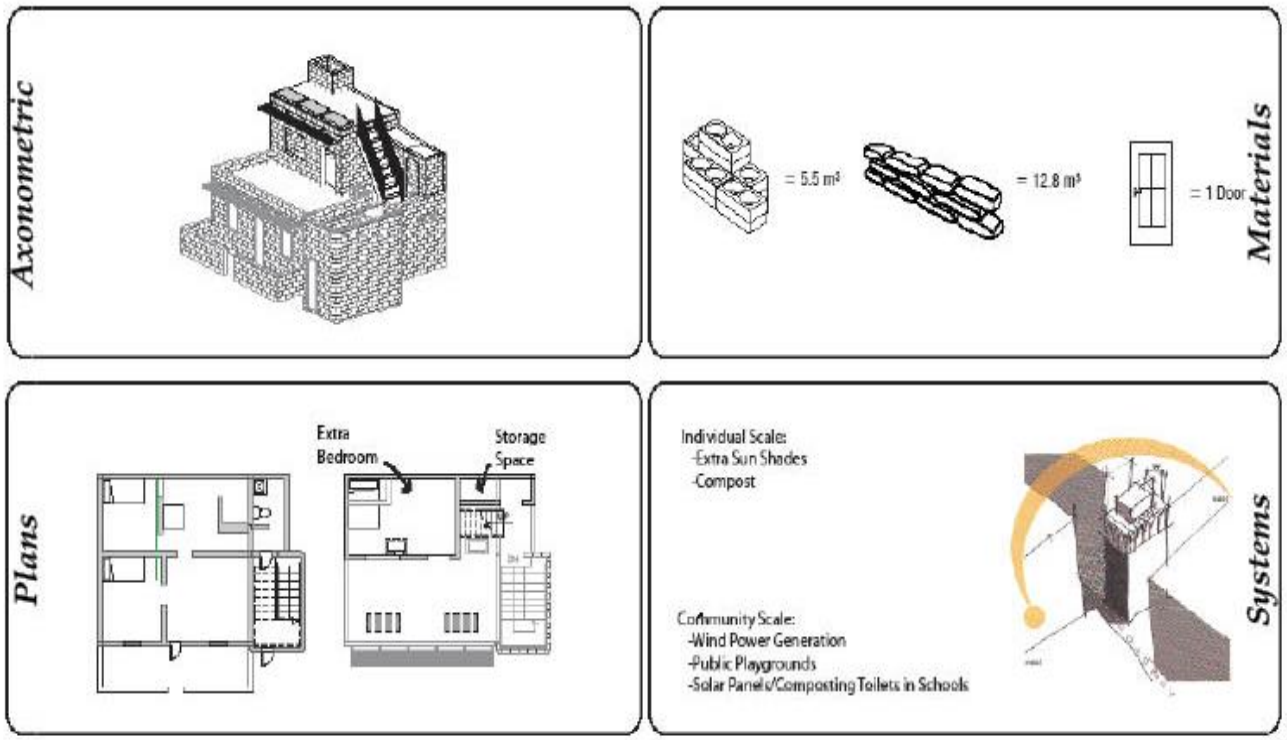


Figure 31: Individual Learner Work – Safende; Stage 4 in Incremental Renovation
Source: Excerpt from studio document

Eugenio Lima

> *The children in my host family were also a favorite part of my stay. Elesander, my 9-year-old host nephew was very shy at first, and I was very happy when he warmed up to me. One night he took me to see his family's pigs, and then spent a good part of the night talking to me about his neighborhood and teaching me some Portuguese. I admit, I didn't understand all of what he said to me that night, but I was touched by his excitement to show me his neighborhood and teach me things. – Learner*

The learner proposed new construction to encompass an expanding family. This was borne of her sensitivity to and celebration of the family relationships. This learner's process began with detailed diagramming of neighborhood services and who in the community made use of these services. Like all the participants, she produced detailed documentation and analysis of the resource flows in the host family's home. These flows and here understanding of the family dynamic informed the choice to propose a courtyard building with multiple apartments of varying size for the extended family.

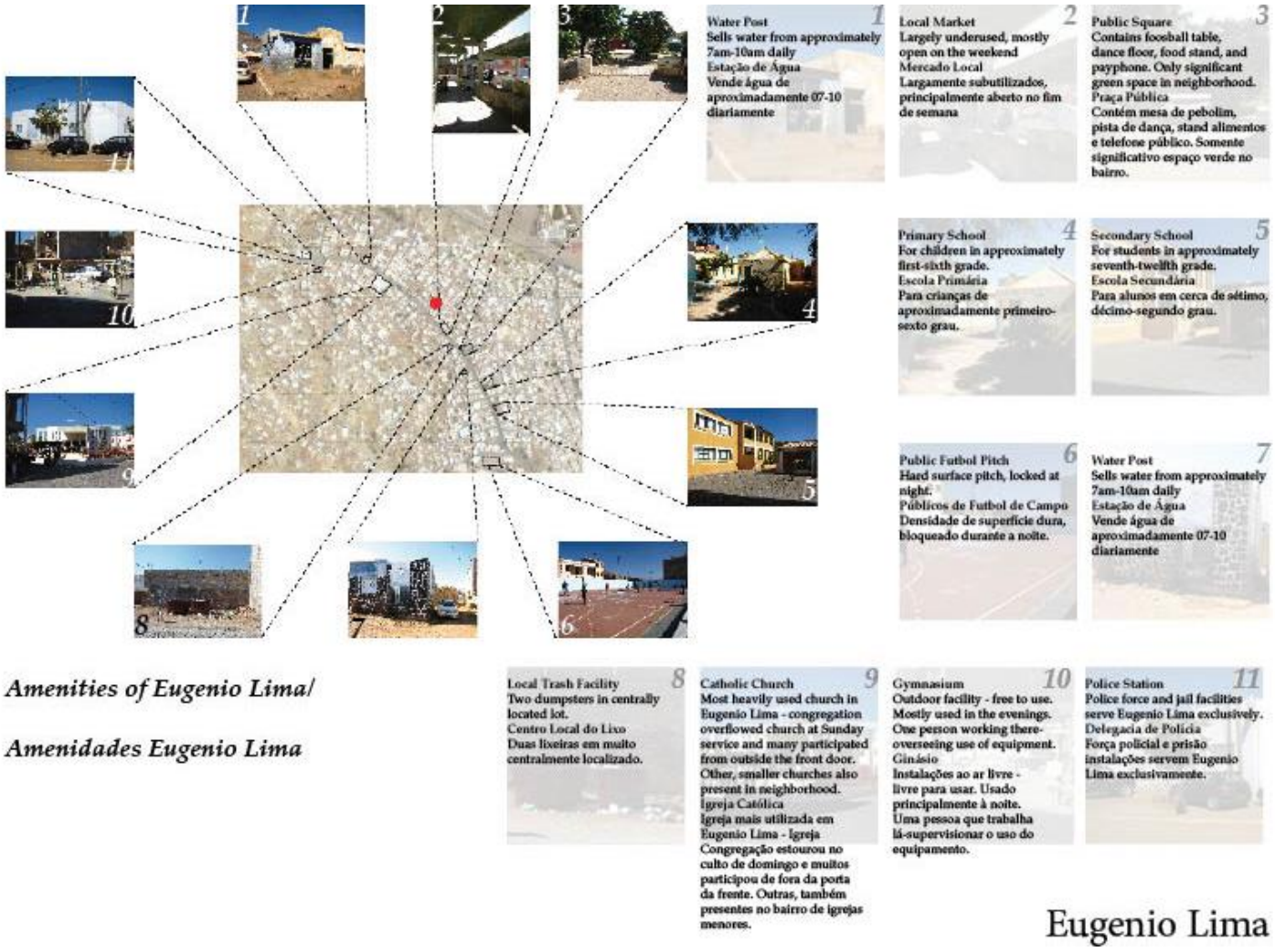


Figure 32: Eugenio Lima – Mapping the Area.
Source: Excerpt from studio document

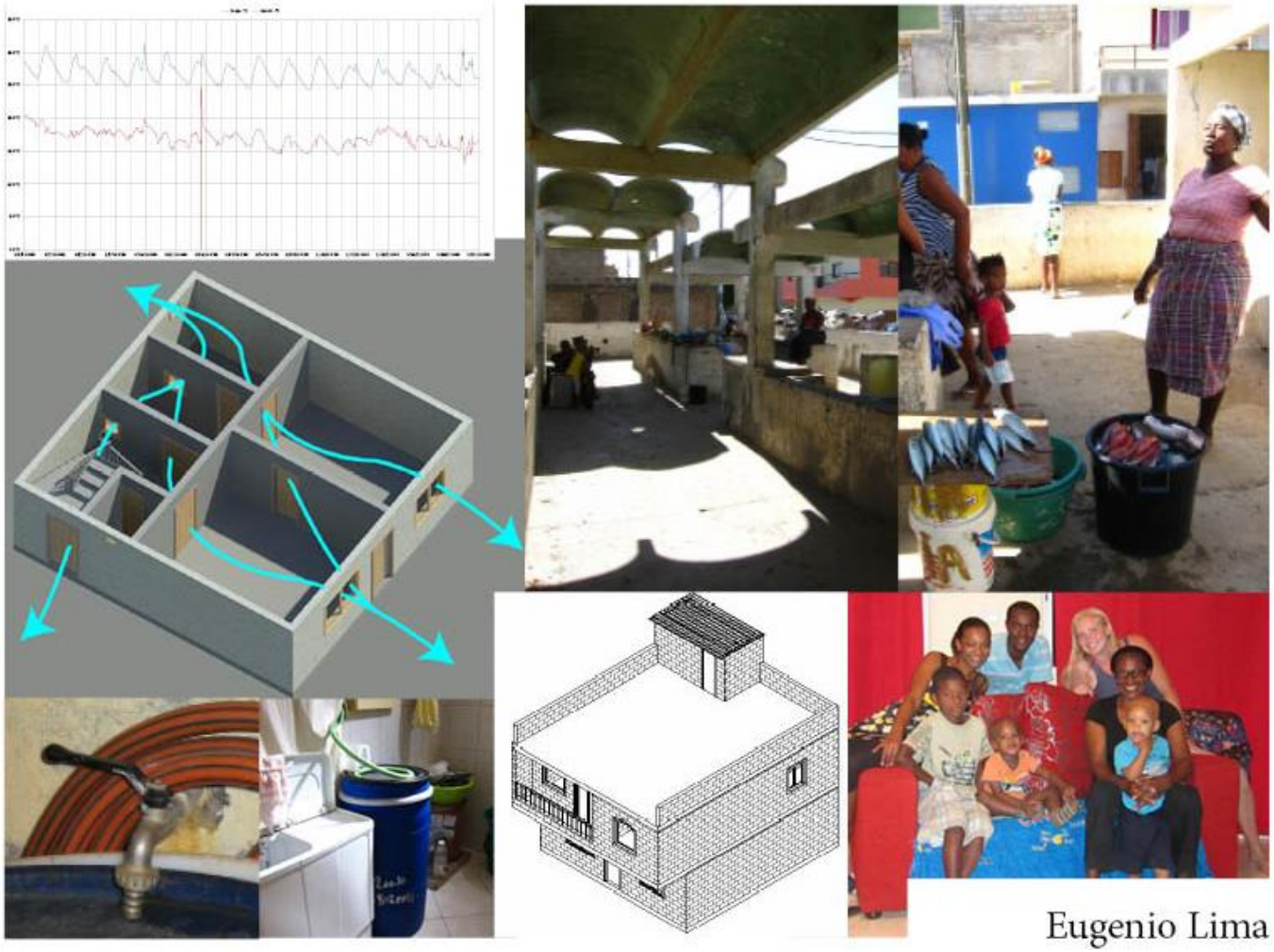


Figure 33: Eugenio Lima – Various Qualities of the Existing Building and Its Surroundings Source: Excerpt from studio document

Figure 34: Eugenio Lima – Design Response;
Home for an Extended Family. Source: Excerpt from studio document

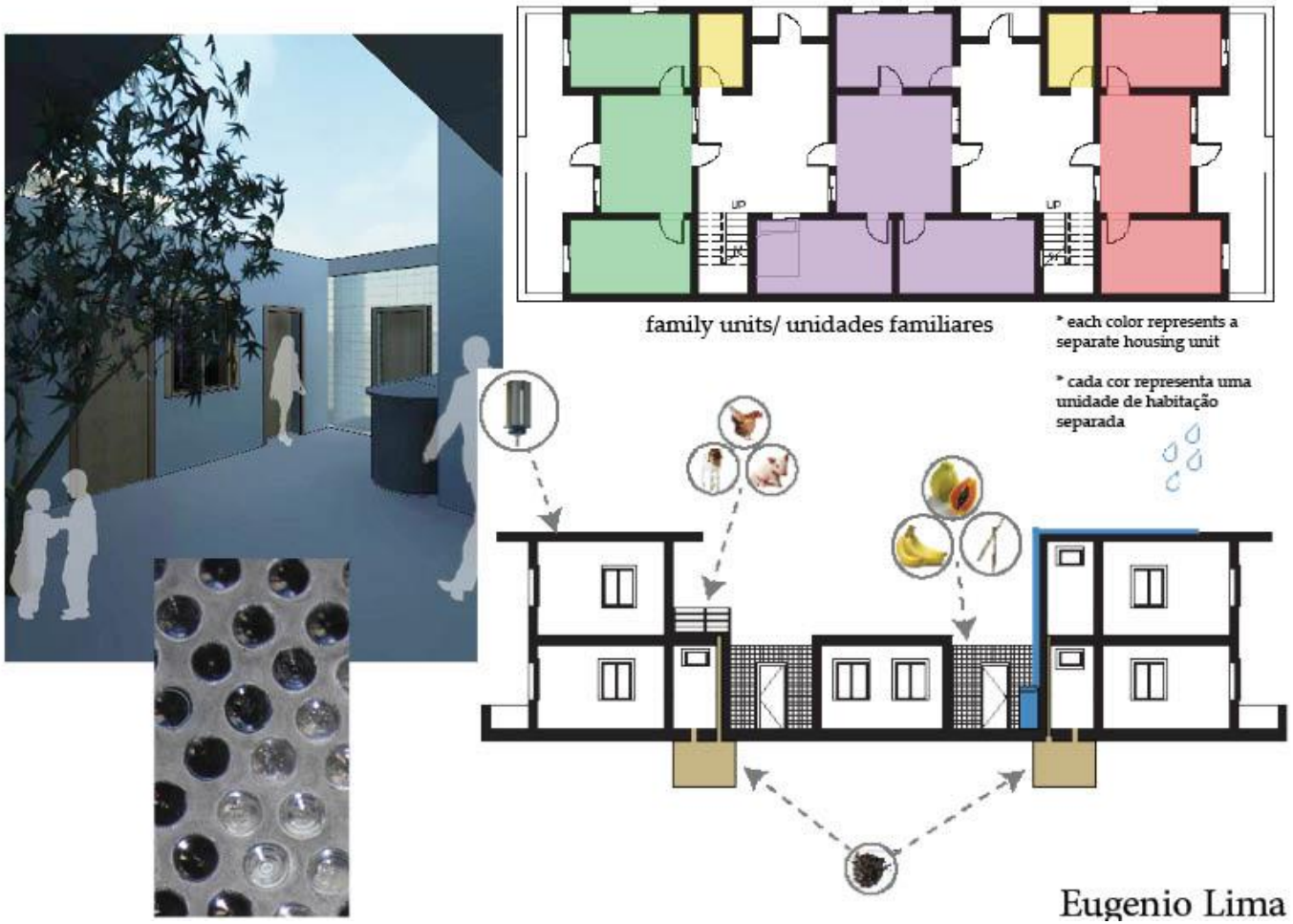


Figure 35: Eugenio Lima – Design Response;
Diagramming Qualities of the Proposed Building. Source: Excerpt from studio document

Kobon

> *After the initial culture shock set in, I was more filled with amazement at the beauty of the island and the thriving local culture that existed there. The people of Cabo Verde are probably the nicest people I have ever met in my life. The first night in my new home in Kobon, I met half the neighborhood. Everyone was coming over to meet me and say hello. My host family was so nice and caring. Any time I was gone for more than a school day Marcolina (my host mom) would come out to meet me, saying she missed her daughter, along with a crew of about 10 kids from around the neighborhood who were attached to my side as soon as I would get home from school every day. We also had lots of dance parties to the "fu-na-na" in our living room. – Learner*

The learner proposed reuse of materials; shipping containers arrive heavily laden with cargo as they arrive to the island nation but leave high on the water – apparently empty. However the proposed design took the existing building with its courtyard and reconfigured it to allow for similar use patterns. Hence a courtyard enclosed by shipping containers for her host family and neighbor who shared the existing building.

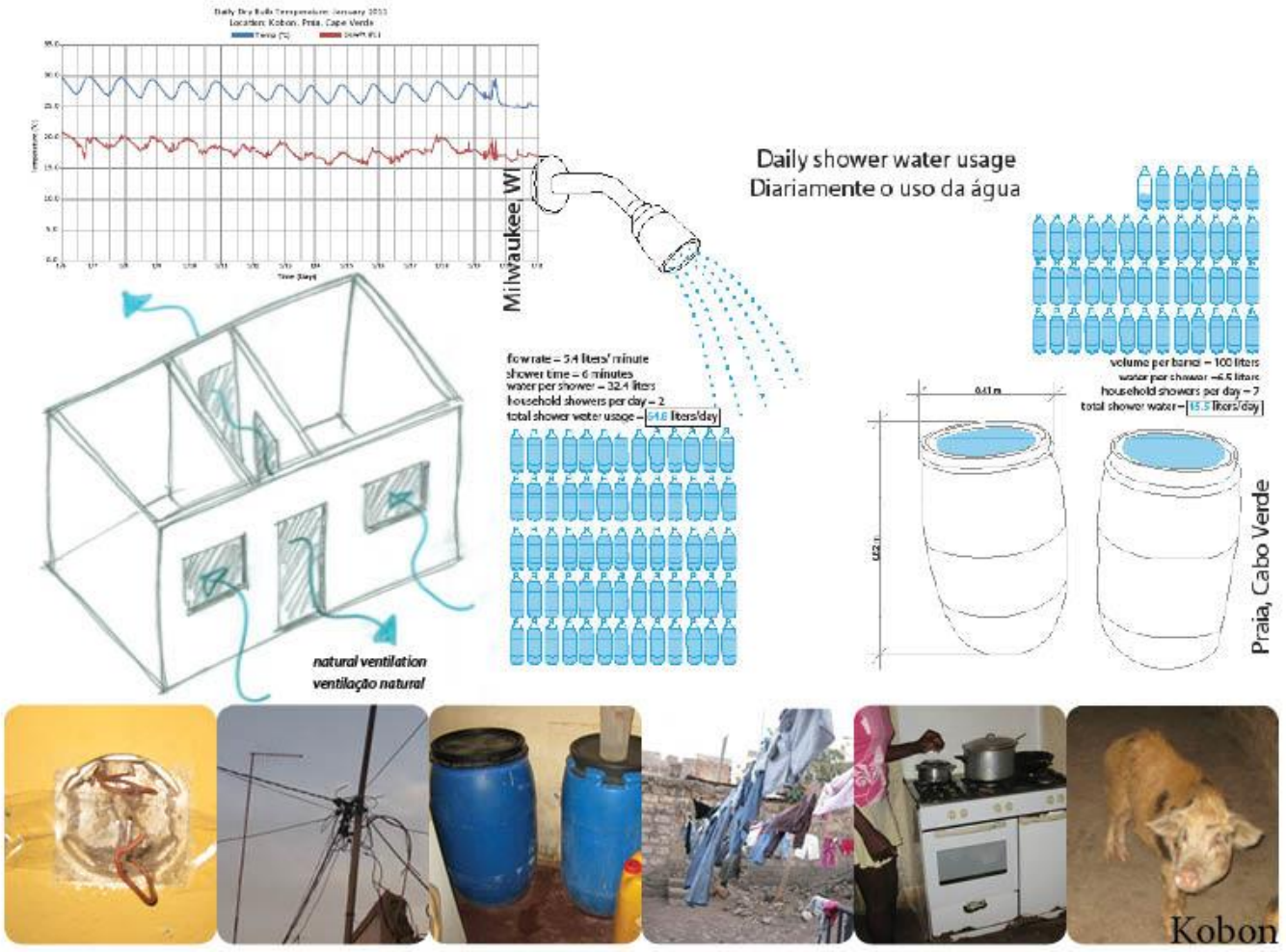


Figure 36: Kobon – Existing Conditions;
Energy, Water and Food. Source: Excerpt from studio document

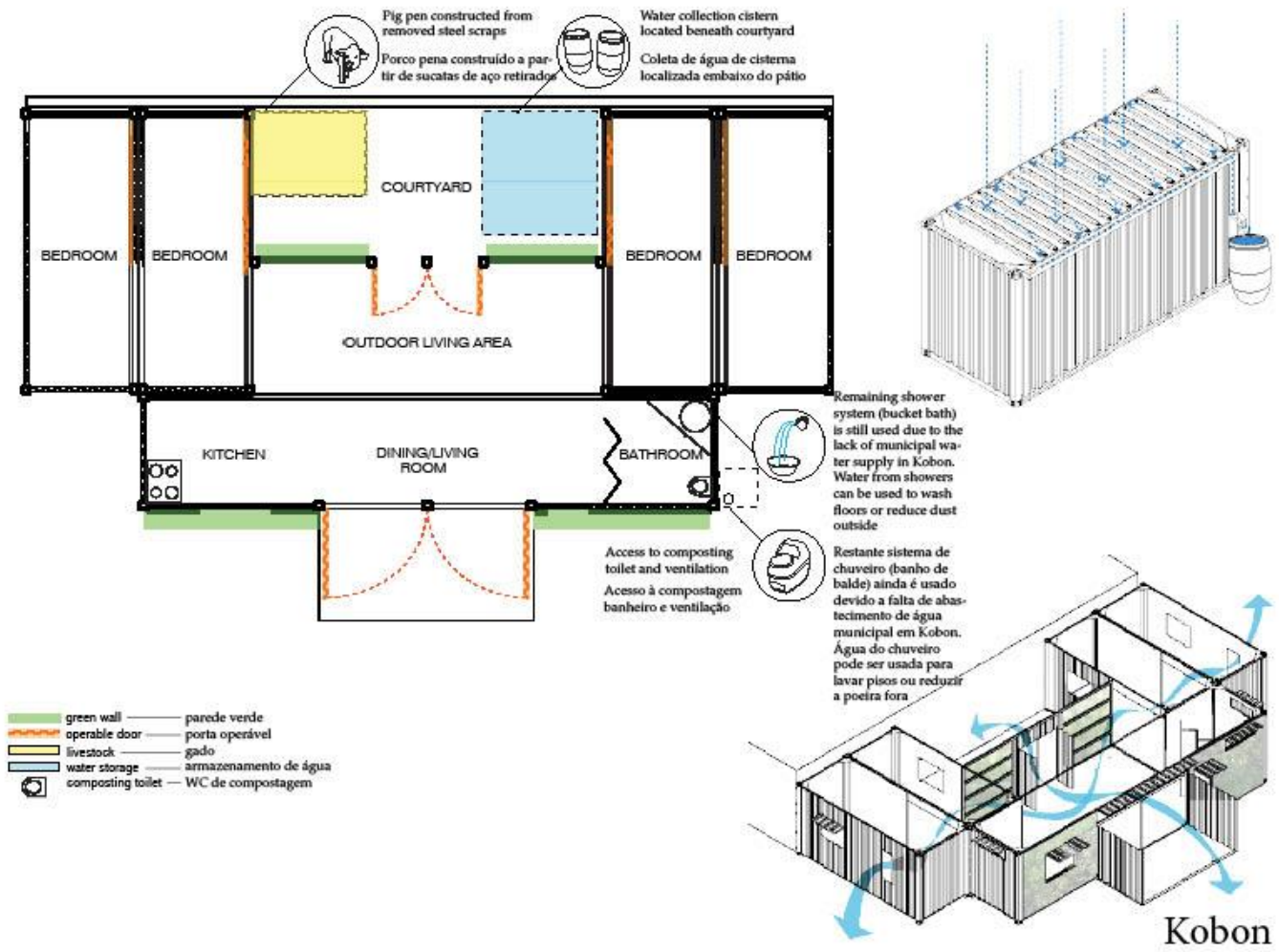


Figure 37: Kobon – Designing with Recycled Shipping Containers
Source: Excerpt from studio document

Figure 38: Kobon – Designing with Recycled Shipping Containers
Source: Excerpt from studio document

Inferno

> *The last and most important part of our trip was our families. They were instantly accepting of us and made our trip infinitely more enjoyable than staying in a hotel. I had a family of six living in one room and it was an incredible experience. I felt as though it did not take long to become a part of the family. Although I did receive special treatment, I also felt the connection that developed between us. – Learner*

The learner proposed minimal architectural intervention with community-wide solutions to address provision of amenities such as energy and public health issues - especially sanitation needs and mosquito control. Many of the solutions proposed were taken from charrette 2 and further refined and resolved.

