

Design for a Sustainable Future: An Autoethnographic Examination of  
Practical Applications of Sustainability for Design Education

A DISSERTATION  
SUBMITTED TO THE FACULTY OF THE  
UNIVERSITY OF MINNESOTA  
BY

Sara Almudhaf

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY

James Bequette, Adviser

May 2017

© 2017 Sara Almudhaf  
All right reserved.

## Acknowledgments

I would like to thank Kuwait University for their generosity and for allowing a young woman to grow. I would like to express my gratitude to my adviser and professor at the University of Minnesota, James Bequette, for giving me his full support during my academic matriculation and research journey. I also thank my committee members and professors Mark Vagle, Betsy Maloney Leaf, Stephen Polasky, and Gillian Roehrig for their support and valuable input on this work. I would like to thank all the editors, assistants, and participants for their time and contribution to this research. A special appreciation and gratitude is given to my family for their everlasting confidence in my efforts, love, support, encouragement, understanding, and contribution to this research. I would like to give special thanks to all my best friends and fellow graduate students from different parts of the world for their continued faith, love, support, encouragement, and contribution to this research. This dissertation would never have been possible without all of the people who played a role in its process and in the years of preparation leading up to it.

This dissertation is dedicated to Kuwait.

## Abstract

The world has seen increased consumerism and wasteful practices that have contributed to a monumental municipal solid waste problem. In spite of international consensus for sustainable development, academic programs have not yet fully integrated sustainability into design. Through reflexive investigation and critique of culture, this autoethnography explores: (1) How the interest in sustainability and environmental practices came to exist within my personal sphere of knowledge and among Kuwaiti officials; (2) how the values related to environmental responsibility can be instilled through education and transformed on a cultural level to create motivation for action; (3) how theories of sustainability are synthesized into practical application in an educational setting in the U.S.; and (4) how former alumni and I perceive the practicality and applicability of the program as it translates to our localized contexts. The purpose of this dissertation is to explore best pedagogical practices of sustainability in order to establish key components for integrating sustainability into academic design programs, particularly as they relate to the waste problem in Kuwait. This research provides a synthesis of viewpoints from the perspectives of both local consumers in Kuwait and graduates from a design for sustainability program in the United States. Six themes emerge, including values transmission and development, behavior change versus conformity, facilitating behavior change, collectivism and motivation for action, the viability of systems, and the spread of new ideas. This research utilizes nine behavioral change theories and models: Social learning theory, the two-stage model of value transmission and development, situational awareness theory, the transtheoretical model, rational choice theory, collectivism theory, systems theory, the viable systems model, and diffusion of innovation theory. This

research has uncovered several critical considerations to include within a design for sustainability curriculum and pedagogy. These components encompass student's awareness of environmental issues, values development, knowledge of sustainability theories, case studies, practical tools, human-centered research methodologies, interdisciplinary collaboration, community-based projects, and innovation. There is a consensus among the research participants in creating an educational environment that encourages a sustainability mentality, the development of personal attributes, values, civic responsibility, leadership capabilities, and team management skills.

*Keywords:* social change, design for sustainability, sustainable design education, solid waste, attitudinal and behavioral change, Kuwait.

## Table of Contents

i	Acknowledgements
ii	Dedication
iii	Abstract
vi	List of Tables
1	Chapter One: Introduction
13	Chapter Two: Review of the Literature
59	Chapter Three: Research Design
68	Chapter Four: Methodology
87	Chapter Five: Autoethnography
115	Chapter Six: Theoretical Analysis
133	Chapter Seven: Recommendations and Conclusion
143	Bibliography
177	Appendix

## **List of Tables**

- 71 Table 1. Pool of Reviewed Sources for the Autoethnography
- 74 Table 2. Master's Programs in Sustainability-focused Design in the U.S.  
in 2015

## CHAPTER ONE: INTRODUCTION

The world has seen increased consumerism and wasteful practices that have contributed to a monumental municipal solid waste problem. There are growing issues of industrial pollution, solid waste pollution, depletion of resources, and social distress that require significant action. In Kuwait, as well as in every industrialized country, these practices have caused environmental, economic, and social distress that jeopardizes the well-being of current and future generations (Alhajri, 2004; Blair, 2009).

Kuwait is a half-century behind in sustainable waste management strategies, as is the rest of the Middle East. With a growing population and a torrent of consumer goods flowing through Kuwaiti households, waste is a critical problem. In order to remediate the source of the excessive consumer waste problem in Kuwait, the social and cultural factors must be dealt with in conjunction with upgrading waste management infrastructure. In fact, the limitations of the ability of Kuwaiti infrastructure to rely on recycling is evidenced by the fact that the vast majority of all waste ends up in local landfills (United Nations Statistics Division [UN Statistics Division], 2011). Kuwait does not recycle its own waste, but a small amount is sold and handled abroad (Metal & Recycling Company [MRC], 2016). The problem has escalated for decades, contributing to Kuwait's ranking as one of the highest per capita waste generators in the world in 2014 (Kloosterman, 2014; McLellan, Iyengar, Jeffries, & Oerlemans, 2014; Zafar, 2016).