The variety shown in this and other individual design responses is a testament to the variety of the learners' experiences and to the individuality of each learner. The group projects showed how they were able to collaborate but also what was common about their experience of the trip.

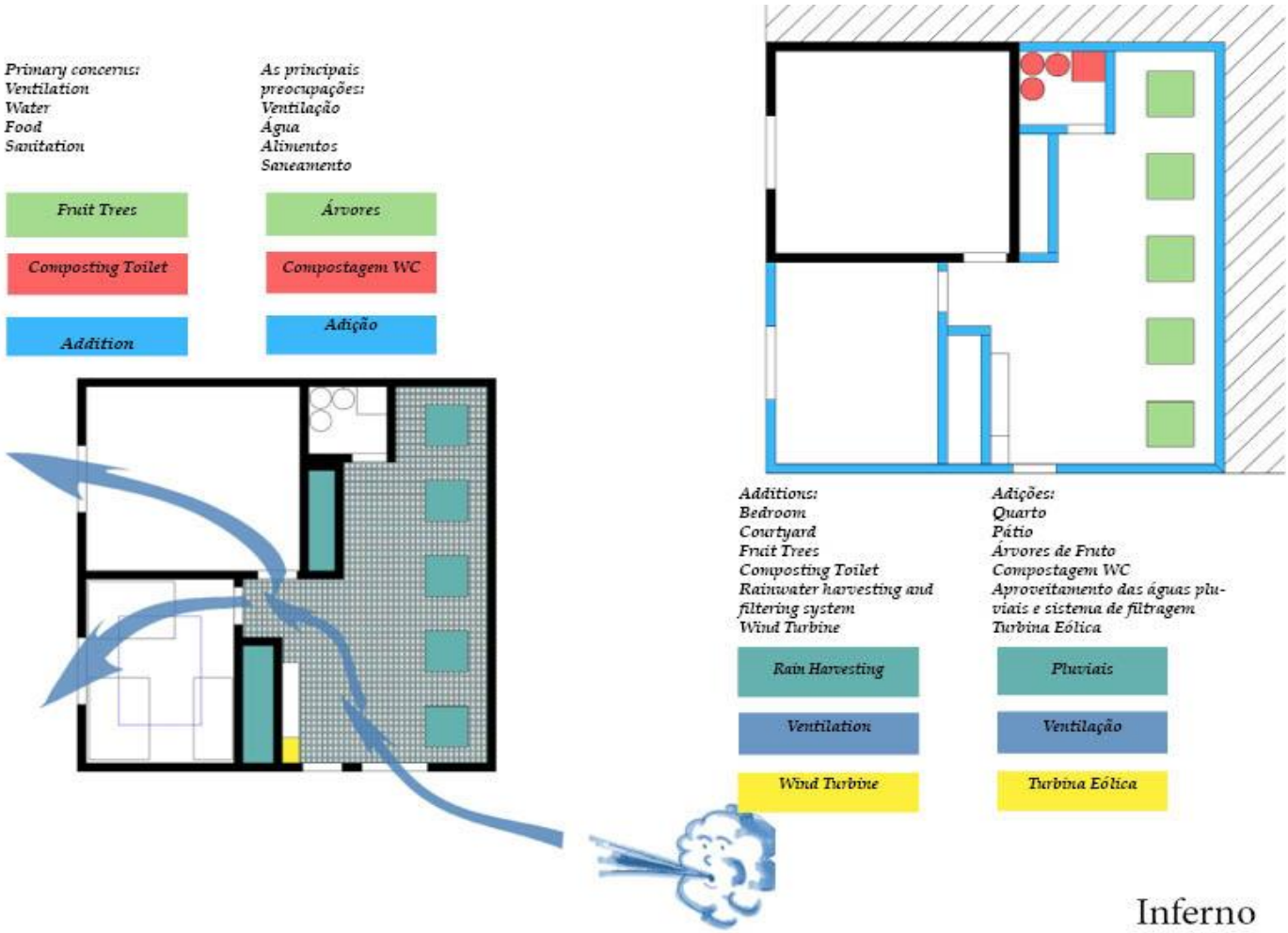


Figure 39: Individual Learner Work – Inferno
Source: Excerpt from studio document

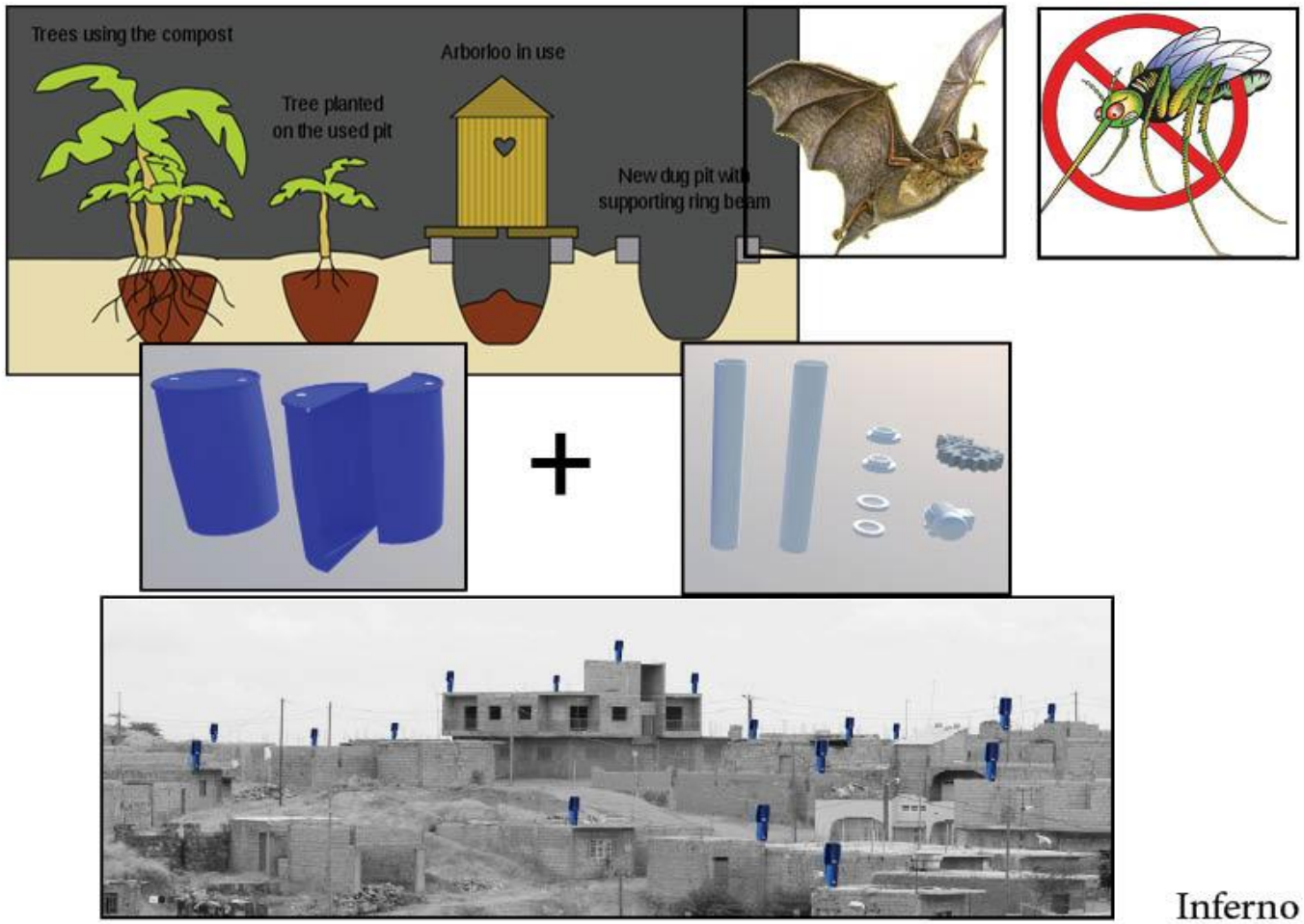


Figure 40: Individual Learner Work – Inferno
Source: Excerpt from studio document

Studio Work – Group Projects

As the learners were working on the designs for their host families, many of them decided to work on side projects. The existing buildings were small and not very complicated formally. Most of the learners opted to keep that formal simplicity – in part due to the obvious economic challenge a more complicated design would entail. The side projects were done in teams of two or three. These group projects, more so than the individual design responses, attempted to use salvaged materials as much as possible. This was in part because the learners felt that the contextual constraints precluded specified manufactured solutions. A more interesting reason given was that the learners wanted to gain a fuller understanding of how resources are acquired.

Wind Turbine

Figure 41: Group Project - Wind Generator
Source: Learner's photo

The genesis of this project was from a learner's desire to understand electricity. The learner appeared overwhelmed by the idea of trying to provide infrastructure to a

whole community. The learner then decided to build a wind generator. I asked for volunteers and two learners stepped forward to assist.

Figure 42: Group Project - Wind Generator
Source: Learner's photo

Skylight & Solar Shade

Figure 43: Group Project - Operable Skylight and Solar Shading Device
Source: Learner's photo

The operable skylight was an experimental response to the art, toys and other objects made by Cape Verdeans out of discarded materials. The learners in this group wondered what they could make with a pallet and old in-line skates. The team was formed to tackle a solar shade. Solar shading was a challenge faced by one of the learners working on an independent research paper on natural light and ventilation.

Solar Purifier

Figure 44: Group Project - Solar Powered Water Purifier
Source: Learner's photo

Architecture studio has a strong tradition of precedent study. During a discussion in studio about Las Gaviotas, Colombia, the learners were shown a solar water purifier that was installed in that sustainable ecological community. One learner decided to make a water purifier and recruited another learner to help.

Aquaponics

Figure 45: Group Project - Aquaponics System
Source: Learner's photo

This group started work on a small-scale food production system without asking for faculty permission. They occasionally approached me with a few questions but they were already a few days in before I was aware of it.

Two learners also attempted an experiment each. One tried to make a sand filter, which ultimately did not work. The other made a tarp by ironing plastic bags together. The ingenuity and initiative of the learners on these projects were simply inspiring. They brought the same care and consideration to bear on the assigned design response.

I thought it would cost a lot to create ecologically sensitive design. – Learner

Figure 46: Other Projects - Sand Filter and Tarp from Plastic Bags
Source: Learner's photo

Chapter 7 – Research Findings

> *All we do as creatures – eating, sleeping, interacting, procreating – are the… real space…, while what we do as conceptualizers – evaluating, calculating, envisioning, trading – are part of the geometrical space… – Thomas Fisher*[57]

The Cape Verde project departed from traditional design education in several ways. The study abroad program was very different from the typical architecture study abroad, which is in the tradition of the Grand Tour. The Cape Verde design studio used most of the elements of the typical design studio, but in ways that attempted to preclude many of the pitfalls of design education discussed chapter 4. Those differences are discussed in a subsequent section.

Comparisons of Study Abroad Programs

> *"I got to know why I was doing something. I got to know the people I was doing it for. I got to know why I was designing it a certain way, instead of just getting a sheet of paper that says you have to do this for somebody." – Learner*

Itinerary

A grand tour itinerary would be incomplete without visits to important buildings in the canon. Even though the number of buildings that constitute the canon is an infinitesimal percentage of all buildings, it is still a large number. The same is true of paintings, sculptures and other items of material culture. In the countries where such tours frequent the number of important works is staggering. Hence, many architecture study programs afford the students the briefest exposure to climatic issues addressed

by these buildings in the canon. The primary interaction between the student and the buildings is through the eye.

Most of the buildings are seen and much fewer are experienced. It is an opportunity to have this interaction in context. Usually, the experience of each building is often fleeting. The items on the Cape Verde itinerary, on the other hand were designed to maximize the learners' experience of the place with all its ecological, social and cultural specificities. A few buildings were experienced, in context and for considerable lengths of time: particularly, the home of their host family, where they lived.

The learners lived in the house for over two and half weeks, and experienced the building as part of the urban ecology. While there they observed and recorded resource flows, for future analysis. On the other hand, it is possible that the limited number of buildings that the learners experienced gave them a skewed view of what was available or possible in Cape Verde. Furthermore, there was no exposure to canonical architecture.

Enculturation

Determining relevant precedent is the main goal of the grand tour. Precedents are in the service of developing the prescribed aesthetic, and both are in the service of enculturation – the primary goal of design education. In the grand tour model, there is strong enculturation of the architectural ideal. However, that ideal is narrowly defined. There is no question that observing these buildings that have been shown to them as images, has a profound effect on students.

Table 10: The Architecture Grand Tour vs. Community Immersion
Typical Study Abroad Program vs. the Cape Verde Study Abroad Program

	Grand Tour	Cape Verde Study Abroad
Itinerary Tour of precedents germane to learning goals	Main learning goals are aesthetic literacy, enculturation, and embodied cultural capital. Pro: Visit sites of cultural production – emphasis on artistic and architectural works and sites that are part of the received canon. Focus on celebration of aesthetic richness. Con: Avoids ethical questions regarding cultural production and consumption, social constructions and consequences, as well as ecological effects.	Main learning goals are ecological literacy, social justice and critical engagement. Pro: Visit sites of cultural production – emphasis on resource cycle sites that are part of modern consumption. Focus on ecological conditions and social justice questions. Con: Diminishes traditional role of art and architecture for cultural enrichment, which in turn humanizes.
Enculturation	Pro: Enculturate strong architecture ideal. Con: Ideal very narrowly defined.	Pro: Develop strong design ethics. Con: Enculturate weak architecture ideal.
Aesthetic Literacy Engagement with cultural artifacts	Pro: Appreciation of wide and varied aesthetics. Con: Narrow aesthetic criteria; typically restricted to visual aesthetics and adjudged through rationalist lenses with assumed objectivity.	Pro: Appreciation of alternate aesthetics. Not restricted to the visual. Con: No good aesthetic criteria.
Symbolic Capital Exposure to rich and/or different culture(s).	Pro: Acquire much symbolic capital, mostly in the form of embodied cultural capital. Discussion of trip upon return translates into strong social capital among mentors, peers and laity alike. Con: Achieved at great financial expense. May experience awkward social moments. Possibly some language and other communication barriers.	Pro: Acquire some embodied cultural capital. Discussion of trip upon return translates into strong social capital among mentors, peers and laity alike. Not expensive. Con: Cultural capital not specific enough to be of great value within the field. May experience awkward social moments. Definitely many language and other communication barriers.

Table 14 (contd.): The Architecture Grand Tour vs. Community Immersion

	Grand Tour	Cape Verde Study Abroad
Ecological Literacy Deeper knowledge of place	Pro: Exposure to climatic issues addressed in the canon. Many buildings observed. Buildings seen and some experienced in context. Con: No direct engagement in ecological literacy. Buildings in the canon are not seen as part of the ecosystem. Experience of each building is often fleeting.	Pro: A few buildings experienced in context, for considerable length of time. One building lived in and experienced as part of the urban ecology. Resource flows observed and analyzed. Con: Few buildings observed. Buildings not seen in context of many other buildings, such as canon of important current and historic buildings.
Social Justice Interaction with humans in context.	Discussed insofar as it is relevant to points of interest about the buildings, the location, the architects and other interested parties. Pro: Interactions with local culture and people at student own comfort level. Con: No direct engagement in social justice	Some families face economic challenges. Some houses located outside of legal norm. Resources such as electricity and water acquired outside of legal norms. Pro: Deep and broad social interaction with family and community members in a context far removed from the students' normal. Ample opportunity for social justice issues. Con: Potential security problems.
Critical engagement	Opportunity to engage in architecture and cultural history discourse with peers and historical figures in architecture. Pro: Expand literacy in architecture, culture and history. Con: The architecture and culture discussed is circumscribed. The discourse is closed to those without the proper symbolic capital – specifically embodied cultural capital. Hence, the student or recent graduate does not have enough knowledge to participate fully. The historical figures and acceptable works are circumscribed.	Opportunity to engage in ecological, social and cultural history discourse with peers and people facing resource challenges. Pro: Expand literacy in ecology, social interaction, politics, culture, economics and history – extended to areas outside the canon of architecture education and general Western education. Con: May not acquire sufficient embodied cultural capital.

In Cape Verde, there was also some enculturation. However, it was not towards the architectural ideal. Rather, the learners developed stronger design ethics with concerns for ecological and social justice issues. The point in Cape Verde was to engage in a different culture, as a way to empower themselves and to develop empathy for others, to be transformed by the lived experience of a home shared with their host families, rather than through the observation of a preserved artifact.

Aesthetic Literacy

While a grand tour student is taught to appreciate wide variety of aesthetic expression, the terms of that appreciation are restricted. The criteria for what qualifies to be appreciated are predetermined and fall into narrow aesthetic requirements; typically limited to visual aesthetics and judged through hegemonic lenses with rationalist language and assumed to be objective – lenses that are part of the embodied cultural capital of architecture. These conventions have the effect of restricting what the students will observe, and therefore what is appreciated.

During the study abroad to Cape Verde, the experience of aesthetics was very different. The fact of the very different context, where aspects of mass and high culture were used in ways even less familiar than is the case in typical grand tour contexts, assured a different reaction. The learners were not given any aesthetic criteria. In other words, they were free to generate content. As such, we witnessed two outcomes as illustrated in the following anecdote:

There were two learners who were working on minors in art history. They were tasked by that department with writing papers on the art of Cape Verde. A few days

after arriving, we were sitting at a café, when one of the two complained out loud that she had been looking for art and had not seen any. Several of the other students asked her "if she was kidding," and asserted that there was "art everywhere." That interaction demonstrated the advantage of removing limits to aesthetic criteria: it allows students to see things they may not. It also points to a potential pitfall, an inability for independent aesthetic appreciation. It may also be a comment on the level of aesthetics in Cape Verde.

Symbolic Capital

As an architecture student, I went to France for two months. The trip remains a source of many stories till today, almost twenty years later. The stories include the site of the best falafel in the city – located in a hole-in-the wall restaurant with no chairs, run by a Hasidim family in the Jewish Quarter. I always say in the retelling that I assumed that they thought I was okay because I had locks too. I enjoyed that part of the city as much as I did the Parc de la Villette, where I also spent many hours, as well as the nearby Père Lachaise Cemetery. These vivid memories of important cultural icons were not part of the scheduled tour. The overnight stay at the La Tourette monastery near Lyon was significant for the building itself and for its use. The quality of the light in the chapel during vespers was exquisite, as was the light at Notre Dame de la Haut in Ronchamp.

When I mention the earlier stories to anyone, they are amused. As such, there is no doubt that much social capital was acquired. When I tell the latter stories, all are incredibly impressed. That difference in reaction demonstrates the increase in

embodied cultural capital that a grand tour bestows. Although, the experience came at great financial expense, I still believe it to be worth it. The language barrier and other communication faux pas that I may have experienced were ignored and forgotten in light of the great cultural enrichment that I acquired.

In Cape Verde the learners experience an even larger language barrier and greater communication breakdowns. Although some in the group took advantage of the weekly Portuguese class offered during the fall before the winter study abroad, most of their host family members did not speak Portuguese, but rather spoke Cape Verdean Creole. Furthermore, there is no strong tourist industry on the island of Santiago to provide many of the supports and paraphernalia that come with the tourist trade.

On the other hand, the learners have reported that the Cape Verde study abroad trip does have cache among their peers and others. And while it may not impress many architects, some are and it appears to be more impressive to non-architects than a trip to Europe. A few people have expressed surprise that the participants were willing to stay in homes and did not demand posh hotels. More importantly, many of the learners who went on Cape Verde had little patience for visits to sites deemed culturally significant by CI.DLOT staff. Some of the learners opined that some those visits were unnecessary and were thankful that they were few. Some learners expressed the wish that some of those trips had been omitted in order that they could spend more time getting to know their host families, and some chose not to go to some of the sites. On the other hand, some students went on day-trips with their family members. These

destinations were appreciated because their cultural significance was determined by the families, and not by the staff of the research center.

As with most study abroad programs, the Cape Verde participants enjoyed a bond among themselves, which continued into the studio. However, in the case of Cape Verde, they also developed strong ties with their family members, which many have maintained.

Ecological Literacy

In a typical study abroad program, students are only exposed to architecture in the canon. Any issues raised are discussed with regard to the buildings in the canon. While ecological issues, especially climatic considerations have been integral to architecture throughout history, ecological literacy has not explicitly been of interest. As such only those climatic and other ecological issues that are addressed by buildings and architects in the canon are up for discussion. Often the faculty members leading the tour and the affiliates with whom they are working are unfamiliar with any ecological insights to be gleaned from the visited sites.

Certainly, the students could discover these insights on their own, but they have not been required or encouraged to. The students will typically pay attention to the things they are instructed to and even when specifically invited to discover elements of the buildings that are of interest to them, their interests have already been circumscribed by the nature of the enculturation.

Furthermore, the experience of the each building is fleeting. As such, no direct engagement in ecological literacy occurs. Buildings in the canon are not seen as part of

the ecosystem. Rather, they are culminations of images they have seen in images presented before the grand tour began. However the experience affords the opportunity to see the building in the context of other great works – an important aspect of design education.

Such contextual comparison to canonical works was not offered to the Cape Verde project participants. Nor did they visit many important buildings. They visited a few important buildings and locations. On the itinerary in Cape Verde was the national museum, where the students played a game called ninja[58] on the roof deck as the sun went down. We visited the electricity generation plant and the water desalination plant, which were on the same site, because as we learned, desalinating seawater requires huge amounts of energy. As the Peace Corps coordinator for Cape Verde quipped, "they expend great energy to pump water out of the sea, treat that water, then pump it into the island's homes, only to be flushed down the toilets back into the sea. Then the whole process is repeated again."

Ecological literacy was a primary goal for the Cape Verde project as illustrated by the discussions about the desalination plant and other such discourse. Furthermore, one of the primary assignments for the learners while on the island was to measure the resource flows through their homes. Thus, although very few buildings were observed, they were experienced in detail. While those buildings are not in the canon, they did provide important lessons that the learners have reported to be useful beyond the Cape Verde project.

Social Justice

The statement by the Peace Corps coordinator, mentioned earlier occurred in a conversation at the U. S. embassy in Praia, where the learners were hosted by the acting ambassador. There, the learners posed many critical questions to the staff about how the embassy engaged with the citizens of the country. This was an early instance of the learners questioning the status quo. These questions were prompted because the learners were living in communities that lacked infrastructure to supply water, energy, collect waste or provide transportation, among others. If an American university student takes the grand tour to France, they may never see, let alone interact with the ambassador. The small numbers of Americans traveling to global south locations makes such an audience very likely. Later we met the president of Cape Verde. Such meetings are likely on a small island. It was also fortuitous that the acting ambassador was an acquaintance of the director of CI.DLOT and had grown up in Milwaukee.

There were other instances where we were interviewed by the press; by a major Cape Verdean newspaper and the Africa service of Radio Portugal. The reporters all wondered what could possibly be of interest to American students and academics in the favelas of Praia. We assured them that we were there to learn, like any other context.

There were many more everyday occasions to address social justice concerns. Many of the participants lived with families without any vestige of financial security and in neighborhoods, as I have mentioned that lacked basic amenities. The land upon which many of the host families had constructed their homes belonged to others. As such, they lived there illegally, and at the tacit behest of the land owner and the government.

They faced frequent harassment by the authorities, including attempted evictions complete with police and bulldozers. The learners also realized that the necessity to stave off these incidents and their general financial poverty made those neighborhoods more cohesive. Many inhabitants of the low income areas of Praia helped each other to access electricity and water, by tapping into passing conduits and pipes.

While in Paris for my study abroad, I was frequently stopped by “Control” and asked for my papers. None of my peers experienced this and few of them witnessed it. None of them thought it was odd that the only black person in the group was frequently stopped. Any other social justice issues that were discussed during that trip were historical with little if any current import, whereas, social justice issues were in the forefront of the Cape Verde participants’ daily interactions. For instance, one learner mentioned how his host mother had been prevented from hawking peanuts in the downtown area. She was reportedly told by the police officer that it was bad for tourism.

On the other hand, the rich exposure to social justice could pose a security risk for students going into a low income neighborhood without proper language skills. Some of the participants pointed out that they perceived their Cape Verde neighborhoods to be safer than where they lived in Milwaukee. Some opined that the low income neighborhoods were safer than the wealthier ones because thieves surmised there was nothing to steal in the former.

Critical engagement

A grand tour provides very good opportunities for critical engagement. Through the enculturation process and the development of aesthetic literacy with the vocabulary of the discipline entailed, the architecture student can participate in a centuries-long discourse with other architects. They are able join with their peers and their mentors, in academia and in practice, in an ongoing discourse about culture, the nature of art and the meaning of architecture. However, there is no direct critical engagement with society; not with the specific inhabitants of the contexts of the canonical works, or with the global community outside beyond others with similar or greater symbolic capital.

Furthermore, the culture, art and architecture discussed are typically circumscribed – and if not delimited, the terms of discourse are. The discourse is closed to those without the proper vocabulary, and even a student or recent graduate can only participate in a limited way. The ability to engage others outside of architecture is limited, due to the language barrier and lack of interest on both sides to engage each other.

The Cape Verde project, on the other hand, provided multiple avenues for critical engagement. The learners were constantly interacting with the fabric of Cape Verdean life; the society, its culture, its politics, its economy and of course, its ecology and physical context. Such engagement was free and open. If the learners had any prior knowledge of Cape Verde or of Africa, they were able to engage at a deeper level, only possible with personal contact. Praia was small enough that not only could each learner experience the whole city and how his or her neighborhood fit into that whole, each of

them was able to compare notes with their peers and exchange ideas about their observations.

Many study abroad programs stay longer and do design work in-country. This is an idea that the Cape Verde project may have benefitted from. It may be that an adequate amount of data collection and contextual understanding did occur. However, the deeper understanding of place that is required for ecological and cultural literacy, as well as for social, political and economic critiques could definitely benefit from a prolonged stay. Critical engagement, social justice issues and ecological literacy as experienced by the learners, really informed many of the pedagogical and design decisions in the studio.

Comparisons of Design Studios

> *"You gave us free range to look into ideas that would help our designs - it was not about a regimented 'okay we need to have a set square-footage...' I would have been looking at those things rather than low-income or outside-the-box sustainable solutions."*

Studio

As discussed in chapter 4, with the help of Cuff's analysis of design education (1991, pp. 44-45, 63-66), the studio is the primary site enculturation of the architect. It is purely disciplinary initiation into the ethos of architecture, with less regard for professional skills. While a study abroad can often have a life changing effect on a student by exposure to a completely different culture and context, the day-in, day-out studio experience may have a more lasting effect, permanently altering the habits of the student. Acquisition of aesthetic literacy and cultural capital as discussed in the previous

section on the grand tour hold true for the studio as well. It is also in the studio that all the possibilities and strictures of architectural aesthetics and embodied cultural capital are introduced.

In the studio, other forms of symbolic capital, besides embodied cultural capital are also more likely to be acquired. Lifelong ties are often created in studio due to the many hours, including nights spent in studio. The sense of camaraderie and esprit de corps is palpable in the similarity to trench warfare in the syntax of the macho language that pervades discussion among architects with regard to studio and its component element such as desk critiques, reviews and charrettes.

Such discussions also occurred among the Cape Verde participants, during and after studio. However, the language was less competitive and more cooperative, leading to more collaboration between learners that continues till today. That was because the Cape Verde was developed instead using a blend of all six of Hutchinson's approaches, instead of only disciplinary initiation. While the typical studio builds the students' confidence by increase in symbolic capital, learners in the Cape Verde project were encouraged to engage in community, and to become more politically aware and socially active.

The de-contextualized nature of typical design studio work produces a disconnect from the reality of most people, including clients and potential users of the space being designed. However, the studio also has a tradition of introducing design students to the idea pro-bono work. This was also the case with the Cape Verde project. In the latter

case, it was the explicit goal of the class to design for low income communities. As such, several of the learners have embarked on non-profit work.

In general the high aesthetic ideal that the quintessential studio enculturates can lead architects to become disillusioned in practice, when the constraints of real site issues, the challenges of dealing with clients, users and the law, conflict with an aesthetically pure idea. Likewise, learners from the Cape Verde project may be let down by the continuation of ecological damage, by the persistence of social injustice, and by the lack of momentum in the culture for addressing these issues.

Desk Critiques

The desk crit is an opportunity for faculty to engage in one-on-one or small group interaction with students. It is often in the form of an iterative design exploration. Usually, the faculty member will sit at the desk of the student in question and will suggest changes to the proposed design, redrawing the proposal in the new way and helping the student to anticipate what if any implications the change means for other aspect of the design. These aspects could be spatial or programmatic, having to do with the use of the space, aesthetic or symbolic, having to do with perception of the building, and any number of other aspects deemed important by the faculty and student. It is great for resolving design challenges (Cuff, 1991, p. 122).

Table 11: Enculturation vs. Ecological Literacy and Critical Pedagogy
Typical Studio vs. the Cape Verde Studio

	Typical Studio	Cape Verde Studio
Studio Good setting for learning; combination science lab, art studio and apprentice workshop.	Disciplinary Initiation Pro: Builds student's self-confidence by enculturation and the introduction and expansion of symbolic capital – specifically embodied capital. May engage in pro-bono-work, during school and after. Con: Disconnect from reality of most people, including future clients. Possible disillusionment after graduation during professional career – let down due to high art expectations.	Blend of all six of Hutchinson's approaches. Pro: Encourage community engagement and social activism by critiquing the markers of embodied capital. Connection to reality of most people, including future clients. May engage in pro-bono-work, during school and after. Move towards non-profit work. Con: Possible disillusionment after graduation during professional career – let down due to high ethical ideals.
Desk Critiques Opportunity for faculty to engage in one-on-one or small group interaction with students.	Pro: Help resolve design challenges. Opportunity to introduce more specific precedents relevant to particular student's work. Occasion for intense enculturation. Opportunity for iterative design exploration Con: May lead to favoritism.	Pro: Help resolve design challenges. Opportunity to engage in learner-centered pedagogy: Often engage students in teaching skills and techniques to each other. One student is shown how to do something, then that student is asked to show another student as faculty watches. Precedents also presented. Occasion for some enculturation, but not focus. Con: Individual projects may suffer. Faster or more technically skilled students may feel unchallenged
Reviews Opportunity to receive feedback about design work.	Individual presentation-style review is typical. Pro: Celebrates individual genius and accomplishment. Occasion for intense enculturation. Con: Adversarial critique. Student presents work for short period to audience of faculty and peers, often with other faculty and practitioners. Peers are ostensibly allowed to participate, but usually decline (often as tacit agreement for similar treatment). Presenting student often keeps quiet to receive criticism. The criticism is often scathing and incomprehensible to the students.	Group salon-style review in small groups or round-table with whole group. Pro: Non-confrontational, more conversational discourse of student work. Con: Not occasion for enculturation. Does not celebrate individual genius and accomplishment. May be louder. Student may miss reviewer opinions of some of their peers' work.

Table 15 (contd.): Enculturation vs. Ecological Literacy and Critical Pedagogy

	Typical Studio	Cape Verde Studio
Drawing s and Model Making Drawing and building scale representation of design proposal.	Drawing s schematic. Use of manufactured materials typical. Pro: Develops appreciation for craftsmanship and pristine aesthetics. Development of tactile skills. Con: Produces waste. Exposure to toxins.	Construction documents. No "finished" model required. Avoidance of manufactured materials. Pro: Develops appreciation for alternate means of fastening and non-pristine aesthetics. Develop appreciation of wastage. Avoid exposure to toxins. Development of tactile skills. Con: Still produced some waste and toxins
Charrettes Usually the final push to meet a deadline. Extended hours are spent to produce drawings.	Pro: Opportunity for strong enculturation and camaraderie. Opportunity for feedback from peers and impromptu drop-in critiques by faculty. Highly competitive – possibility for innovation. Con: Highly competitive and individualistic – possibility for outlandish work and grand-standing. Macho reputation of charrette may put some students off.	Pro: Opportunity for strong enculturation and camaraderie. Opportunity for feedback from peers and impromptu drop-in critiques by faculty. Not competitive – more cooperative. Con: Non-competitive – possible diminution of innovation.
Competition Including competitive vs cooperative atmosphere.	Relies on completion between individual students to motivate student group. Pro: Builds self-confidence. Occasion for intense enculturation. Heightened degree of experimentation. Con: .Heightened innovation may lead to outlandish designs. Heightens de-contextualized ethos of design studio. Cooperative skills not developed. Cooperative skills and instinct diminished	Focused more on cooperation. Pro: Considerable reduction in stress levels. Improvement of skills that address architecture as social art. Con: Possible diminution of innovation
Precedents	Typically of canon buildings and architects. Pro: Useful as research subjects through centuries of trial and error. Useful for enculturation. Con: Many in canon not germane to ecological design and social justice issues. Vernacular buildings not in canon –not often used as precedents. May not be contextual.	Picked specifically for ecological and social justice issues Pro: Address ecological and social issues. Is strongly contextual Con: May not consider aesthetics.

However, the scope and type of design aspects addressed are often determined solely by the faculty member. While that makes sense given the levels of experience, it curtails the agency of the student. While such limits on the student's agency supports enculturation it discourages any critical engagement. Nor is the student really in a position to ignore the suggested design changes. The student rarely participates in determining the content and has little voice in deciding the terms of evaluating its success. Even if a student is given such a voice or decides to express an opinion on the terms of a design's success, it is not given much credence by the faculty. More importantly, not having participated in the content determination, the student is unable or unwilling to engage in the evaluation. The major drawback of the dynamic of the desk crit is that it is conducive for favoritism.

All the positive aspects afforded by a desk crit in any typical studio obtained in the Cape Verde studio. However, the addition of group projects to the individual work diminished the amount of time spent with each learner on their individual design proposals, and a reduction in the number of iterations applied to those proposals. The utility of iteration cannot be underemphasized, providing the design student with many options to choose from, learning why some options do not work well, and promoting the kind of rigor engrained in the architect. Of course, why something works or not is determined purely on formal or functional grounds, with the inclination towards form or function determined by the predilections of the faculty member.

In the Cape Verde studio, the desk crit was used as an opportunity to teach a particular skill necessary for documenting and analyzing their study abroad experience,

or a technique for synthesizing the acquired knowledge and transitioning into design. After a learner was shown an idea, taught a skill or technique, he or she was invited to show a peer, as I watched, only commenting occasionally to reinforce, emphasize or clarify a point. That learner was then invited to teach a third, while the first observed. Thus a pyramid scheme of teachers rippled through the room and the rudimentary understandings of complex skills such energy simulation software was achieved in a few days. While mastery was not achieved in this or other skills, all the learners produced workable simulation models, which they in turn analyzed and used to inform their design work.

I also encouraged the learners to give constructive, critical feedback to their peers. The leveling of the power dynamic between faculty and student, the camaraderie developed during their time together, and the desire for critical engagement, ensured that the critiques by peers remained civil. The emphasis on cooperation in the Cape Verde studio at the expense of the pervasive competitiveness in typical studios meant that individual projects may have suffered. Faster or more technically skilled students may have felt unchallenged, although only one student mentioned it. He was encouraged to do more. As such, he developed the phasing concept shown as the first sample of individual work in chapter 6.

Reviews

The review, jury, presentation or crit is the culmination of any design studio. It is the way that a design proposal is presented to faculty. It is also the way professional architects win over their clients, making the review the one thing about architecture

education that mirrors real life – in theory. However, in practice, the review in studio is very different from a professional presentation. In studio, most of the contextual issues that would be important to the client are usually not addressed. The students learn to respond to the peculiar interests of the faculty and other reviewers, which are particular to architecture and the culture of architect, and usually remote from the interest of clients (Cuff, 1991, pp. 122-126).

The individual presentation-style review is typical, pitting the student in front of a room after many nights without sleep. The student presents the idea and is sometimes not invited to interact further once feedback has begun. If it is invited, the student usually does not have enough of the required vocabulary to participate fully. However, this style of review celebrates individual talent and accomplishment, but it can also deliver a punishing rebuke. It is an occasion for intense enculturation, often with very important reviewers called upon to participate. In some schools, architects who may already be part of the canon are invited, flown in and hosted at great expense to participate in juries.

The notion of a jury illustrates how adversarial reviews often can become. For this reason, students often conspire to avoid asking each other questions, ostensibly to alleviate the burden of the inquisition.[59] As such, even when a faculty member genuinely invites and encourages student participation, it is not forthcoming. In the Cape Verde studio, I also encouraged the learners to give feedback to their peers, but made some alterations to the format of the review to make sure it happened.

First the alternate style of the review, often called the salon, rather than the jury, was used for class presentations. The salon style is non-confrontational. For the final review, a roundtable discussion was convened and various architects, community members and other interested parties were encouraged to discuss the experience and its effect on the lives of the learners and their design work. CI.DLOT staff and some host family members joined in bay video conference from Cape Verde, but the technology failed us.

After the roundtable, the group moved into the studio where the semester's work was displayed. People milled about the room discussing individual or the group projects with the learner. The more conversational format made for a more relaxed atmosphere. Although the salon style review and the roundtable discussion does lend itself to use in enculturation, it allows the learner to practice presenting their idea multiple time in a day and to receive feedback from many more people. Unfortunately, due to the louder volume of the salon style review and the time spent repeatedly presenting, a learner may miss the critique of a peer by a reviewer.

Drawings and Model Making

The typical studio does not require the students to produce construction documents – drawings that could be used to construct a building. The Cape Verde studio required the learners to produce construction documents. There were a few ancillary courses at the University of Wisconsin, Milwaukee's architecture program that comprehensively taught how to produce construction documents. The numerous courses on drawing

were geared towards freehand drawing; specifically enabling the design student to see in particular ways – ways which coincide with the enculturation already discussed.

Models are typically constructed in keeping with that aesthetic, made to look pristine with manufactured materials. Students develop the habit for using manufactured materials and a sensibility of waste as these models have little use but as decoration when the semester is over. Often the materials used contain toxic materials. Model making improves the craftsmanship of the student, as well as the appreciation for craft. More recently, the tactile skills acquired by model making have been lost as more students opt for creating a computer model and have the components of the model cut by rapid prototyping machines.

Figure 47: Toy Made from Trash
Source: Learner's photo

Another lesson that design students acquire from model building is how expensive symbolic capital can be as they exchange economic power for it. The Cape Verde studio required no finished models. Hence, there was no requirement to purchase expensive manufactured materials, with a reduction in the use of toxic materials. Unfortunately,

for one of the group projects, the learners constructed a wind turbine, and used copious amounts of epoxy to hold the magnets for the generator. In hindsight, we learned that an abandoned alternator from a junk yard would have been repurposed for this function.

In general, the learners began to explore the use of waste materials. It was something they had noticed in Cape Verde in the way art and toys were made from old tins and other disposable containers. The aquaponics system shown in Figure 45 was constructed entirely of found objects. Hence many of the exploratory charrettes that asked the learners to explore the use of waste materials around the campus encouraged them to develop or improve their scavenging skills, which are useful for proper ecological literacy.

> *"If I had known we would build systems, I would have looked at different things in Cape Verde. It would be nice to go back and provide suggestions to locals about how to build the systems." – Learner*

Charrettes

A detailed description of the charrettes is in chapter 6. The advantages in its typical usage include the opportunity for strong enculturation and development of camaraderie among students. It also provides for greater likelihood of feedback from peers and sometimes, faculty members will drop in to give impromptu critiques. The charrette is highly competitive, with the possibility for innovation and creativity to surface. On the other hand, the highly competitive nature of the charrette can foster too much individuality, leading to possible outlandish design work and grand-standing by said

individualist students. The macho atmosphere during charrettes and the macho reputation of charrette may put some students off (Cuff, 1991, pp. 126-128).

The Cape Verde studio's charrettes also promoted strong enculturation, because they also involved impromptu moments and short deadlines geared towards specific tasks and goals. Camaraderie may have been even better, because of the group projects, but that is difficult to ascertain definitively, because a high level of camaraderie was established in Cape Verde and persists among the learners today. Moreover, many of them were already friends before the trip. One concern was that the minimal level of competition would reduce innovation. As the design proposals in the individual and group projects show, this was not the case in the Cape Verde studio. Any diminution in creativity that a less competitive environment may create was more than compensated for by other aspects of the program – notably the rise in their imaginative abilities.

One key reorientation of the charrette was its use as a scaffolding assignment – that is, as building block assignments towards the final project. This was the most significant application of a teaching technique that was completely unnoticed by the learners.

Competition

Competitions are an integral part of architecture practice and education. It is often used to secure work, directly or indirectly by generating acclaim for the architect or architecture firm. Some individuals and firms have been known to dedicate large portions of their time to competitions. Others are reputed only work on competitions at least for a considerable period of their professional life. In studio competition are used,

and a competitive atmosphere is maintained, to motivate the students. Those who emerge from that atmosphere unscathed are highly favored. However, it has not been clearly established that those who are exceptional in design studio go on to be exceptional in practice.

Yet, the mythos is reinforced in the stories that the profession tells of itself and competitions help to bolster students' confidence. The privileging of the individual is somewhat culturally determined. The idea that one could be a genius is a modern invention (Galdwell, 2010). The Greeks and Romans would have said that one has genius, implying that it was a gift that one possessed only fleetingly that came and went as it pleased. Obviously a more apt description of how it feels in practice.

As mentioned before, competition may foster much experimentation, but may also generate outlandish design ideas. The opposite may obtain in a cooperative environment where fewer risks are taken. However, as the Cape Verde studio's project illustrate, there is no shortage of innovation in a cooperative atmosphere. Moreover, the development of collaborative skills has broader and longer-term benefits within and without the profession. Finally, more cooperative designers are more likely to engage in architecture as social art (Boyer & Mitgang, 1996, p. 3), and engage in the issues that this dissertation is focused.

Precedents

As with the grand tour, the design studio perpetuates the canon of acceptable work, by making use of the same or similar precedents. This is important in architecture education because precedents are equivalent to research in other fields; the canon

often includes buildings that succeeded through trial and error, and have survived for long periods. Similar to the law, precedent establishes that a particular solution is possible and the extent to which is referred to, determines its long-term importance and influence on the profession.

Unfortunately, many canonical buildings are not germane to ecological design or social justice. They do not pertain to ecology, because building construction has often existed to negate the surrounding nature. While there are important social justice issues in architecture, it has often been on the side of the haves, rather than the have-nots, because of the requirement for sponsorship. Furthermore, because the canonical buildings were designed by a canonical architect who was likely not local, and the building owners desired a “signature” building, there is often little interaction with the context in anyway, social, cultural or ecological.

The Cape Verde studio precedents were selected precisely for their ecological design attributes and how they engage in the social, cultural, political and economic life of the place. Precedents that used local materials and recycled waste materials were sought after. However, they were not presented as examples to emulate by the explicit use of those materials, but as exemplars of how one might go about determining local materials for use. We did not insist that only local materials be sources if there was an influx of another material or component that could be appropriate because it was abundant or likely to be considered waste.

Yet, none of these practices were done at the expense of the ecosystem, or contrary to what was culturally acceptable and economically feasible for the clients – the host families, nor were they done at the expense of aesthetics.

Design Responses by Neighborhood Type

CI.DLOT recruited family members to host the students. Some family members stipulated that they would only host female students. We made use of the buddy system with the learners, so that they could travel together as much as possible. The learners chose their buddies. An attempt was made to put buddy pairs in proximity to each other. In one case where a buddy pair ended up not as close as we desired, each was reassigned to join another nearby pair to make two trios. In the two other cases, they managed somehow to make it work.

The neighborhoods and the houses of the host families have different characteristics, representing different levels of planning, access to infrastructure and the economic status of the families. There were four main categories. The two students who did not take the design studio lived in an eleventh neighborhood. Their locations, their host families and neighborhoods are not included this dissertation, except when referring to activities and statements made by the group. The graduate student stayed in a hotel in another neighborhood and was treated more like a teaching assistant, and the data on his experiences are also not included.

The following pages show twelve of the housing assignments in ten neighborhoods. For each learner, a plan of the dwelling is shown, followed by an internal and external photograph. Below that are three comments from the learner, providing a sort of

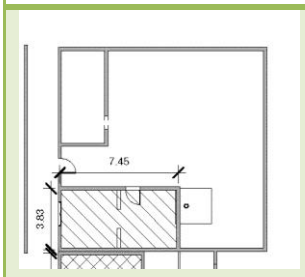
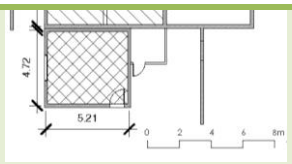
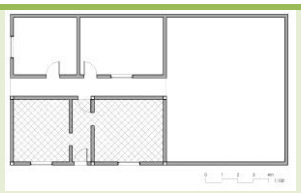
before-during-after, timeline for the Cape Verde project. The first is a comment made while in Cape Verde, the second in studio and the third during the year-later interview. The learner who was hosted in Calabaceira did not finish the studio and did not participate in post studio and year-later interviews. Finally, each column includes the illustrations of their design responses. While the learners' design responses were ecological based, they were very relevant to the context, attempting appropriate use of materials and construction practices. The responses respected the economic situation of their clients, the host families, and attempted to be relevant to the social and cultural practices of Cape Verdeans.

> *There was more consideration given to how and what we design affects not only the people who are directly involved but how it connects to others from the local all the way up to the scale of the city.*

Neighborhood Type 1

The first group of neighborhoods, shown in Table 12 includes recent neighborhoods, not planned by the government. The homes in these neighborhoods have no indoor plumbing. The economic situation of the families is quite tenuous.

Table 12: Housing Assignments "Informal" Communities – Category 1
Relatively new neighborhoods - not planned by the govt. No plumbing. Bad roads with access to transit buses.

Inferno 1	Inferno 2	Kobon
		
Host family residence (hatched area) w/courtyard: 3 family members, 1 room. Student on mat. Barrel/water containers, no toilet, exterior bathroom. No pets, no livestock	Host family residence (cross-hatched area): 6 family members, 1 room. Student on mat. Barrel/Water containers, no toilet, exterior bathroom. No pets, no livestock.	Host family residence (shaded), separate abode to the north and Shared courtyard to the east. Shared kitchen. 3 family members, 1 room. Student on mat. Barrel/water containers, no toilet – chamber-pot, no bathroom - . Pet cat, dog, livestock: pig.
		
		

Housing Assignments

The first neighborhood, Inferno, is constantly threatened with demolition by the authorities. On the other hand, the students reported very strong community cohesion. The young girls, one eleven year old in one household and the thirteen year old in the other, travel considerable distances to fetch water and participate substantially in housework. The learners were very impressed by this.

Perceptual Maps

Table 13: Perceptual Maps "Informal" Communities – Category 1
Relatively new neighborhoods - not planned by the govt. No plumbing. Bad roads with access to transit buses.

Inferno 1	Inferno 2	Kobon
1. The toilet is cut out of the side of the hill. You squat on top of a little mound, it goes into a trench and you cover it and that's it. It's very simple. It's not wasteful and gives fertilizer to the plants. I can't find a better toilet in the world. 2. Although I created a room for bathing and washing, the toilet facilities were placed outside of this area. The arborloo was the one solution that seemed to fit best in the situation…. The composted biomass would nourish the tree… the fruit can then be sold at market and the money would be devoted to creating a more permanent facility. 3. Since there is no stigma to dealing with human waste in Inferno, I see no reason for a negative opinion of the arborloo. Good sustainable design doesn't have to be high tech.	1. As odd as it may sound I was thrilled by the lack of infrastructure, the size of my house and the generally poor nature of the area. Since I was looking to have an experience as different as possible from my daily life these aspects were all a dream come true. 2. A return to Cape Verde is 100% guaranteed. I will go back as often as I can and would love to help my family personally or Inferno in general in whatever way I can. I do not think sanitary plumbing would be beneficial to them. I hope I get the chance to study Inferno through its development as a neighborhood and, with any luck, help shape its future for the better. I honestly could see myself living there, at least for a while. 3. Primary goal would be to more mainstream sustainability, to bring it out of the world of academia and introduce it to average people – the common man. The primary method would be a sustainable design school, where we teach people what sustainable design is, why it matters and how they can actually use it to benefit themselves and others.	1. You have to think about everything, which is not something we have to do in America, you know. I mean it kind of puts things in perspective for you, but in a good way. This lack of infrastructure was startling, but the way that the community has adapted to it was also amazing 2. ISO shipping containers are designed to naturally shed water during transport on the stormy seas. The tops of the containers are slightly curved so that the water sheds off of the long sides of the container. The corrugations of the steel on the top surface are also oriented to direct the water toward these edges. Gutters can be added to collect and direct the water as it drains off the edges and into a collection container or cistern. 3. We saw how people acquired resources since they were not provided by govt. – finding independent solutions for such resources… energy, food, water, waste management…. Green walls and shipping containers were things I would not have looked into if you did not say to look into the things that are relevant to your design.

The other neighborhood in this category, Kobon, is under threat from ecological forces, as the building and much of the neighborhood is located in the flood plain. Kobon residents also have a strong community; the learner mentioned that often her host mother would cook copious amounts of food and feed all the area children and anyone else who happened to drop in.

Design Responses

The two learners who lived in Inferno proposed very minimal design responses for their host families. Considering the economic situation of the families, they decided that major improvements were not feasible. However, the main reason they both gave was that improvements were not necessary. They insisted that they were of the opinion that the homes did not need improvement, except with regard to water supply, food growing and sanitation. The Inferno 1 learner wrote:

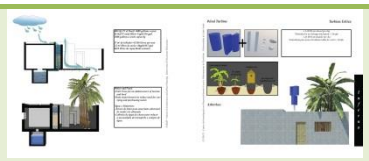
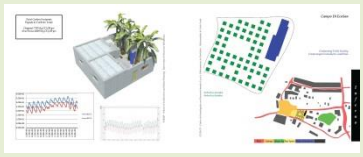
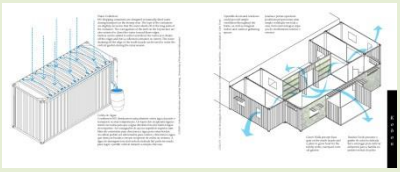
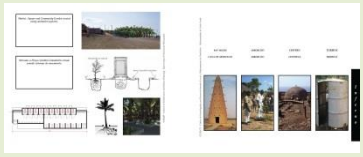
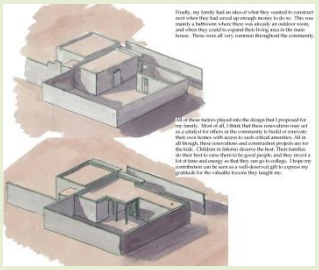
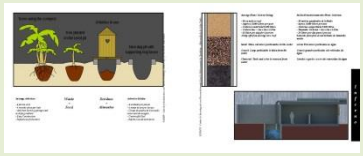
> *Rather than clear the site and redesign, I made the choice to renovate because my family would have nowhere to live if their home was knocked down. On top of that the home is in great condition. I chose to give my family amenities that they do not currently have, such as catching and containing clean rainwater, a toilet facility, and a new gardening strategy.*

The images in column 1 of Table 14 show his sketches of the listed systems. The bottom image in the column shows the very minimal change between the existing and his design proposal. The Inferno 2 learner expressed similar sentiments and did not seem perturbed by the close quarters:

> *The smallness of the house seemed to make no difference at all. I actually liked it. It kept everyone close... Here at home [in Milwaukee] my family would drive me nuts if we were in the small space they seemed to do fine in.*

Hence, his design proposal was also minimal. However, he went further to expand the neighborhood plan developed by the group in Charrette 2 (Table 3, Figure 26 and Figure 27). The plan included neighborhood-wide systems for water collection and sanitation.

Table 14: Design Responses "Informal" Communities – Category 1
Relatively new neighborhoods - not planned by the govt. No plumbing. Bad roads with access to transit buses.

Inferno 1	Inferno 2	Kobon
		
		
		
		
		

The sanitation plan was a phased plan that involved arborloos, which provided locations for future fruit trees. The fruit trees were proposed part shade for a market and part economic engine to provide a more permanent sanitation facility. Water collection is designed to occur at each house, except for a communal cistern used for the sanitation facility. Included in the neighborhood plan is a scheme to install wind generators built from salvaged materials. The wind generators would be installed on the flat rooftops across Inferno and tied together to supply power to the neighborhood. This would obviate the current necessity to "tap" power from passing power lines. Also in

the proposal is the erection of multiple bat-houses to control the mosquito population and to produce guano, to buttress the food production systems.

Kobon is also a relatively new neighborhood, with no internal plumbing fixtures. The learner proposed the use of a shipping container, because we observed that many ships came into port heavily laden with shipping containers and left the port high in the water. She decided on the shipping containers because of several attributes it possessed that she found to be desirable for her host family. For instance, the curved profile and ribbed surface of the roof was ideal for rainwater collection. She compensated for making the courtyard smaller by providing a semi-outdoor living room space and integrating a food growing vertical wall system into the design. She made it clear that she intended to make improvements to her host family's residence. She expressed satisfaction with the design afterwards saying:

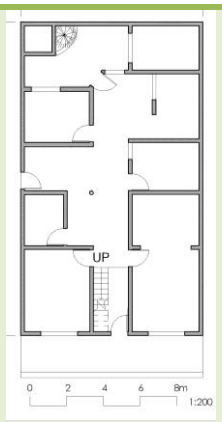
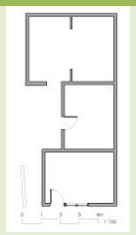
> *The existing home has a much higher carbon footprint than the new home. The new home is also made out of completely recycled materials (the containers). In addition, the use of vegetation as an exterior wall surface also contributes to the decreasing the total carbon footprint*

Neighborhood Type 2

Table 15 shows the second category. Safende is also a relatively recent settlement. Both homes have indoor plumbing, but the residence in Santa Ninha did not. However, the student lived down the street in another neighborhood which was more established. As such, he did not spend the night with the family he was working with.

Housing Assignments

Table 15: Housing Assignments "Informal" Communities – Category 2
Relatively new neighborhoods - not planned by the govt. Bad roads with access to transit buses.

Safende 1	Safende 2	Varzea/Santa Ninha
 Host family residence w/roof access. 5 family members. 3 rooms. Student in individual room with bed. Barrel/water containers. Pet cat, livestock: pigs.  	 Host family residence, w/roof access. 3 family members. 3 rooms. Student in individual room with bed. Barrel/water containers. Pet cat, dog, livestock: pigs.  	 Host family residence in Santa Ninha, with roof access. 2 adults, 1 teenager, 1 child. Bath in northwest corner lacks a roof, kitchen in northwest, has a crumbling roof. Due to complicated family dynamic, student lived in nearby, apartment in Varzea. 4 family members, 4 rooms. Student in individual room with bed. Barrel/water containers. No pets, no livestock.  

Perceptual Maps

Table 16: Perceptual Maps "Informal" Communities – Category 2
Relatively new neighborhoods - not planned by the govt. Bad roads with access to transit buses.

Safende 1	Safende 2	Varzea/Santa Ninha
1. Even though the shacks seemed like they were falling apart, it seemed like that there was more of a sense of belonging, because you have to. The small floor plan allowed for proper ventilation during the hot times of the day, as well as keeping the interior properly day-lit. Although the CMU bricks did not allow much light into the building, they were useful because they created a thermal mass which kept the building slightly warmer at night and cooler during the day. 2. My project was designing an approach to designing a house. Design ethos: focus on low tech/easy to implement systems. Use sustainable materials; develop in affordable stages (based on annual income). 3. [The Cape Verde Trip and Studio] provided me with an experience of being in a different atmosphere and broke down a lot of assumptions that I had - especially about infrastructure.	1. I'm going to try to carry some water in a few days. I think that's going to be one of the most challenging things. Not being able to turn on the shower and rinse off, I was faced with my first realization of how much water I use back in the States. 2. Because of my concern for the environment and dislike of wastefulness, I developed two simple systems that would help remove solid waste: plastic bags and bottles, and repurpose them as meaningful and productive objects. Educating ourselves about our consumption of resources creates the opportunity to improve our effect on the environment by reusing our waste. This could lead to a better understanding of waste and how it can be repurposed. 3. We cannot make a design decisions contrary to community members' wishes. We need to understand how people interact and that there are social implications of the built environment. I have a different definition of an architect than I did coming out of high school.	1. My host family doesn't pay for water, the community helps them.... The free water is only one example of how the community unites around the less fortunate. [People in the neighborhood] realize what living in a community means, how important a community is in the lives of so many people. [The host family] stressed on many occasions that community is the most important thing in a neighborhood 2. My proposal would enable them to collect water from their roof. It would yield close to 8800 liters of water a year. The water that they would be receiving from neighbors could then go to another family. 3. I had no initial knowledge of composting toilets and other systems. The opportunity to apply convictions in a project that had some meaning was important. Working with my host family in the Cape Verde project made me realize that there was a disconnect between a traditional architecture practice and my desire to be involved and engaged in helping people.

Design Responses

Both learners who resided in Safende developed interesting strategies for designing for their host families. In considering the financial situation of his hosts, the learner in Safende 1 proposed a phased construction process. In his plan, as parts of the proposed building are constructed, parts of the existing building are deconstructed, and components are added. Many of the components suggested form a palette of optional

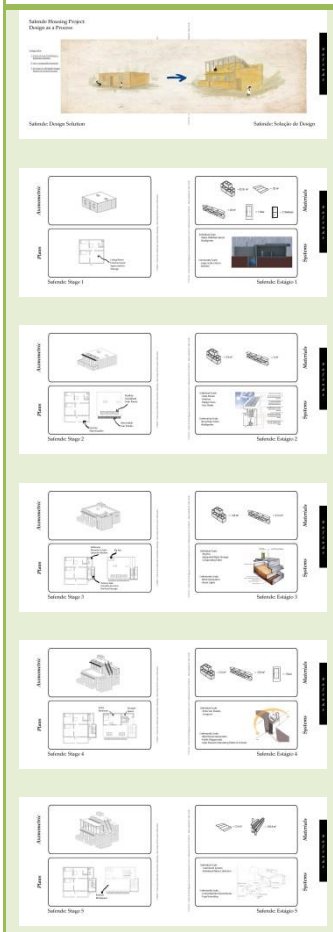
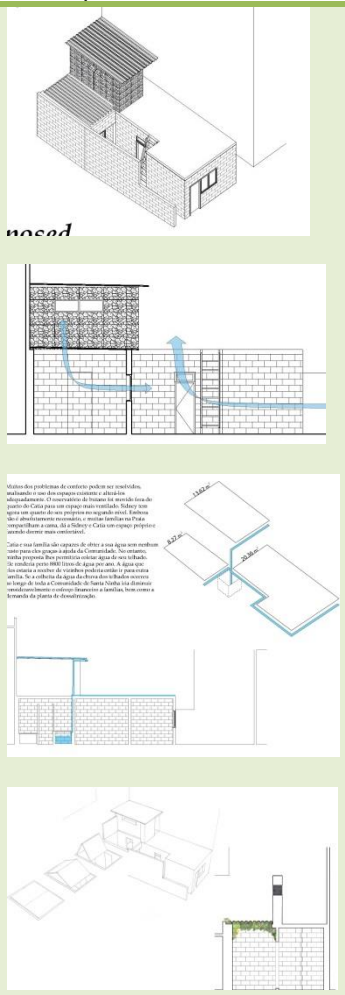
equipment ranging from water collection tanks to solar panels. This is the only design proposal that includes solar panels.

The Safende 2 learner like many of his peers felt that “things were not planned.” However, “it was liberating. Maybe more structure would have been nice… but it would have impinged on the opportunities to engage families.” He felt that previously, he had no opportunity to engage in the design of things that were of interest to him. Once he realized that he had a great deal of freedom and that he could build something, it “sparked this interest in prototyping and using reclaimed materials.” His prototype with reclaimed materials was a tarp made from discarded shopping bag. He proposed that the tarp could serve as a sun shade and water collection device (Figure 46). He attempted to do a life cycle assessment of the tarp, by calculating its carbon footprint.

Safende 2 learner also proposed a design solution at a broad scale. He discovered saltwater greenhouses, which have been shown to work in other arid climates. This was one seminal moment where I was taught something completely new. Apparently the saltwater (or seawater) greenhouse filters salt out of saltwater and uses the water produced for the plants in the greenhouse.

Typically, they produce an excess of water and have been shown to introduce or bring back vegetation to arid, barren land. He went on to run an economic analysis of the seawater greenhouse. The seawater greenhouse appealed to him because of its economic and ecological advantages: producing food in an arid climate without chemical or fossil fuel inputs.

Table 17: Design Responses "Informal" Communities – Category 2
Relatively new neighborhoods - not planned by the govt. Bad roads with access to transit buses.

Safende 1	Safende 2	Varzea/Santa Ninha
		

Like Inferno and Kobon, Santa Ninha is a new neighborhood and the client family did not have indoor plumbing. The learner proposed a folding roof to replace the existing crumbling one, in part because he liked the idea of a roof open to the stars, which are visible in Praia's night sky, but also because he wanted to give them the option of closing it off. He also proposed a water catchment system to offset the family's dependence on their neighbors for water, but also, he reasoned to allow that communal assistance to go to another family. The crumbling roof and walls inspired him to

investigate gabion wall construction. He justified this material choice because he surmised that the family could not afford new building materials and so he could reuse the crumbling parts of the building in gabion walls. Furthermore, the use of a gabion wall for a roof-top room for could provide a well-ventilated addition.

> *The rubble could then be used in the construction of the second level in the form of 46cm x 92cm x 46cm gabions. The rubble-filled wire baskets would lessen the carbon footprint of the building, the cost of new construction and allow for passive ventilation.*

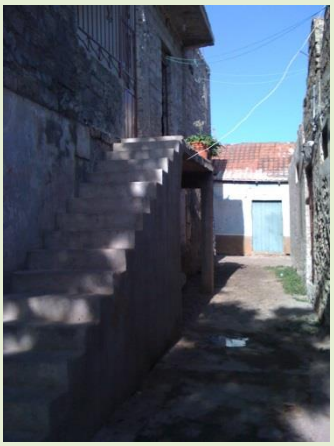
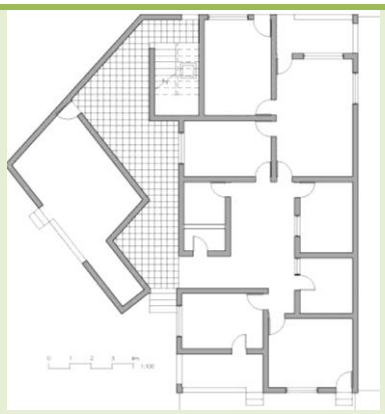
Furthermore, a butane tank currently kept in one of the bedrooms can be relocated to a better ventilated space for improved the air quality in the house.

Neighborhood Type 3

The neighborhoods in Table 18 are older and more established communities of several decades. Even though they were not planned by the government, there was tacit acceptance by officials and in some cases, infrastructure such as sewers and pipe-borne water was installed.

Housing Assignments

Table 18: Housing Assignments "Informal" Communities – Category 3
Established neighborhoods - not planned by the govt. Rare pipe-borne water, acessible transit, passable roads.

Achadinha	Calabaceira	Eugenio Lima
 Host family residence (shaded), with roof access. Grandmother downstairs in similar size space w/other extended family members. 3 family members, 2 rooms. Student in individual room with bed. Barrel/water containers. No pets, no livestock.  	 Host family residence with roof access. 4 family members. 4 rooms. Student in individual room with bed. Barrel/water containers. Pet cat, dog, livestock: pigs  	 Host family residence. Second level with roof access. 3 family members, 2 rooms. Student in individual room with bed. Barrel/Water containers. No pets, no livestock  

Perceptual Maps

Table 19: Perceptual Maps "Informal" Communities – Category 3
Established neighborhoods - not planned by the govt. Rare pipe-borne water, acessible transit, passable roads.

Achadinha	Calabaceira	Eugenio Lima
1. I didn't expect it to be as developed as it is. Which sounds weird because it's not that developed, but I didn't expect there to be as much housing and infrastructure as there is. 2. Instead of designing an entirely new space, I decided to propose improvements to her unit based on what she has now and her stated desires…. Part of the proposed design is to educate the user who will be actively involved in operation of the systems. 3. I usually like group projects when roles are known and each can go off and do their part. I liked working with someone to figure things out. [The Cape Verde project] was really about the culture and the people – not just about architecture and building construction – I think. I rally began to get what design can do for a person, for a specific problem.	1. I mean, you see pictures of it, but until you're here, it's much different than what you think…. it's completely different. Just the smell, the dust, the wind, is so much different than just a picture. So it's surreal, in a sense. 2. My new "family" was quite large and extensive. So much that it took me until about the tenth day to finally understand the dynamics within the house. First, there was Nelita, the mother and owner of the house. Living with her were her three children Otavio, Vandy, and Venusa. Otavio had his two children Tavinia and Tiago. Vandy lived with his wife Cariny and their three children Valeno, Rick, and Liedson (with a fourth child on the way). Venusa lived with her husband Walter and their daughter Edileny. Also living in the house was Gi, Janice, and Jica, the children of Nelita's brother Pedro. There were a few other individuals in the house, but I was unable to establish their relationship to the family. Because it took me a while to really know many of these individuals and all the daily visits by people from around the neighborhood and city, I found it difficult to understand who I was living with.	1. The differences between Cape Verde and the US were immediate and striking. It was impossible to not notice that not all roads were paved, not all neighborhoods were planned, that water was scarce and electricity was unreliable. 2. The house I designed helps provide several resources for the family. There are spaces on the roof where livestock may be kept, much like many families in Cape Verde do currently. 3. Immersion makes the whole process more meaningful, you can get so much more out of it… especially when you're trying to do stuff with social implications, getting the community involved… in my Environmental Justice class everyone keeps talking about that.

Design Responses

Achadinha is near the city center, Platô. As the name implies, Platô is on a plateau overlooking much of the city and is a tourist area that also houses many government offices, banks and embassies. In spite of its "informal" status, Achadinha located in the valley below the downtown area, is a relatively nice area, close to major thoroughfares, shops and other amenities. The design responses of the learner who stayed here focused mainly on daylight, ventilation and water collection. For instance, she

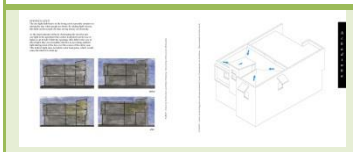
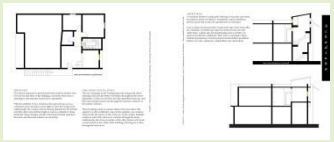
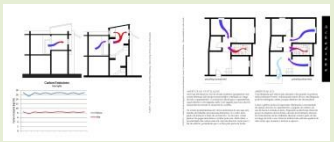
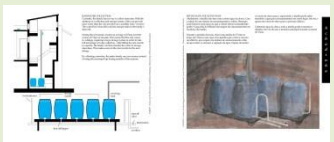
investigated the prevailing winds to propose how the openings in her renovation would improve air flow:

> *The prevailing winds at various times of the year allow this system to work in different ways. In the summer, one window will provide the source of the cooler air. In the winter, multiple windows will catch a breeze to circulate through the home.*

All three systems that she proposed took advantage of an existing stairwell to provide skylights, stack effect and water collection surface.

The Calabaceira learner did not finish the studio for personal reasons.

Table 20: Design Responses "Informal" Communities – Category 3
Established neighborhoods - not planned by the govt. Rare pipe-borne water, acessible transit, passable roads.

Achadinha	Calabaceira	Eugenio Lima
    	**No Design Response**	    

The host family in Eugenio Lima is a very large family with many branches of the family living nearby. Therefore, the learner proposed a courtyard complex with various apartments opening onto shared courtyards. The two proposed courtyards are divided by an apartment.

> *It is for a large group of extended family and friends, with a series of units that are capable of operating independently, but have shared spaces and also can function as a single unit. Each unit is flexible to accommodate a family with children, or a couple of roommates. There are three housing units per level, and units can be added vertically as the family grows. There are two interior private courtyard spaces, and semi-public porches on the facades facing the street.*

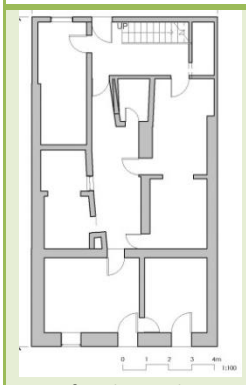
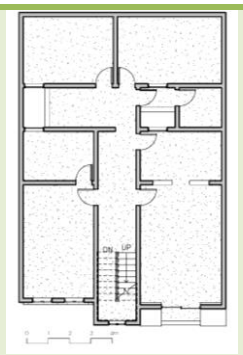
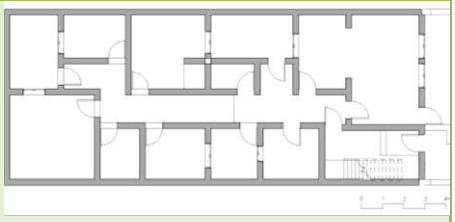
She also proposed a phased plan wherein one apartment can be built beside or on top of an existing one. Like many of the other leaners, she provides roof access to the roof.

Neighborhood Type 4

The final category in Table 21 shows three planned neighborhoods. The one in the middle, Cidadela is a private development and the other two are government planned. These neighborhoods have better infrastructure, such as roads, although maintenance did not appear to be necessarily better than in the more established “unplanned” settlements. Water and electricity supplies were generally more reliable.

Housing Assignments

Table 21: Housing Assignments Planned Neighborhoods
Govt. planned neighborhoods (Cidadela is private). Occasional pipe-borne water. Good roads and transit access.

Achade Grande	Cidadela	Palmarejo
 Host family residence, with roof access and 2 rooms at roof level. 4 family's members, 4 rooms. Student in individual room with bed. Barrel/Water containers. Pet dog, livestock: pigs, chickens  	 Host family residence – student apartment. 3 family members, 3 rooms. Student in living room on mattress. Barrel/Water containers. No pets, no livestock  	 Host family residence – student apartment. 5 family members, 4 rooms. Student in individual room with bed. Barrel/water containers. No pets, no livestock.  

Perceptual Maps

Table 22: Perceptual Maps Planned Neighborhoods
Govt. planned neighborhoods (Cidadela is private). Occasional pipe-borne water. Good roads and transit access.

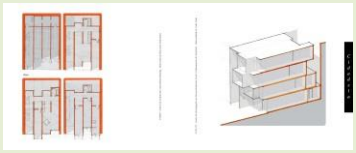
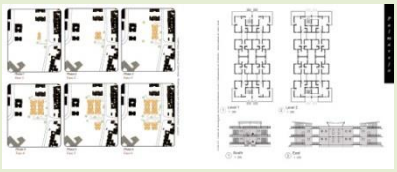
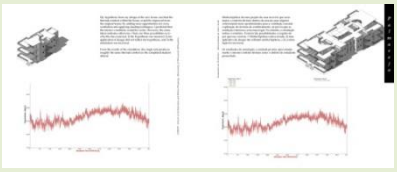
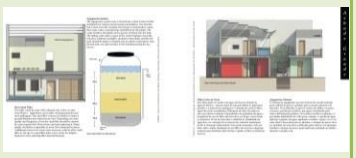
Achade Grande	Cidadela	Palmarejo
1. Any excess food was given to the farm animals who lived on the roof…. In the last week we ran low and had to limit our water usage to food consumption. This meant no showers, no flushing toilets, and no washing clothes. 2. Aquaponics system to produce fish and plants for market and personal consumption…. Feed the fish worms from the compost, the fish grow and produce waste, that waste water is pumped up and filtered by the plants…. and is gravity fed back into the tank. The falling water adds oxygen… Sunlight is needed for plants but fish tank should be shaded to reduce evaporation. Also the tank can add moisture to the air during the dry season. 3. In Cape Verde, I saw how things operated. Now I am able to see how it is possibly to transform space by using another material or taking what's there and using it for a different use.	1. I was surprised to see so many nice cars and kind of the extremes on both ends where you would see this really rustic, not really rustic,, but kind of beaten down shack but then the house right next to it would be completely finished so it kind of threw me off a bit, so I guess I was kind of confused at first as to what it really was. 2. Praia is a net importer of goods, with many shipping containers arriving at port. Thus, I used shipping containers as a basic building module or building block. The house is divided into 3 zones, one being a living zone, another circulation and the final being a small convenience store for every day needs. 3. It is even more important now that I'm in the field, because I know how to think about how it impacts people and use of locally sourced materials…. And it's not so much that it's less about aesthetics, but it is more about its use.	1. Students in Cabo Verde are extremely studious. Most nights my family's classmates would come over to study deep into the night. The students came from different houses around the university, and collaborated on homework on a small table in the front living room. 2. The design of these new homes is to make this habit easier, as the students are grouped together in a student district. The homes themselves are also oriented to the "public" in the front of the house, while private areas in the back are for sleeping. 3. I don't want to say that the studio wouldn't have been as good without the study abroad, but I think the study abroad definitely gave it a deeper meaning - a deeper understanding of what we were doing…. I do think now of how the client will use a space and of how the users will come in and see it… and how to accomplish that

Design Responses

These three neighborhoods include two planned by the government and one private development. The learner in Achade Grande proposed major renovations to the host family home. To facilitate the installation of an aquaponics system he proposed, he reimagined the front façade with a large window that could house vegetation in the system. He proposed a water collection system, with a sand filter, a prototype of which he built during the studio (Figure 46). He proposed a commercially available toilet, but

one marketed by a South African company, making it more economically feasible for his host family.

Table 23: Design Responses Planned Neighborhoods
Govt. planned neighborhoods (Cidadela is private). Occasional pipe-borne water. Good roads and transit access.

Achade Grande	Cidadela	Palmarejo
		
		
		
		

The learner in Cidadela, the private development, reported that it was devoid of any community cohesion. In fact he rarely saw people in the neighborhood; no community to cohere. His host family consisted of students who were always busy and as such, his design proposal seemed only to have empathy for the situation of the host family. The design response made use of shipping containers to plug in, almost as an infill of stacked boxes. He arranged the shipping containers such that they slid beside each other to create voids and protrusions.

The Palmarejo learner also lived in an apartment of all students. He was the only one who decided to pick a completely different site; a site several blocks away on a large vacant lot near the university, which most of the members of his host family attended. He opined that his student host took their education very seriously – more than their American counterparts, he believed. In response, he conceived of a series of shared student residences (as his host were doing), constructed in phases. His cooling and heating load simulations and analyses began with one apartment building and continued as the complex expanded with each new residence. He also realized that while running simulations the default comfort zone embedded in the software may have to be altered:

> *There was a noticeable difference in the perception of comfort between my family and me. When they were comfortable I was hot, and when I was comfortable, they were cold. It seemed that when I wanted to open a window to allow a better flow of air, the breeze was too cold for them.*

There is wide variation in the designs and the design approaches. The leaners reported that in making their design decisions, they were responding to the context and to the situation of their host families. One such factor is the material conditions of their clients. The tendency seems to be that the greater the wherewithal of the host family the more elaborate the design solution. Finding the most likely reasons for the wide range of designs is an interesting possible direction for further research.

Summary of Findings

> *"I got to know why I was doing something. I got to know the people I was doing it for. I got to know why I was designing it a certain way, instead of just getting a sheet of paper that says you have to do this for somebody." – Learner*

The analysis focused mostly on the interviews and writings. The secondary data points were mostly data collected by the learners. The photographs and other video recordings of the learners while in Cape Verde were mainly to observe how they responded in social settings, including how they behaved. Some of these recordings occurred during periodic meetings at the University of Cape Verde or on trips outside Praia for visits to experience the culture and history of Cape Verde. Interpretation occurred within the following frameworks; Ecological Literacy; Cultural Pedagogy – Cultural Studies and Critical Pedagogy; and Experiential Learning – Situated Practice and the Kolb Model. The questions posed were: how to draw out the learners' interest in ecological, cultural and social issues; how useful was immersion in meeting these goals; how did these issues influence their ideas about design; and what were the immediate, intermediate or long-term changes in the learner's attitudes to these issues.

Interest in Ecological, Cultural and Social Issues

Whether it is possible to draw out the learners' interest in ecological, cultural and social issues is a key question in this dissertation. The hypothesis that such interest exists in people depends on the idea that they possess latent cooperative instinct (Boyd & Richerson, 2009), (Pennisi, 2009). By the end of the Cape Verde project, it became evident that the learners possessed such concerns and developed greater awareness. In

some cases, the learners already considered such matters in their daily life and in their design decisions, prior to the project. Such considerations either remained at the same level and came to the forefront of their lives or increased for one or more of the three sets of considerations. More importantly, they all began to make connections between these concerns in ways they had not previously.

Did the project engender the desired engagement of current issues – the ecological, cultural and social issues? One learner did not believe that it changed his concerns for ecological issues, stating that "the Cape Verde project influenced the social reasons behind why I am into sustainability." That is, he was concerned about ecological issues before his involvement with the project. However, afterward he connected the social conditions of his host family to the ecology of their context. This knowledge was applied more globally and abstractly. He made an interesting comment about the interconnectedness of sustainability and poverty:

> *The way I think of sustainability, it would definitely affect poverty alleviation. I'm sure you could do sustainability without poverty alleviation in there… obviously. But the way I see it, poverty today is basically an outcome of being unsustainable.*

Another learner wrote in response to reading White and Whitney (1992) that she was "a bit surprised when poverty was cited as 'the cause of much of the environmental degradation found in less developed countries.'" However, she thought that it made sense. She "had never before associated poverty with environmental problems." In the early interview in Cape Verde, one learner remarked on "how everybody seems so happy. Even though they don't have much they still feel like their life is good." He went

on to say that he has “many more things than they have here but I feel like they're much more comfortable than we are.” He decided that it was perhaps, because Cape Verdeans had fewer things “distracting them.” He seemed very impressed by this; “I just feel like that kind of mark, that’s going to stay with me for a long time I think.”

How can the desired engagement be achieved in a design school and what are the mechanisms to do so? The design studio with the desk critiques, the reviews and ongoing charrettes provided useful mechanisms to instigate engagement in current issues. The use of the charrettes (as discussed earlier) was pivotal for the transition from documenting and analyzing their experience in Cape Verde to synthesizing that into a coherent critical approach to design. The conventional, and more confrontational, style of reviews was avoided by initiating a few changes for the final presentation. Using what is often referred to as the salon style review; the learners’ work was placed on the walls and displayed on computers screens around the studio room. In another room, a roundtable was organized where learners sat around with guests to discuss what they learned and to take questions on their thoughts on the experience.

The guests included architecture faculty and students, as well as practitioners. Also invited were non-architects – friends, family and other interested parties. One of the learners even invited the local city councilor. The CI.DLOT partners participated over video conference. After the roundtable discussion, everyone adjourned to the studio space and walked from one display to the next, where each learner explained his or her project. This illustrated the importance of the learning context itself. The design studio context, half science laboratory and half art space, is ideal for experimenting. The room

can be rearranged with little notice into a discussion circle. This could be prompted by a penetrating question by a learner or to receive feedback on a video. It also provides for interaction between learners – encouraging the exchange of ideas. The desk critiques are terrific for serendipitous learning opportunities.

One interesting discovery that came out of the project was a teaching technique that a learner observed – one that I was not consciously aware of. The concept of the desk critique is the basis of this technique. In a usual desk critique, the faculty member sits at the desk of the learner for many minutes – sometimes up to an hour, as they try numerous iterations to solve a particular design challenge. This could be a problem of spatial arrangement, access to daylight, the aesthetics of certain details or a combination of things. Usually, changes to any such aspects affect any number of others. The desk critique time is also useful for teaching specific techniques, such as: how to attain proper scale in drafting software, how to cut model materials neatly and safely or how to add texture to a rendering. It may be that in any such conversation, an issue of ecological, cultural or other import arises. It may be a code issues or something regarding standard building practice. At such moments, when something like that is explained to the learner, the desk critique allows for a very robust explanation.

Whenever this occurred during the Cape Verde project (and in all teaching situations I have been in), I typically invite the learner to show, teach or demonstrate this newly acquired skill or explain, describe or illustrate this newly found knowledge to a class mate. I then sit back and observe and only interject if and when the learner asks for

assistance. One learner noticed this technique and reported that he uses it in his capacity as an educator. He said:

> *But the fact that five people were targeted and learned it, learned it, not just heard learned it…. Now I implement that same process into the way that I teach aquaponics. We have a kid down at JFK, John F. Kennedy high school, who I taught how to do it, briefly in like a 5 to 10 to 20 minute session. He does the research, and he brought on 30 people. Kid's amazing. He's also teaching his teacher. So he is teaching his teacher, who is teaching others and he has taught 30 people who will go and teach in the community.*

Referring to how I showed one learner how to use the simulation software, and then watched as he taught it to another learner, and then watched her teach another learner, he felt that he really learned how to use the software. As such, he believed it to be an effective learning technique. The software referred to above was the simulation program TRNSYS. It was taught in the studio so that the learners could run energy simulations on the existing buildings and the proposed designs.

They were also taught Revit so they could represent those buildings and designs. While their drawings were not of the highest professional quality, they had taken the first step in learning a drafting software that has become the industry standard and another which helped them to describe, quantitatively how the variation in thermal comfort, lighting and seasonal changes interact to effect energy consumption. One important pedagogical advantage here was that software was being learned in the studio, where they were immediately applied to solving contemporaneous problems. It also meant that the difficulty of learning the problem was rationalized because its utility was

immediately obvious. “TRNSYS was the least fun part, even though I think it was useful,” said one learner.

Figure 48: Floor and Wall Finishes
Source: Excerpt from studio document

The learners’ increased ecological literacy was immense. One of the most cogent illustrations of this was the chart (Figure 48), created by one of the learners showing different kinds of rocks used as finish surfaces for buildings in Cape Verde. The learner was pursuing a minor in geology. Freed from the necessity to visit important cultural sites that would have been the case in a typical study abroad program and encouraged to develop his own content, he determined to catalogue the various rock formations that he observed on the island. He and other learners remarked on the use of stones in

construction, especially the use of volcanic rock for most foundations and cobble stone roads.

Figure 49: Foundation Construction
Source: Learner's photo

The learners' ecological literacy improved on many levels, most notably in their reaction to the availability of resources - particularly water. While there were occasional black outs, electricity was not scarce. Water was scarce, but it was less so in some of the homes. "At least once a day we actually had running municipal water," wrote one learner. When that happened, "we would fill the barrels to the top, and it would be more than enough water to last until the next time the water was running." However, the water situation was the most obvious difference that the learners noticed – and they noticed it immediately.

In interviews a few days after arrival in Cape Verde, three of the learners who had worked as waiters made an interesting observation. They observed and discussed how their water glasses were not constantly refilled in restaurants as it would have been in

the US. In Cape Verde “you have to ask for a bottle of water, like special,” one of them said. “It’s just something really strange that we take for granted,” she continued. Then immediately, she reflected on her own statement by asking: “What is strange, to have your glass always filled or to have to ask?” This moment that seemed so mundane, was an early example of all the aspects of the pedagogical frameworks working together. She was acquiring ecological literacy, as she was observing a cultural difference. She was also reflecting at a high level of student agency with regard to the Kolb Model. The thing she was reflecting on was the difference in how a common social practice plays out in two cultures. She even applied some very complex calculations involving Situated Practice.

Back in Milwaukee, for the analysis and documentary stage of the Studio, she calculated what her Cape Verde household of seven (including her) used for showering for an average day. Then she calculated it “for my two-person house in Milwaukee.” She found that the Milwaukee usage was “almost twice as much as” in Cape Verde. Interviewed in Cape Verde, another learner said that being there made him “feel like there’s a disconnect from what I’m used to; just turning on my faucet and I have this plumbing run by the municipality where I live.” He observed that the concern for water purification was ever-present in Cape Verde – knowing that he could not “just go to the bathroom, fill my glass and drink water.” However, the experience of having to fetch his own water made an impression on him. “I have to… wake up early, bring my bucket down and take it uphill.” The scarcity of water in Cape Verde was a “culture shock” for

him, and he believed that it is "going to change my perspective on how water is to be used. Water is a precious commodity. It's not cheap." Back in Milwaukee, he wrote:

> *The hardest adjustment to life was water. Adjusting to a limited supply of water on a daily basis was the hardest and most interesting. Since there is no infrastructure…, everyone transports their own water on a daily basis to their residence. If someone wants hot water for a shower, one would boil this water to be mixed with cool water.*

Another learner opined that in Cape Verde, "water is sacred and it was used as such." In his house there was a cistern in front of the house. He calculated that his host family "used about four to six five-liter-buckets for cooking, cleaning and bathing" per day. He observed that they only bathed once a day and only cooked hot meals at night.

One learner found the water situation to be "kind of disturbing." He went on to say in his Cape Verde interview that "how much trouble it is just for people to get water," whereas it is "taken for granted in America." He had noticed that his host family had to "get it from a well or be very cautious of what kind of water to use." He said that he was "hurt" that he had not noticed prior to travelling to Cape Verde and he thought that it was something he "should have." In the interview from a year after the project, he was still affected by the experience. He reported that he no longer showers as much as he used to. "I don't shower as much. I have gone from taking thirty minute showers per day to two to three minute showers, every two or three days." Another learner who was equally appalled at the water situation reported that he took 45 minute showers before he went to Cape Verde, which he had curtailed to 5 minutes. In the year-later interview, he said that he still thinks of water as precious, although he "doesn't do anything about

it" anymore. He admitted that he had reverted to his wasteful ways with water and electricity, although it was not clear that he had returned to taking 45 minute showers.

The same learner remarked on the frugality around food. "One day, my [host] mother dropped a full bowl of stew on the ground. Instead of throwing it all to the animals, she collected what she could and served it for dinner… saving about 70%" of it. Apparently, the rest was mopped up and fed to the animals. He concluded that "either she did not want to waste food or she collected it before it was considered inedible. Dinner was delicious anyway." All the learners reported that food was abundant and shared liberally wherever they went.

The question of better cultural understanding is very complicated. Perhaps, it cannot be answered fully. However, it is clear that the learners attempted to understand. It may be that the differences between Cape Verde and the United States of America are stark enough that they prompted the rethinking of cultural views. In the following excerpt from the documentary narrative, a learner discusses one negative and one positive difference in how she was perceived and treated:

> *In Cape Verde, I learned for the first time what it felt like to be a minority. I got used to being stared at, hearing people call out "Blanca" when they saw me walking down the street, and having complete strangers touch my skin or hair. While it was a relief to no longer draw so much attention, I feel that it was certainly a learning experience, as I have never before been such an obvious minority. Also, while in Cape Verde, I admit I complained about being overfed. No matter where I went, I was provided with food and encouraged to eat and eat a lot. However, I immediately began to miss that sense of warmth and hospitality that I now associate with Cape Verdeans.*

This example of a subjective interpretation of normative social practices shows how the learner became aware of some cultural differences. She also seemed to become more sensitized to what others may experience because of difference. The learner also, observed similarities: “we saw lots of the influences of American culture in Cape Verde and saw how they translate… seeing how things are connected and completely disconnected.” Her observation ends on how culture is fluid and the agency of various actors interact with cultural structures – a kind of negotiation that perpetuates and changes those structures at the same time.

How much of a learner-centered experience was it for the learners? This was a challenge – especially at the beginning because the learners were cautious about taking greater control of the content and determining the direction of the work. As one learner put it in an interview at the end of the studio; “sometimes things were not well-organized, but it may have worked out eventually since it allowed us to work at our own pace.” Many learners agreed with the sense that it was disorganized. However, they also agreed that it “worked out” because of the pacing. The curious thing about this perception was that they had the equally strong view that they did a lot of work in the studio. As another learner put it, “it was really nice to do a lot of work without really feeling it – with little stress or even realizing it.”

Because the framework was designed to be learner-centered, the schedule was flexible and often ambiguous about content and deadlines. It also allowed for changes in direction. If the learners’ interests moved in a different direction, initial plans were abandoned. This depended on a discussion with the whole group to ascertain that a

valid pedagogical case for such a change could be made. One learner opined that a weakness of the studio was the "lack of formal time periods allocated to each part." However, he believed that it meant that they "were able to explore things that were unplanned that became important for learning and useful for Cape Verde." In that case, the learner understood the pedagogical importance of those shifts in content for the benefit of the contextual issues.

> *It was nice to get away from that; 'this is your project, this is what you need to do, it needs to be done by this time.' It was kind of nice to have a whole semester to really think about what we're doing and how it could actually impact somebody, instead of just designing for the hell of it.*

Many of the assignments were open-ended – especially the design charrettes, which invited the learners to interpret the problem as they saw fit. For instance, they were asked to design their ideal house, but the meaning of the ideal house was left open to debate – so a debate ensued. Some learners chose to put the house in a particular context while others did not bother with that. One learner proposed a house that was portable and could operate in any context.

Student creation of content was slow to take hold, but once it started, it accelerated quickly. Once learners realized that they could determine the content in the studio, they became extremely motivated to do so. One example was when a learner decided that she really wanted to understand electricity and how it could possibly be sourced for a context such as Cape Verde. Her avenue to acquire this knowledge, she decided, was to construct a wind generator and turbine. My only suggestion at that point was to find her two volunteers to work with her. Already, another three learners had decided to

construct an aquaponics system. Two other groups formed soon after that, one tackling a solar powered water purification system, while the other built a solar shading device and an operable skylight. It was around that time that the learners took complete control of the studio space. And while they continued to work on the required individual projects, they worked diligently on these group projects.

Without making any assumptions about learning styles, learning activities were cycled through the Kolb model. For instance, during the studio, the learners were exposed to abstract conceptualizations. Some of the content was provided by faculty, while the students were encouraged to find other sources. For instance, once a week, a film was shown. One such example is a documentary about people living in the community of Makoko – located in the Lagos Lagoon (Anderson, 2010). Another was about an architect in New Mexico who builds “earthships” (houses with thick walls that use passive design principles) out of discarded tires (Wexler, 2007). Various books were made available in the studio to be read and brought up for discussion.

They included books on passive solar design (Mazria, 1979) and the politics of aid to Africa (Moyo, 2009), among others. Various ecological, cultural and social issues were introduced and discussed constantly. They would be revisited whenever we watched a film, read a book, became aware of a precedent, presented with a design solution or engaged in a critique. Active experimentation initially took the form of design charrettes and group brainstorming for ideas.

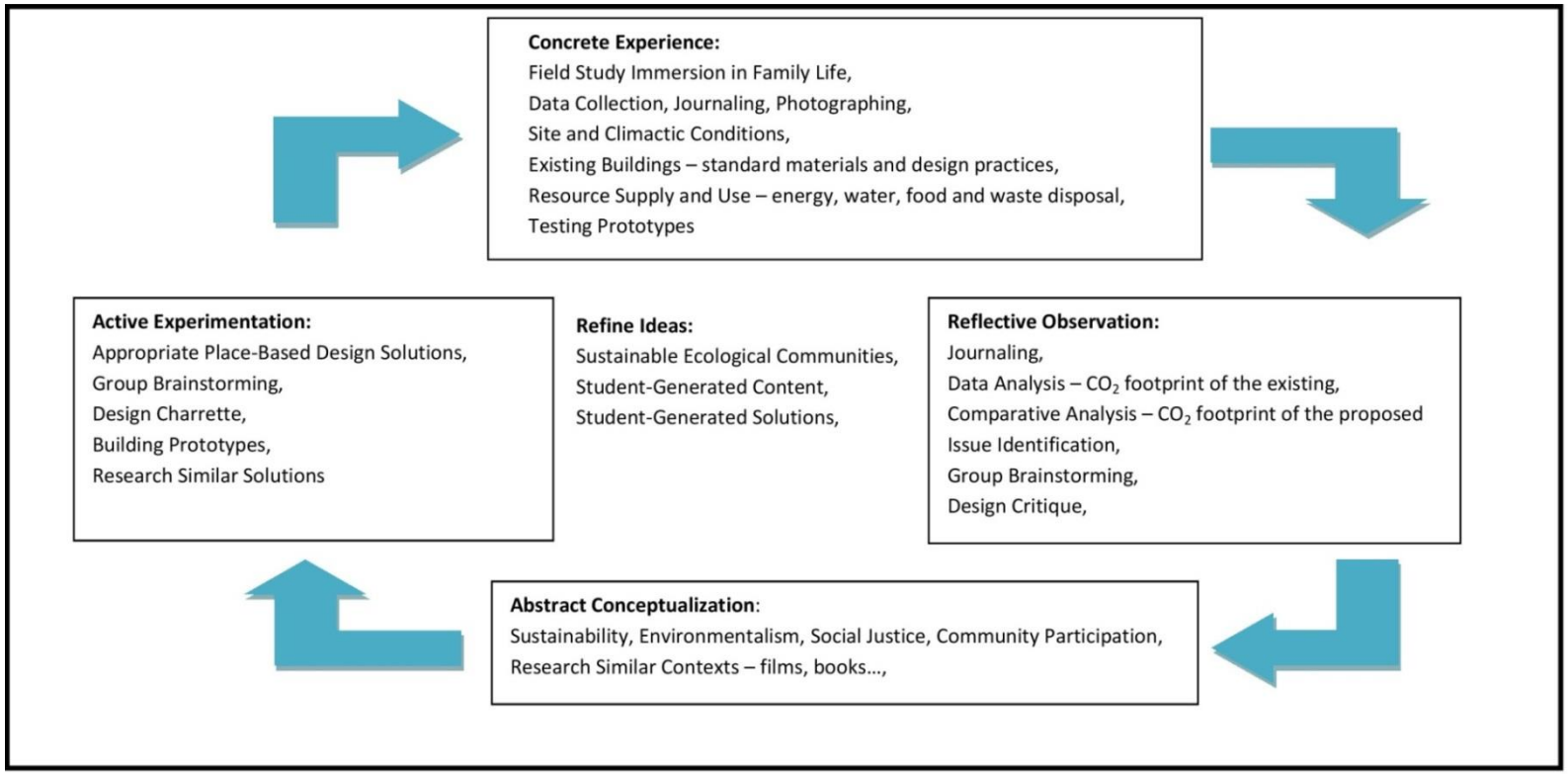


Figure 50: Kolb's Experiential Cycle Adapted to the Cape Verde Project

These were then assessed in light of what the learners thought was feasible given their concrete experience of the trip. The learners were able to discuss the merits of each point, idea or suggestion thoughtfully. They would continually question whether such things were applicable in the context – would it make sense culturally, is it economically feasible and what are its social costs or ecological impacts. This discourse continued for the rest of the semester. The learner who liked being able "to really think about what we're doing and how it could actually impact somebody," also had this to say about the project;

> *I think it helps more now, especially now that I'm in the field, because then, I know what to think about in terms of design, and think about how it impacts people and how it could be built.*

Usefulness of Immersion

> *All my schooling beforehand was sit 'down and listen.' My grades reflect how well I did on that. – Learner*

The learners' views on the utility of the immersion in meeting the goals of the course are unequivocal. They all insisted that the study abroad was by far the best part of the program. Certainly, the warm weather in January played a role. However, the learners reported that interacting with people and the outlook of Cape Verdeans, were more significant factors. One learner began his narrative about his experience in the following way:

> *I miss Cabo Verde – being there. I miss the people the most; I miss the interactions, whether one-on-one or in a group sitting down for lunch. I miss the weather too. It's impossible not to miss high 70's and no rain. The culture, the pace of life, "island time," we were a good fit. It's a good thing to have a plan*

> *but there has to be some flexibility to it, so it's good to just step back, relax, and go with the flow sometimes. That was one aspect I liked about the people and the culture of CV: their ability to do that. To take a deep breath and relax, live. (And I'm not saying that living in Praia is sand beaches and all-you-can-drink papaya juice every day, it is just a very different culture than ours in America).*

On the second day in Cape Verde, the learners were encouraged to explore their neighborhoods, and possibly figure out how to get from their hosts' houses to the city center where the CI.DLOT office was located. Three learners got lost in one neighborhood where one of them lived. One of them later wrote that it "ended up being a great way to get to know the area." Once in Cape Verde, it became clear that one could not purchase a simple straightforward map to help with location. This presented a challenge to many learners. On learner wrote that orienting herself was a challenge:

> *I felt disoriented for the first week because I couldn't get my hands on a map of any kind and because there weren't many large landmarks that I could look for. To get my bearings, I usually like to have a map and just go out, walk around, and get lost. By the time we got maps, we had all pretty much figured out where the important things were and could get around on our own quite easily.*

This observation illustrates multiple cross-cultural differences and assumptions. We assumed that we would be able to find a map – a simple locational map, but all we could find was one of the city center oriented towards tourists. Of course, many of the city's neighborhoods were "informal" and as such, they had never been mapped. Some were not recognized by the government – even though some of them were over 50 years old. Even if the government wanted to, it was not clear they had the resources to do so. This was discovered by the learners over the course of the trip. As one learner

said in the post-studio interview, “staying in a different neighborhood, with different socio-economic strata,” greatly altered their perceptions of the city – meaning the idea of the city. She continued that the experience “upset standard urban planning establishment assumptions.” She also meant this in the sense that just because a community was informal it did not mean that it was necessarily impoverished or worse off than a more “formal” neighborhood.

The learners also discovered that even economically challenged communities were often more desirable than the affluent ones:

> *Another interesting thing about being in Cidadela was that we had all the plumbing fixtures, but none of them worked. They were basically there for show and it ended up being very similar to the other informal neighborhoods because I still had to wash with a bucket of water.*

Cidadela, a private development, “considered an upscale neighborhood,” sat on a hill. In addition to lacking infrastructure, the learner who lived there felt that it lacked the community cohesion that he witnessed in the much poorer informal settlements of Inferno and Kobon. Inferno is a hill-side community as well, but they lacked basic infrastructure, such as pipe-borne water. The homes of the hosts in Inferno lacked plumbing fixtures. This was also the case in Kobon, an informal community that sat in the flood plain of the river. A watermark along the top of the building was an ominous reminder of this fact. But the learner who stayed in Cidadela thought that Kobon “felt like a community when you were there, because everyone knew each other and everyone kind of looked out for each other,” whereas in Cidadela, “I never saw my

neighbors. I don't think my host family knew their neighbors." This he believed was one of the reasons that made Cidadela a "Westernized" community.

What are the qualities that make Cape Verde, the context for this project, ideal for such an immersion? The reasons were laid out in much detail in chapter 6. As mentioned, Praia was chosen because it is representative of other global south cities such as Karachi, Lagos, Jakarta and Port au Prince. These cities have explosive population growth in common and the fact that much of the growth is in "informal" settlements. Often services are provided by the "informal" economy where much of the commerce is carried out. They also tend to be disconnected from the social and political life of the city. As one learner put it, because it was an island and quite small, "you could look at one specific problem and trace all of the lines to all of the other things that connect to that problem to make it a problem."

Did such immersion enhance the learners' ability to engage in the ecological issues? The obvious success story in this regard was their appreciation of water. In the words of a learner, interviewed a few days after arriving in Cape Verde:

> *Another one of the maybe shocking differences when I arrived was the different uses of water. Where I come from water is just abundant. We turn on the faucet, we take showers, we drink as much water as we want, but here it's very different, the house that I stay in has faucets and shower fixtures and everything but there's nothing there when you turn them on.*

This "shock" that the learners experience prompted more than one learner to make a quantitative comparison, such as the aforementioned water usage calculations. Upon returning to the US, another learner remarked in her narrative:

> *In spite of my relief and finally feeling truly clean, I felt guilty. The only reason I had this luxury is because I happened to be born in a place where plumbing and instant hot water are commonplace. I thought of my Cape Verdean family, and wondered if and when they would be able to have a running shower every morning. They deserve that luxury just as much as I do.*

Her writing includes admissions of guilt, appreciation of her privileged position, questioning that privilege and the purely serendipitous nature of it, as well as the beginnings of a political stance – or at least an ethical stance about it.

One learner compared the size of his house in the US to the one in Cape Verde saying "here at home my family would drive me nuts if we were in the small space my host family seemed to do fine in. I was surprised how little of an issue it seemed to be for them and me." But then he wondered if it was "possible they were on good behavior while I was around." He goes on in his narrative to pose the following question: "What was the quality of life in Inferno? This," he wrote "is perhaps the most important question." And his answer:

> *Well, it was surprisingly high, even for me. For all that Inferno lacks; infrastructure, health sanitation, etc., it more than makes up for with its strong sense of community. I wish my neighborhood had half as much community as Inferno. By far the most surprising aspect of the trip was how much I enjoyed Inferno. I can't fully explain why, although much of it was simply the people and feeling of the neighborhood.*

As was mentioned before, the learners discovered that lower-income communities were sometimes more desirable than those with upper-income residents. However, they also understood that the economically challenged families could not afford expensive

construction materials. The immersion allowed them to observe how their host families used their living quarters:

> *Most windows also had a fabric curtain on the interior of the house, so the window could be open to allow ventilation but be visually covered. Another common practice was the use of light wells/mini courtyards. In my house we had three of these, providing natural lighting to the interior rooms, as well as a means of cross ventilation. While the front windows or doors were open and the doors and windows to the light wells were open, there was a steady breeze flowing through the house. Although I found this to be comfortable, my host family was often cold due to this breeze, and would only leave the window open for short periods of time just to temporarily cool down the house.*

Another learner commented on the "noticeable difference in the perception of comfort" between his host family and him. "When they were comfortable," he went on, "I was hot, and when I was comfortable, they were cold." It seemed to him that whenever he "wanted to open a window to allow a better flow of air," it was too cold for his hosts. The above comments showed that the learner recognized that different people had different thermal comfort zones and such differences could vary widely – especially in a different context with different climatic and social characteristics.

For her year-later interview, one learner reported on what other people thought of the Cape Verde project:

> *Different perspective, different experience than anybody that I have talked to – and it has come up in conversation so many times and I think a lot people wish they had something like that. When I was applying for my job, I used material from the report about Cape Verde. I was able to bring it up in the sense that there was the language barrier and that we were staying with one family and*

> *really immersing ourselves in getting to know this one house, this one neighborhood. They really liked that – they really liked that experience, versus just going to Europe and touring around all the old buildings. They liked that I stayed in one area and got to know a place very well.*

The conversations she referred to include talks with her friends and co-workers. She also talked about her interview at a large, well-known, multi-national architecture firm, where she worked at the time. Her remarks show that the interviewer and other acquaintances with whom the learner has discussed this, found value in deeper knowledge of place. For these reasons, she believed that her participation in the Cape Verde project was instrumental in getting the position. The experience continues to be useful in her professional career. She described how learning to communicate with people with whom she had no language in common to garner complex information was a useful skill to learn. She explained that uses this skill when she communicates with architecture clients who do not understand the language that she uses with her colleagues.

Did immersion provide useful learning about the culture? One learner really believed that the experience of living with the clients greatly increased his understanding of the site conditions. He said:

> *You can look at a diagram on paper and you can get meaning from that. But what if you actually experience what happens in the diagram? You have an ability to design space better - to come up with better solutions to a problem.*

Another aspect of cultural immersion during the trip were the tours organized by the in-country partners at the University of Cape Verde, to sites that they deemed

culturally significant was not very popular with the learners. The CI.DLOT organizers and the faculty believed that it was useful for contextualizing the learners' experience and to avoid generalizing their experience to the whole society. However, many of them opined that the time could have been better spent with their host families in their neighborhoods. Some of the learners developed a sort of solidarity with their new communities, opting not to attend a visit to the national museum. They seemed unimpressed when their peers later informed them that they had missed an opportunity to meet the head of state. This was an early example of the shift in power relations that Freire asserts is necessary for Critical Pedagogy. It enabled them to pursue an avenue of learning that they deemed important – at the expense of the itinerary.

Figure 51: Meeting the President
Source: Learner's photo

Did the immersion include unconventional representations and evidence, to describe and illustrate subjective experiences and social practices? There were many

instances of deeper cultural understanding. For instance, one learner felt that she learned about the value of community strength in spite of low income. She felt that they had a strong community that worked well together, unlike those that she knew in the US. She surmised that she and the two other learners, who stayed in the neighborhoods with the worst living condition compared to others in Praia, developed the closest relationships to their host families and their neighbors. These houses did not have many amenities – including indoor plumbing. Due to the immersion, she learned that social practices initiated at the community level can offset any financial limitations.

> *Sense of community in Inferno was greater than anything experienced here – perhaps because the lack of access to wealth forces people to be interdependent – I knew more people there in that neighborhood after two weeks than in the one I live in here in Milwaukee even though I have lived here for two years.*

Did it include opportunities to critically engage in the context? Staying in homes and the interactions with students at the University of Cape Verde provided opportunities for critical engagement. There were tours, lectures and symposia organized by the CI.DLOT partners, which provided deeper discussions on Cape Verdean culture and society. The trip in January of 2011 to Cape Verde by students from the University of Wisconsin was the first from any American university. As such, the American Chargé d'Affaires to Cape Verde hosted the learners at the embassy. The learners were quite critical of the embassy's outreach activities.

> *I remember when we went to see the American ambassador they talked about bringing American basketball players like American celebrities. And then we asked them if they were bringing bits of Cape Verde and its culture to America but they didn't seem to understand the question.*

Along with such sentiments, the learners admitted to their own preconceived notions of what Cape Verde was. They also recognized the power of American culture – how it can overpower other cultures.

> *They had posters of American pop artists. They were all excited to talk to us about American musicians. They had some of the West African culture but a lot of it was stripped away, they're all dressed in jeans and t-shirts. They didn't dress in ways that you would think traditional West African.*

The above comment is as much an interesting critique of the cultural hegemony as it is an important reflection on expectations of difference. The learner both describes and laments the absence of an expected difference, even as she accepted that she really had no basis for such an expectation of difference. Such a complex mix of emotions, with the attendant engagement with content seems impossible without the immersion.

The opinion of learners on the efficacy of immersion in a community closer to what they are familiar with was mixed. The learners were asked if an immersion program organized in the US – one closer to home for them, would have the same impact. For instance, it could be in a low-income neighborhood in Milwaukee or in another North American city. A few learners believed that it "might work." They all felt it would have to be remote from the university and downtown. However, they did not believe it would have had as impressive an impact on them – because, "you could go home" at the end of the day. They did not think it would be so powerful even if they lived in the home. One learner did believe that it would be "mind-blowing" for a student. He went on, using his contemporaneous work at the time of the year-later interviews, to explain:

> *I'm not even immersed, but I am working on the south side of Chicago right now. The things that I see, you don't get on a campus, where I grew up in the suburbs, nowhere, not even downtown. You hear about it, but until you actually see it and know how to react to it…*

This learner is one of the few who has experience working in lower-income communities here in the US. It seems that his different view about the efficacy of a more local immersion stems from this work. He also mentioned that his choice to work in such communities was prompted by his Cape Verde experience. As will be seen later, he said that the experience completely changed his outlook on life.

All of the learners said that the immersion in a different context was very useful for their learning – including one learner who had been to India and another who had been to Dominican Republic. Some learners felt that the starkness of the difference; culture, language, climate and so on, made them pay more attention in a way they would not have otherwise. One learner surmised that the language difference "made them pay more attention" to what people said and what was going on around them. When asked if the language, culture and other differences did not create a barrier, and could it be that they had not understood their hosts at all, they acquiesced. They believed that they were aware of this as well – even while in Cape Verde, in part because some had experienced instances of miscommunication. As a result, they insisted, they resolved to be even more attentive.

In general, immersion was seen as very useful because meaning and event were integrated (Rogoff, 1982). The purpose for doing something was linked to the activity. As such, they were highly motivation to discover solutions.

The end of the trip came much too soon. I knew on the last night I was not ready to leave. I had so much left to experience and learn… – Learner

Influence on Design Ideas

The Cape Verde experience influenced the learner's ideas about design in different ways. All of them seemed to experience some sort of change. Many spoke about how it strengthened or reinforced their views of design:

I think it clarified it for me. I don't know if it really changed it, but the value of immersion and the value of community participation, it solidified something that I may have felt before but I didn't really know I didn't really have cause to think about.

Others spoke of how it completely changed their views about design. During his year-later interview, one learner compared the studio with previous studios. In the latter, he complained, he did not feel a "social connection" to the users of whatever the design was for. When pressed about what he would do in the future when he may have a client who may not necessarily be a user, he said that he has already changed his methods. In a subsequent studio, he said that he went out to find potential users and talked to them. "If I went to grad school now, I know that I can't just sit at my desk all day and think that things will come out of it."

In her year-later interview, one learner complained that, "in each course, the professor has in mind a particular area of emphasis that they want to think about." As such, she went on, "in the scope of the course that's what you're asked to concentrate on." In her interview in the same period, another learner put it this way:

> *I feel like in most studios if you have solar panels on your building you get maybe point five points of a grade. And people just do that as a copout solution. I feel like seeing what we had to work with and then knowing how we can make this a sustainable minded building without spending all this money on expensive 'conventional energy saving things.' I think about it when I see buildings that are posted in Inhabitat,*
>
> [60] *that are high-tech sustainable buildings. I see them and I think they're cool but it's not my interest any more. I like what we did.*

There was varied evidence of such engagement evident in their documentation and analyses, or in the syntheses and design approaches. With some of the learners, it was more nuanced. As one put it, much of the studio work "was riding off of the high of everything we learned on the trip." As such, she could not differentiate what was specifically due to the studio "or if it was kind of a continuation of all the ideas."

The emphasis on local materials and what their host families (that is their clients) could build, was different from other studios. "Thinking of that in a different way was certainly a new experience – a changing experience." One learner created a tarp by ironing shopping bags together. The tarp was used as a tent shelter and he made another for a professor who used it as a sukkah. The idea came to him because there were many plastic bags littered along the dirt road of his neighborhood in Cape Verde. Thus, the changes engendered by their experience and the changes in their approaches to design were obvious in their work– both in the documentation/analyses phases and in the design/synthesis phases. It was also evident in their narratives, journals and other recorded data to indicate that the learners were discussing or engaging these issues. In

fact, it continued to be evident in their subsequent lives – in their designs, in their other work and in their daily interactions.

With regard to influences on outcomes, this has at least two sides to it. The first is in the work they produced for the Cape Verde studio and other design work. The second is in how they are affected by design – their own work and the work of others. The learners understood that their host families had economic constraints that precluded "materials imported from wherever." As such, they believed they were "forced to use local materials," which in turn compelled them to be more creative. All of their design responses recognized the scarcity of resources and materials. For instance, two learners proposed the use of shipping containers as a building material. The learners made astute observations about how their host families used their living quarters, which informed their design decisions. As mentioned before, they also recognized that varied differences in how people might respond to climate and their relationships to resources. Almost all of the learners made provision for the growing food or keeping livestock – often this was incorporated into the design. So was rainwater collection. Every design response provided a way to harvest, purify and store rain. Many had proposals for energy production, either at the scale of the house or the neighborhood. Others sought to reduce energy consumption by improving availability of daylight and natural ventilation.

What was the connection between larger issues and the learner work? When asked if he missed doing "normal architecture," one learner said, flatly:

> *No. There's no such thing as normal architecture. What they groom you in school is simply a way of programming and thinking about design. Architecture is a way of filling niches – building typologies. Each is a separate architecture. Even though they seem similar, they are not really related. It can only be described in terms that relate to where you are.*

It was unclear in this case whether this was a view that was a product of the Cape Verde project or whether it was a previously held belief. When asked if he missed doing a "normal studio," another learner asked, "what is normal architecture?" He asserted that projects "like this are normal in this day and age." When asked if architecture should have a formal expression that symbolizes aspirations toward sustainability, another learner felt that there was no "need to symbolize such aspirations – you do it because it is the right thing to do, not to get recognition." He did not know if it was necessary to symbolize such aspirations.

Another learner decided it might be useful for spreading ideas about sustainability. She was concerned about people's general responsiveness to sustainable architecture – being able to see and then experience it. The problem, she felt, was that "people associate being sustainable with being more expensive, uncomfortable, inaccessible and not in keeping standard with aesthetic norms." She suggested a way forward could be to make sustainable design "more integrated and less jarring."

Another learner took a somewhat different approach. He suggested that they should be "interesting to the users." One instance he gave was playground equipment that pumps water. Sustainably designed infrastructure should be something the users "enjoy having it in their community beyond its obvious utility." The learners all reconsidered

some aspect of their approach to design, what they considered architecture to be and even many of their preconceptions of the built environment. At the end of her narrative describing her impressions of Cape Verde and her experience, one learner wrote:

> *Although I think it is too early to make a final summary of my thoughts and experiences and lessons learned, at this point I can say this much: this trip was a refreshing opportunity to see the life I take for granted through new eyes. It invited me to think about how the development of a city works, and compare what I knew about ancient developments to what I saw in Praia's development. I had never before seen a city that was mostly developed through auto-construction, and again that brought forth questions of if, when or how urban planning would be implemented in the future. As naïve as it sounds, I had never before considered the idea of a city lacking in infrastructure, and it elicited questions of how infrastructure could be brought to areas that had already been developed, and if the illegally settled areas would ever become legally recognized. As time goes on I am sure I will continue to notice differences.*

The most interesting aspect of her observation was her recognition that she had learned something, and that it reframed both her preconceived notions and how she learned. More importantly, she resolved to pay more attention to such opportunities in the future. As has been discussed, this level of deep self-critique occurred repeatedly.

Changes in Learners Attitudes

> *I think that the shock value of the experience is useful for everyone, but for architects, the difference in infrastructure is also instructive. - Learner*

Many of the learners reported changes in their attitudes to issues of ecology, culture and society. There seems to be ample evidence that the experience of the Cape Verde project informed the learners' plans for their academic and professional careers. Twelve

out of the fifteen learners that went to Cape Verde took the design studio. They were all seniors in the final year of the undergraduate program. Five of those twelve have gone on to architecture graduate school. Only one went directly into graduate school. Two of them took a year to work – although one had one semester of school work to complete, one worked for two years before returning to school. One spent a year in Alabama at the Rural Studio (Dean & Hursley, 2002), discussed among the outliers. All have focused on ecological design in their graduate studies. One learner did not finish. In fact he did not finish the studio – nor apparently, did he finish any of his other classes in that spring of 2011. He has not completed the undergraduate program. Two learners went into traditional architectural practice in firms and have remained there. They are both at relatively large firms. One of the two is at a design/developer firm, while the other has work that greatly involves sustainability issues at an urban scale – working on a large sustainability master plan for a small city. The remaining four have left architecture – or do not work in traditional architecture firms.

One learner entered graduate school immediately to study early childhood education. One segued into industrial design. He opted to stay for two more semesters after the studio before graduating, taking a variety of classes, including a welding class. One learner is the cofounder of a non-profit that does community-based, educationally centered, appropriate technology solutions locally and internationally. This learner did not believe that the project changed his views on ecological, cultural or social issues. However, after his experience of another real-world design workshop[61] and the Cape Verde project, his understanding of what it meant to be an architect changed. It

expanded what he believed to be his professional options. The last learner has become involved in the urban agriculture movement. He credits this transition to his experience building an aquaponics system in a group project in the Cape Verde Studio. When he was asked if he thought this approach to design education was useful he said: "Yes. Definitely, it's actually shaped my life – my current life." He went from considering a more conventional architecture career to working "hands-on in urban food in education." One aspect of this involves working "with schools to implement aquaponics systems to teach STEM[62] development." The design and construction of aquaponics systems is integrated into the curriculum and used to teach English, History and art as well. "So your studio has kind of rewritten the way I view my life." Another learner (the one in industrial design) claimed that it "changed my life."

One learner said that "when NJ told us we could do whatever we want, 'if you want to build something, go build it,' it kind of sparked this interest in prototyping and using reclaimed materials." It prompted him to stay in school for an extra semester, during which he enrolled in a welding class to further hone his skills in this new area of interest he had acquired. He then stayed for another semester to work with a visiting professor who prized social responsibility in his work. For most learners, the experience changed their design philosophy or outlook in life – more profoundly for some than for others.

> *A lot of the unique and interesting challenges that we came across with the Cape Verde design project have not really reappeared in, nor is it a concern in other courses. But the process of thinking about things… of the place, materiality and things like that, have become part of the contemplation of the design process. – Learner*

It is not clear whether this learner is lamenting the lack of interesting design challenges, the dearth of projects with more meaning or the lack of interest among many architects in the concerns of people outside their own social circles. Even the four who left architecture did not seem to feel they have left. They simply reframed what architecture and design meant to them, as well as what those look like – or what they are capable of doing.

There have been many changes in their writing and discourse with regard to these issues. In his year-later interview, one learner talked about how it "has made me less wasteful." He also discussed how he sees those around him and the conversations that he has with them:

> *My girlfriend is very wasteful. She buys a lot of food and she throws it all away. When I come home to her house, I eat all her food and she gets very upset. So I'm always yelling at her 'why are you getting upset with me? You're going to throw this all away, as soon as you go grocery shopping,' and that's what she does. It made me more conscious about how much people throw away and how much people actually consume and how much they think they can consume in a certain amount of time. She's a very small girl…*

He went on to discuss how his mother who also buys a lot of fresh produce, who cooks frequently, often discarded the scraps from the produce. He also engages her on the questions of wastefulness.

He said that focusing on waste during the Cape Verde project alerted him to how wasteful he was – in comparison to his host family who seemed to have no waste at all. Another product of the experience was that when he had to move, he moved into a small studio apartment – instead of a one-bedroom apartment that he would have

ordinarily. Another learner said during his year-later interview that he doesn't take anything for granted anymore. He hastened to add:

> *…but I wouldn't say that I took everything for granted before. I think just seeing what people had to go through when they don't have as much money to work with, but they're still able to function normally. They still take life very seriously – they're not all depressed because they don't have anything. It was a nice refreshing feel to get away from that whole stress that says that if you're poor, there's really nothing to live for – that's kind of the American way.*

He was able to be more reflexive about his privilege and place it in the broader context of discourses about poverty and the perceptions of poverty, as well as how that discourse can be empowering or discouraging.

Did it help the learners make connections to larger global issues? One learner pointed out in his post-studio interview that the use of the arborloo solves the local problem of providing toilets and culminates in a tree. This he asserts is "tied to global warming." The arborloo (shown in section in Figure 27, right) is essentially a hole in the ground with a privacy screen enclosing a portable room. Once the hole is full, a tree is planted and the room is moved to a new hole. The learners decided after discussion that while this solution may not work in other communities of Cape Verde and elsewhere because of the stigma associated with human waste, it was viable in some of the informal neighborhoods of Praia, where people used chamber-pots or the hill-side. They are able to work out complex scenarios involving the quantities and prices of goods. However, without any real context, they had "frequent errors in parallel problems in the

formal testing situation" (Lave, Murtaugh, & de la Rocha, 1984, p. 83). That is because meaning and event are integrally linked (Rogoff, 1982).

The learner who went on the study education said that, "before the Cape Verde experience," he had decided to switch to education. "This experience made me reconsider... somewhat." He mentioned that the time spent his Cape Verdean hosts learning about their culture and living conditions, and attempting to address their resource issues, illustrated the power of design. When asked what architecture could possibly offer low income people in Cape Verde or anywhere else, another learner discussed at length the possibilities; he said that a designer coming into such neighborhoods can see "how the buildings are deteriorating, there is low upkeep, low infrastructure and low food value." He went to on to say the "bringing the element of design" and by "understanding of the culture of the community" by investing time, one can participate in community regeneration. "It can't be dropped in," he cautions, "it's got to be grown from within, which is really hard, because then you need architects that understand… that have the emotional investment in that community." The words of the following learner summarize the intent of the project quite well:

> *The enthusiasm we had for sustainability in the course and for the cultural ideas, and thinking about where things come from and the fact that no one else really thinks about that, it would be nice if there were more opportunities to learn that way, think that way but it's not really a focus for everyone. – Learner*

Challenges

The greatest challenge was the (somewhat) drastic removal of students from their everyday context (with a completely different language). However, this pushed the learners to really engage their context. Being in homes was pivotal for the practical experience of how their host families live – not a set of data.

The learners found the language barrier to be a challenge but in hindsight they opined that it made them more attentive. They also seemed concerned with the loose structure of the trip and studio, but also decided afterwards that it was useful to making the project work well. Although the program was the cheapest study abroad from the university in a decade, the airfare was still a challenge for the learners. However, the cost of being in Cape Verde and living in homes was not expensive. Thus, the program could be run for longer at marginal increase in price. It was too short - although they learned a lot in the 2.5 weeks. A little more time would have decreased the urgency that sometimes overshadowed the project. More time would have afforded greater learning. Going for a whole semester may be better, but necessitates some more planning and expanded coursework.

The software used in studio for energy simulations was not very user-friendly. Perhaps, a concurrent class for computer modeling and simulations software may be in order. Alternatively, a solution might be to find more user-friendly software, at the expense of robustness and accuracy, because it is more important to perform comparative analyses – between the existing and the proposed or among several design options.

Part Three – Notes

[55] Centro de Investigação em Desenvolvimento Local e Ordenamento do Território: Research Center in Local Development and Territory Planning

[56] (World Commission on Environment and Development, 1987, p. 243)

[57] (Fisher, 2008, p. 148)

[58] Ninja can be described as a variation on musical chairs. It involves the players standing perfectly still and then moving suddenly to strike other game players in one motion and then standing still again. The learners played it often – perhaps because they did not have regular access to smartphones or computers.

[59] Nobody expects the Spanish Inquisition!

[60] Inhabitat.com is a weblog devoted to the future of design, tracking the innovations in technology, practices and materials that are pushing architecture and home design towards a smarter and more sustainable future.

[61] This workshop was not a design studio. He worked with other team members to provide preliminary design ideas for a new branch of the Urban Ecology Center on the south side of Milwaukee (Unaka, Kolster, & Reiter, 2010).

[62] STEM: Science, Technology Engineering and Mathematics

PART FOUR – CONCLUSION

When the wind of change blows, some build walls while others build windmills.

– Chinese Proverb

This dissertation was an attempt to demonstrate how to draw out students' interest in ecological issues, while paying attention to society and culture. In my interactions with students, I tried to marry the twin concerns articulated by Aldo Leopold: first, the relationships between humans and other humans, and second, the interactions between humans and the land – or more broadly, the planet. A key question was whether these issues influence the design ideas of the students – and if so, how? The focus of this dissertation was not an assessment of students' performance while taking a class. Rather, the focus was about how they were helped to engage meaningfully in current issues. The Cape Verde project provided a venue to acquire and apply the skills of analysis and synthesis in a given context.

The project was also an exploration of how their designs were useful for such engagement. Critically, they were urged to participate in determining how that engagement occurred. Finally, they were encouraged to critique every aspect of the process as deeply and broadly as they wished. It must also be stated that this dissertation is in part a personal narrative of a teacher's professional growth. Thus, included in the narrative were the changes in my attitude to teaching and how my philosophy of teaching evolved.

This dissertation illustrates a possible approach to design education that taps into what could be termed a latent cooperative instinct in all humans (Boyd & Richerson, 2009), (Pennisi, 2009). I posit that harnessing and channeling that instinct is essential if design students are to be engaged in ecological concerns and sustainable development, as well as all the overlapping social, cultural and economic issues – issues that people all over the world face. These issues include the challenges associated with the impact of the last century of industrialization and the increasing difficulty of resource acquisition to maintain a burgeoning and rapidly urbanizing population. After presenting these challenges, examples of how they are being met in a variety of ways around the globe were discussed. In discussing these challenges and the necessity to address them, the current state of education was discussed, paying attention the potential role design education can play.

The evolution of my teaching philosophy began with a concept that I called sustainable ecological communities. In keeping with the tradition in architecture education of using precedents, I used the sustainable ecological community as a way to describe the precedent contexts that are germane to ecological devastation and social justice: contexts where the aforementioned challenges are being addressed in innovative ways. The evolution in my teaching philosophy was forged by the learner-centered approach proposed by Paolo Freire. I extended his concern for social issues to ecology. As such, the students were encouraged to become ecologically literate about Cape Verde.

However, to enrich the data collected about resource flows, they were also encouraged to learn about the culture through their host families, but in ways that neither devalued their subjective experience of Cape Verde nor denigrated the lived experience and social practices of their hosts. Influenced by Situated Practice, all of the students' experiences were considered a learning experience, thus enlivening the data collected and providing dimension to the design challenges they faced. Experiential learning was made operational with the Kolb Model. Different types of learning were encouraged, without assigning learning styles to any students.

I offered a brief impression of contemporary architecture education: the common design education practices, with their advantages and problems. While there are problems associated with the prevailing model, there are many opportunities that this model could tackle in light of the state of the world, such as contextual characteristics of climate, social conditions and cultural habits. The extent to which design practice and education address those issues will have far reaching consequences.

It is clear that ethical considerations have been part of architecture historically and our understanding of design education is always evolving. While conventional discourses in architecture will inevitably continue (and should), the current issues that I have mentioned (of ecological crises and sustainable development), are ripe for further study. Thus, several architects, design educators and others are forging new paths to increased student participation in the world – in alternative studios. Increasingly they are being engaged in innovative design education models. The most interesting of these models take the studio qualities outside the studio room. They retain the iterative,

intensive study of ideas with the constant questioning of experience and embed the students into a very real ecosystem. The aforementioned studio characteristics are employed in the service of a real problem with social significance. Design education and its important components; the grand tour (or study abroad), precedent study more broadly, the design studio, critiques, charrettes, reviews and critiques afford numerous opportunities for architecture education to address architecture as social art (Boyer & Mitgang, 1996, p. 3) , (Cuff, 1991).

The planning of design education strategies must be seen as part of a comprehensive education. To address current pertinent concerns, the design challenges presented to students were contextualized, affording them the ability to address complex real-world problems. Such a context included social, cultural, geographical, ecological and other aspects. In so doing, the current ecological crises and social justice were addressed by design students. Instead of the typical study abroad – a grand tour of the canon that have constituted the precedents of architectural study for the past century, we traveled to Cape Verde. The island nation afforded them an opportunity to improve their ecological literacy, to study a different culture, and to engage through concrete, lived experience with the social interests of their hosts. The immersion involved living in homes, where students observed the culture, engaged in social commerce and documented resource flows.

The design problems posed to students were also contextualized to have real-world implications. They were required to design for their host families Thus, most of the studio assignments related to the study abroad context. The design studio, which is

pivotal to design education, is privileged by educators and students alike. The design studio constitutes a large amount of the architecture student's academic credits, and students dedicate almost all their time to studio work. Furthermore, the design studio is the site of a strong socialization of the architecture student. As such, the studio can have greater impact on design students than (perceived) ancillary courses. Furthermore, the design studio has many assets that make it an ideal learning context.

The design studio makes the student very hard-working, able to think abstractly and to tackle very difficult problems. Such a learning environment fosters camaraderie between the design students, but sacrifices relations with non-design students and just about everyone else. Furthermore, the de-contextualized design problems often fail to encompass current pressing issues – leading to understandable doubts about the relevance of architects. So, the very structure of the design studio can create and enhance disconnects from real world problems that they will face in practice. However, if used to address design challenges in context, the studio is arguably ideal for encouraging the aforementioned engagement.

Upon return to Milwaukee, we continued to research the islands' culture and ecology in a subsequent studio. The studio involved various place-based design solutions to address contemporary infrastructure problems in Cape Verde's urban neighborhoods. Each student designed a residence for their host family. Each student ascertained the demand for energy, daylight, natural ventilation, water and food provision, as well as waste disposal for each residence, and then determined how much of that demand could be met by household systems or neighborhood systems. Solutions

included alternative energy production using waste materials. Some designed rainwater collection, purification and distribution, as well as growing food systems. These were integrated into the building or the neighborhood, and they also incorporated waste treatment and disposal. These were carried out in ways that were both ecologically sensitive and culturally relevant – that is, they had to make a case for how design ideas matched the economic ability of the their host families and the standard construction practices, among other things specific to their location.

All these characteristics helped to determine the methodology. The main sources of data were interviews of the students and their own writings. Secondary sources were mostly the work done by students during the project either assigned by faculty or generated by the students in response to the project context. The immersion was designed to take into account ecological, cultural and social issues. The students' reflections and responses provide evidence of how this was done and what effect the immersion had on them. There are many lessons that can be learned from this endeavor. These range from how to engage design students in important contextual issues to the challenges of immersion. There were several effects on my teaching philosophy – principally in how the experience could inform design education, particularly within the studio but also in architecture school more broadly. This project has implications for designers (in practice and the academy) and all those interested in addressing issues around ecology and environmental justice.

A Tentative Conclusion

The Cape Verde project was devised to engage the aforementioned issues, to help develop theoretical bases for research and teaching ethically grounded ecological design. It was not initially intended for a dissertation. It was only after the trip and during the studio that committee members suggested that something different was occurring with sufficient data to provide such a dissertation. Hence, the research methods were very improvisational, borrowing from many traditions and approaches. It is part natural experiment, part action research, part ethnography, part community based participatory research and somewhat emancipatory.

The hypothesis that I put forward was that projects that engage participants strongly in the context, (socially, culturally, ecologically and otherwise), are more effective in encouraging students to think about available resources and the impact of architecture on the world. It is also more likely to motivate them to expand their knowledge and engage critically with issues and contexts, to become more ecologically literate and more active in social justice.

With this preliminary analysis of the data, I can confidently say that the hypothesis was proven; the participants improved the ecological literacy and became more active in social justice, to varying degrees. One of the key reasons that the project worked so well was that while Praia is a small enough city that its layout could be learned relatively quickly, it possesses all the challenges other much larger cities have, necessary to address the issues at hand.

However, there may remain some outstanding questions. For instance, did I inadvertently select students who were predisposed to have interests in these ecological, cultural and social issues? Did the students self-select because of said interests? There may also have been some lost ground over the years: learners becoming less concerned with or interested in these issues.

I think that the maintenance of interest is a function of how much reinforcement of the experience there was. Learners who went on to work in areas that continued to expose them to the issues tackled in the project retain many of its lessons. This is less so with those not engage in community or environmental work. Perhaps, the maintenance of these interests also depends on a solid foundation. The Cape Verde project was tangential to the overall educational experience. And while there are many other studios that provide non-traditional approaches, none in the academic careers of these particular students made such drastic use of the study abroad and studio towards these particular ends.

There were several components of various learning techniques and education theories that were put to use. Some of these key components were intentional; for instance, redeploying the traditional architecture charrette – typically used to meet a deadline – as scaffolding assignments towards the final project.

Other techniques were spontaneously discovered in the educational experiment, such as when I took the desk crit and turned it into a sort of pyramid scheme of skill acquisition. Not only did it greatly increase the speed of dissemination of techniques, it increased the openness of the learning environment. The desk crit was transformed

from a context for potential competition and favoritism to a vehicle for cooperation and content creation.

The Cape Verde project was useful to raise questions among students, academics and practitioners about a number of important issues. First, the learners began to tackle the notion that as architects who alter the environment, they should take ethical positions with regard to such alterations. Hence, they began to develop their own ethics. Second, the learners participated in generating content and teaching themselves, by determining what was relevant to their clients experience and the context of their projects. They also engaged in teaching their peers, encouraging them to take greater responsibility for teaching others, while building camaraderie. By repeated teaching and learning of techniques, and in the context of ethical discourse, the learned skills are better internalized and are rendered more meaningful.

Third, the freedom allowed students in the design studio to determine their design responses was tempered by the requirement that it have an ethical underpinning and relate to the contextual issues. Hence, many began to develop design strategies and design philosophies – approaches that address ecological, cultural and social issues. Fourth, the stark difference of the immersion, with enough of culture shock and language barrier, coupled with the requirement to acquire specific information, encouraged the learners to be more attentive. Hence, their design responses repeatedly refer to the situation of their clients, the host families, and often to specific sentiments expressed by and explicit statements made by the clients.

Fifth, the learners observed and began to reflect on and analyze many issues of social injustice. For instance, they confronted the U. S. embassy staff about what the American government's role, if any, was in alleviating the resource challenges faced by Cape Verdeans or what influence they have brought to bear on that country's elected officials. At the same time, many of the design solutions proposed were feasible and had the potential of eliminating the need for reliance on government. Many of those solutions employed the use of waste materials. Sixth, the use of waste materials in many of the design proposals, indicate clear understanding of the impact of waste and consumerism on the environment. Seventh, the ideas for provisioning of resources, such as water, expand the learners' understanding of the power of design.

The experience of actually carrying water for long distances was a challenging part of the experience. That and other experiences of the Cape Verde project ensured that many of the learners experienced fundamental changes in their design approaches and their outlook in life. Finally, I intend to clarify these thoughts to provide a companion for others who wish to teach – or rather, to learn along with others, about ecological design grounded in ethics that addresses ecological problems and social justice.

Further Research

The data collected has great depth and some breadth and provide a source for repeated and more in-depth study. The reflexive content in the journals kept by the learners supply a trove of information about their states of mind on different days during the trip. The other writings and interviews of the learners recorded at different stages in the project are also useful for the same reasons. The data that the learners

measured and that collected by the data loggers can help to understand the differences in thermal comfort in different homes in Praia – providing representative information about other such cities, other such climates. This quantitative data can be juxtaposed with the journal entries to better understand variations in personal preferences with regard to thermal comfort across cultures.

Therefore, further research involving more detailed analysis to generate more focused themes in various areas is warranted. These areas include what other factors may have contributed to the varied impressions, learning experiences and design responses of the learners. Furthermore, the use of qualitative research software can help to generate and elucidate themes that may have strong correlations for factors not noticed or dismissed in this first analysis. This would provide more avenues for even further analysis, and could lead to perhaps, other research questions.

Expansion

The Cape Verde project was a very interesting and by all accounts critical (possibly life-changing) event for the students, as well as the faculty. There are obvious lessons for how it could be repeated and/or expanded – within Cape Verde or beyond. There are not so obvious lessons as well. The first thing of interest may be to revisit the learners who participated in subsequent years and revisit the issues raised in the project. Of interest would be what they think about the ecological, cultural and social issues raised in this dissertation.

There are however more ambitious undertakings:

Control

One avenue for further research could involve interviews of architecture students from the same sophomore class who did not participate in an immersive study abroad that dealt with ecological, social and cultural issues. Possible categories could be students who did not participate in a study abroad program, students who participated in a more conventional study abroad program (typically to Europe), and students who participated in study abroad programs elsewhere in the global south.

Local Immersion

An interesting possible area of inquiry could be to attempt a local immersion, placing students in homes in an American city to see what issues percolate to the surface. It would also be guided by current issues the way it was for the Cape Verde project. However, the contextual issues would be different because of the different context. Local immersion could occur in a different part of the city or in a different part of the country. The differences achieved by going to Cape Verde could be achieved by going to a community with some of the differences that Cape Verde afforded. These include cultural, linguistic, social, ethnic and racial differences, as well as variations in income. Immersion in a different part of the country with a different ecology, climate or geology could provide sufficient differences. As in the Cape Verde project, the immersion is part of experiential learning to engage them in generating relevant content.

Longitudinal Study

An interesting alternative could be to separate a small cohort of students entering their first architecture studio into a different track. They would have dedicated studio

space just as the other students. This cohort would learn all the material normally taught in ancillary courses as part of their studio instruction. They would begin with a study abroad to the global south or placed in home elsewhere in the US, such as described above. Furthermore, their faculty would use projects to engage them in generating the relevant content.

Cross-Disciplinary

One possibility is to coordinate a long-term, cross-disciplinary study abroad, which would tap into different ways of looking at these issues, different ways of discussing them and potentially defining the issues and challenges, along with different ways of finding solutions where necessary. The proposed project involving sustainable development projects in the global south could last for multiple years. The students could go to the location for varying periods of time, ranging from a few weeks to several semesters. Faculty members from different disciplines, and possibly different universities could participate. They could also come for varying periods of time – offering course work in their various disciplines. The courses and the number of credits would be determined by the availability of the faculty members and the duration of their stays. Such a project would make a study abroad more affordable for students and provide a holistic, integrated and liberal learning environment.

Last Words

One of my influences in the past six years is an advisor and member of my dissertation committee, Brian Schermer. He once described a PhD degree to me as the

occasion for a kind of free fall – a free fall into whatever topic one is delving into, and into the literature (pronounced with emphasis on the second “t”), related to that topic. As an avid reader beforehand, I initially dismissed his invitation to read. As a novice, I did not understand his specific use of the word “read” as he proposed it. I assumed that he did not mean the casual reading that one does with a delightful, suspenseful or amusing book that accompanies one to the beach on glorious summer days - whether dense or light. I rarely read such books. I received joy in books that made you eschew the beach. I also assumed that because he had a PhD and taught at a university, he must be a very serious fellow and must therefore mean to encourage me to read books that prevented you from enjoying reading on the beach. But I already did, so I did not get it.

At the end of my fall, I am beginning understand what he meant and I am just learning to read the world. The most important thing I have learned as a teacher is how to become a better student. Just as writing this dissertation has made me a better reader. So I look back at Professor Schermer’s metaphor of free fall and I would like to recast it as learning how to fall. The evolution of my teaching philosophy can best be described as learning how to fall. To the learners go the very last words:

Good job

Favorite undergrad experience

If you go back, let me know I’ll go…

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N Jonathan Unaka

Profile

N J is an adjunct lecturer in architecture at the University of Wisconsin, Milwaukee. During his professional architecture career he has worked on a variety of projects; including schools, office buildings, libraries and hospitals, among other building types at architectural firms in Boston, New York and Milwaukee. These projects have been across the Americas, Africa and elsewhere. He has taught in middle schools and high schools in Boston and in the Bahamas. He teaches a technology lecture course, an ethics of ecological design seminar and design studios. His research interests are in the intersections of ecologically sensitive solutions with community participation, design and implementation – especially how education can be a catalyst for such interactions. He has a passion for appropriate technology use in low income areas around the globe - including in informal settlements.

Education

Ph.D in Architecture **08/2014**

University of Wisconsin, Milwaukee

Dissertation: The Cape Verde Project – Teaching Ecologically Sensitive and Socially Responsive Design

Masters of Architecture **01/2001**

Boston Architectural Center, Boston

Thesis: Labyrinth as a Path to Clarity – Revitalizing Boston's Dudley Square

Bachelor of Science Civil Engineering **06/1993**

University of Massachusetts, Lowell

Thesis: The Big Pig – Reconnecting Boston's North End

Teaching Experience

Adjunct Instructor – University of Wisconsin, Milwaukee

Ethics, Ecology and Design *01/2014 to 05/2014*

Arch 390/790 – Introduces students to different ethical approaches, with emphasis on ecological ethics. The students gain a rudimentary understanding of ecology and potential effects of design. They develop ecological ethics towards generating a design philosophy.

Design for the 99% Design Studio *09/2012 to 12/2012*

Arch 645/845 – The students designed a house for an urban in-fill site using the imperatives of the Living Building Challenge. They also developed ideas to make an existing Milwaukee house to be more self-sufficient in resources – water, food and energy. They worked in teams on these and other projects, focusing on the urban context with all its intertwined social and ecological challenges.

Architectural Structures and Construction *01/2012 to 12/2012*

Arch 301 – Course on building structure, materials and components and construction techniques. Building performance information was used to inform design decisions. It focused on collecting and analyzing information to make judgments concerning building design in several areas; site issues and response to climate, zoning and building codes, preliminary structural design, material qualities and weatherproof building envelope. Each student was expected to understand the fundamental concepts and principles behind design judgments.

Cape Verde Project - Co-instructor M. Utzinger *12/2010 to 05/2011*

Originated and developed the syllabus and overall course structure

Arch 497/797 – Cape Verde Study Abroad: Involved home-stays in various neighborhoods of Praia, Cape Verde, some of which had limited or intermittent supply of utilities. It was the first study abroad program from an American University to Cape Verde. Students were taken on tours to places of cultural interest and resource production.

Arch 645/845 – Cape Verde Design Studio: The students designed a house for their Study Abroad host families, providing performance simulations and carbon footprint estimates of the existing and proposed house. Student teams constructed design prototypes for resource provision in their Cape Verde neighborhoods.

Teaching Assistant **09/2008 to 12/2009**

Arch 210 – Introduction to Building Technology *01/2009 to 05/2009*

Collaborated on curriculum and exam development, met with students upon request, and graded all written work, including final exam papers.

Arch 510 – Survey of Structural Analysis/Design *09/2008 to 12/2008*

Collaborated on curriculum and exam development, met with students upon request, and graded all written work, including final exam papers.

Project Assistant **06/2008 to 12/2009**

Urban Ecology Center Collaborative Design Project *05/2009 to 12/2009*

Arch 392 – Pre-Design Class: Participated in the development of syllabus and overall course structure. Oversaw coordination between students and clients, day-to-day activities and administered all grades.

Arch 391 – Design Class: Participated in the development of syllabus and overall course structure. Facilitated interaction between teams and within teams to improve student collaboration. Coordinated interactions between students and client. Advised clients on technical issues of each design proposal. Oversaw liaising with funder and administered all grades. Co-instructor Michael Utzinger.

The Carbon Neutral Design Project *06/2008 to 01/2009*

CND Summit: Helped to organize conference which brought together various experts and academics involved in carbon neutral and net-zero energy design.

High School Teacher **07/2004 to 06/2005**

Cape Eleuthera Island School, Bahamas

Taught Algebra II and Pre-Calculus at this semester abroad program for high school sophomores and juniors in a wilderness setting. The school has a strong focus on physical fitness, sustainable living and placed-based education. Helped maintain computer network, with first aid and campus logistical support. Helped coordinate outreach program and excursions into the surrounding communities.

Middle School Teacher **07/2002 to 06/2004**

Epiphany Middle School, Boston

Taught geometry, 6th and 8th grade science, as well as, 7th and 8th grade Art. The 12 hours a day full service school provides individual learning plans, social and medical support, 3 healthy meals, with a wide variety of arts and sports.

High School Teacher **12/1998 to 06/1999**

City on the Hill Charter High School, Boston

Taught Arts & Crafts to 9th-graders.

Technology Teacher **03/1999 to 06/1999**

Cooper Community Center, Boston

Taught 6 to 16 year-olds how to use computers. Identified appropriate technology, installed, customized and repaired computer software and hardware.

Professional Experience

Co-Founder **09/2011 to Present**

ReThink Factory, Milwaukee, WI

ReThink Factory is a non-profit organization that brings together a collective of designers, builders, community activists and concerned citizens. ReThink Factory uses design to positively affect the lives of people in their communities, addressing issues of food, energy, water and waste. Paying particularly close attention to context, they work with community groups to find appropriate-technology solutions for resource challenges. They engage learners of all ages, encouraging maximum participation and continued learning for all involved. Their projects include orphanages in DR Congo, Senegal and Ethiopia, schools in Haiti and Nigeria, a library in South Sudan and a hostel in Uganda. Some projects involve the design of buildings, while are some feature, such as a water catchment system or an effective compost toilet. ReThink Factory serves as a do-tank, carrying out experiments at the Milwaukee site, to test the feasibility of appropriate technology solutions before implementation.

Design Consultant **05/2011 to 12/2012**

Helio-Design, Milwaukee, WI

Designer at a firm that focuses on ecologically sensitive, engineering and architectural solutions through extensive client engagement, computer simulations, environmental control systems and passive design. In charge of two community-based projects; a vertical farm and a low-tech design school.

Design Consultant **07/2009 to 12/2011**

Milwaukee Community Service Corps, Milwaukee, WI

Designer for this non-profit that trains ex-offender youth in various trades. Designed houses slated for renovation, which are sold to low-income families in need of housing. Advised the corps on how to implement Wisconsin's Green-Built Homes initiative to make the houses more sustainable and energy efficient.

Designer **02/2008 to 10/2008**

Kahler Slater, Milwaukee, WI

Worked on the construction documents for the state-of-the-art Martha Jefferson Hospital in Virginia. Was part of team responsible for the plans, sections, elevations and details of their exterior shells, as well as coordination with the engineering consultants on five buildings.

Designer **10/2006 to 11/2007**

Lee Harris Pomeroy Architects, New York, NY

Worked on several projects, including the renovation of warehouses under the Manhattan approach to the historically significant Brooklyn Bridge. Other projects were a school, two subway stations, and a hotel/residential project along the revitalized High-line corridor.

Design Consultant **04/2002 to 09/2006**

Worked at several firms on contract basis in Boston and New York. Below are a sampling of the firms and some of the projects:

Acheson Doyle Partners Architects, New York, NY 03/2006 to 09/2006

Worked on preparing marketing, zoning and construction drawings for several high-rise residential renovation projects. Participated in project management and coordination with project engineers and contractors.

Mitchell Kurtz Architects, New York, NY 01/2006 to 03/2006

Worked on several theater projects in the New York City area. Main focus was to liaise with clients in the early phases of the project to ensure the design stayed true to their wishes.

Atelier Imrey Culbert Architects, New York, NY 10/2005 to 01/2006

Worked on the schematic phase for the renovation of the Kuwaiti National Museum. Responsibilities included ensuring production of a basic construction set, and coordinating with an AE firm in Cairo who were the architect of record and construction management team.

Kyu Sung Woo Architects Inc., Cambridge *01/2005 to 02/2005*

Worked on the construction documents for an addition to the Schneider Building at the Heller School of Social Policy and Management at Brandeis University.

Shepley, Bulfinch, Richardson and Abbott, Boston *12/2003 to 04/2004*

Worked on the construction documents for two hospital projects and the construction administration phase for a university project. These include the University of Michigan's Cardiovascular Center.

William Wilson Architects, Inc., Boston *04/2002 to 06/2002*

Worked on the drawings for the renovation of the firm's office space. Also worked on code issues for two buildings at the University of North Carolina – a large lecture theater and a science laboratory.

Project Manager **07/2001 to 02/2002**

Architects and Associated Designers, Boston

Worked on all facets of several projects at this small firm, from site inspection to design, from interactions with consultants and clients to on-site construction management, from design inception to post-occupancy evaluation. Project manager for the State Pharmacy project in Tewksbury, Ma. Also handled computer and network maintenance.

Job Captain **04/2001 to 06/2001**

Cubellis Associates Inc., Boston

Worked on the renovation/expansion of Shaw's Supermarket in Milford NH, and planning and maintaining all coordination involved on the project. Managed the phasing that allowed the store to remain operational during all phases of demolition and construction.

Designer/Drafter **04/1998 to 01/2001**

Trapani Associates, Architects and Planners Inc., Boston

Worked on many projects – mainly renovations and improvements to existing schools, residences, offices and several area hospitals. These included; Saint Catherine's Catholic School, Somerville, MA; Boston Medical Center; Massachusetts General Hospital and New England Regional Primate Research Center, Southborough, MA. Duties encompassed all facets of design and administrative work at this small firm. Also helped set up and maintain the computer network.

Drafter/Model Maker **10/1994 to 09/1997**

Shepley, Bulfinch, Richardson and Abbott Inc., Boston

Worked on many projects, starting from master planning straight through to construction documents. They were fast-track institutional projects, such as hospitals, office buildings, libraries and schools. These included; Bronson Methodists Hospital, Kalamazoo MI; Fidelity Investments Regional Campus, Smithfield, RI and others. Also worked for a year in model shop, on many presentation models for job getting interviews and study models for use by designers.

Marketing Assistant **02/1994 to 05/1994**

Childs Bertman Tseckares Inc., Boston

In the firm's marketing department, help to develop proposals for bidding on jobs. Maintained project libraries and computers, and adapted software for project and client databases.

Presentations & Publications, Awards & Memberships

- Cities and Globalization Conference: Perspectives from the Global South 01/2011
- Unaka, NJ, Ali Kolster, and Nick Reiter. Urban Ecology Center Menomonee Valley. Raleigh, North Carolina: Lulu.com, 2010.
- Advanced Opportunity Program Fellowship 09/2009 to 05/2012
- Chancellor's Graduate Student Award 09/2008 to 05/2009
- National Organization of Minority Architects

Languages

1. English – fluent – mother tongue
   Writing: advanced
   Reading: advanced
   Speaking: advanced
2. Igbo – fluent – father tongue
   Writing: advanced
   Reading: advanced
   Speaking: advanced

Computer skills

Knows how to:

- work in Windows, Linux (Ubuntu) and Mac OS environments
- work at expert level with CAD software including Autocad, Revit and Microstation
- work at expert level with simulation software TRNSYS and good familiarity with Ecotect
- work very comfortably with various office suite, desktop publishing and web design software
- work with various audio and video editing software
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Hobbies

- Enjoys traveling, meeting new people – learning about different cultures and languages. Likes to bicycle, rollerblade, read a wide variety of literature and watch foreign films. Likes to work on his house – currently building a greenhouse. Likes to participate in art events in community groups and artist coalitions. Plays percussion instruments. Creates sound and set designs for theater. Loves multi-media painting, murals, portraits, sculpting and poetry – especially haiku.

References

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