According to scholars and international experts, the proper long term response to these growing environmental and cultural stressors is to adopt sustainability practices, rather than increase waste dumps, collection, or downcycling (McDonough & Braungart, 2002). Sustainability goes beyond recycling and is defined as the practice of maintaining

balance and harmony within the environment, economy, and society, meeting today's needs without compromising the ability to satisfy future needs (U.S. Environmental Protection Agency [U.S. EPA], 2013). McLennan (2004) stated that the goal of sustainability is to "maximize the quality of the [created] environment, while minimizing or eliminating negative impact to the natural environment" (p. 4).

Design professionals have not yet adopted the practices of design for sustainability on a large scale. Clearly, there are still social barriers that are slowing down progress on such a path towards the practice of maintaining balance and harmony within the environment, economy, and society. A historical review of social, environmental, and economic factors that incentivize and motivate design development, inventions, and production processes is necessary for learning what conditions affect major social change to influence societies and cultures to fully accept the need for design for sustainability.

From the pre-industrial era to the present, designing and inventing were logical developments in accordance with the incentives and restraints of different cultures. Design and production methods have always been influenced by human needs and wants, accessibility to natural resources, and economic incentives. However, interconnected incentives for sustainability, including environmental protection, social justice, and economic growth, require the implementation of novel design solutions that profit from nature's *interest*, but do not exploit its *capital* (Cortese, 2003, pp. 15-16). The historical review shows how these current incentives are different from past incentives and have not been adequately incorporated into recent design practices. Environmental, social, and public health problems, resulting from the industrial revolution, are becoming insurmountable on a global scale and will require major conceptual changes in design to

deal with these issues. Scholars and academics have argued that it is incumbent upon educators within academic institutions to lead the way for a social paradigm shift, which would integrate and promote design for sustainability into manufacturing, production, and cultural lifestyle (Bergman, 2013; Cortese, 2003; Designers Accord, 2011; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2005).

For such a paradigm shift to take place, Cortese (2003) stated that, “Higher education institutions bear a profound, moral responsibility to increase the awareness, knowledge, skills, and values needed to create a just and sustainable future. Higher education plays a critical but often overlooked role in making this vision a reality” (p. 17). Cortese (2003) argued that sustainability should not be isolated as a special course or specialized program. Rather, he advocated that sustainability must be a fundamental principle in all academic disciplines (Cortese, 2003, p. 19). Sustainable practices have attained international importance, shifting global mindsets toward a more sustainable future. At the 2012 United Nations (UN) global conference in Brazil, titled “United Nations Conference on Sustainable Development”, academic institutions were urged to teach sustainable development in all disciplines (Bergman, 2013).

In 2015, 150 world leaders adopted the United Nations General Assembly’s action plan for the 2030 Agenda for Sustainable Development (United Nations, 2015a). The 2030 Agenda seeks to balance the economic, social, and environmental dimensions of sustainable development and strengthen universal peace and prosperity (United Nations, 2016). This action plan focuses on 17 interconnected Sustainable Development Goals (SDGs) with 169 associated incremental targets to reach these ambitious goals (United Nations, 2015b). These goals are:

(1) No poverty; (2) zero hunger; (3) good health and well-being; (4) quality education; (5) gender equality; (6) clean water and sanitation; (7) affordable and clean energy; (8) decent work and economic growth; (9) industry, innovation, and infrastructure; (10) reduce inequalities; (11) sustainable cities and communities; (12) responsible consumption and production; (13) climate action; (14) life below water; (15) life on land; (16) peace, justice, and strong institutions; and, (17) partnerships for the goals. (United Nations, 2015b)

Recently, in response to these global recommendations, Kuwait has started to adopt sustainable practices and encourage educational institutions in the country to integrate sustainability into their curricula (Albazzaz, 2014). However, sustainable design education in the areas of design, manufacturing, and production is still lacking in Kuwait.

Teaching sustainability in educational settings is as new as the concept itself and requires more scientific consensus on how to approach this academic endeavor. Scholars have argued that sustainability education (SE) has been focused on the theoretical aspect of teaching the science of sustainability, and advised that the term be changed to education for sustainability (EfS) in order to focus on the “how” aspect of teaching practical applications for achieving sustainability (McKeown, Hopkins, Rizi, & Chrystalbridge, 2002, p. 7). The learning of conceptual sustainability is far different from applied sustainability in solving real-life problems. In light of this movement towards sustainability, research is needed that highlights the importance of sustainability practices in the twenty-first century in order to encourage more academic design programs to begin to integrate sustainability in the most effective way. The purpose of this research is to further the establishment of educational standards, curriculum criteria, and guidance on

how to translate sustainability theories into design practices to enable academic design programs and curricula to better integrate sustainability into new designs (Miller et al., 2014; Wiek, Withycombe, & Redman, 2011).

### **Purpose Statement**

The overall purpose of this dissertation is to explore best pedagogical practices of sustainability in order to establish key components, criteria, and guidelines for integrating sustainability into academic design programs, particularly as they relate to the waste problem in Kuwait. This research provides a synthesis of viewpoints from the perspectives of both local consumers in Kuwait and graduates from a design for sustainability program in the United States. Through this researcher's autoethnography of growing up in Kuwait and studying in the United States, an exploratory examination of lived experiences of both Kuwaiti and American individuals are documented. These experiences, subjective in nature, are discussed in terms of awareness, attitudes, and practices regarding meaningful engagement with sustainable design. Autoethnography is a qualitative research method that provides descriptions of various experiences and a multifaceted critique of culture from the perspective of both the researcher and members of the culture under study (Adams, Jones, & Ellis, 2015).

This method is the ideal platform from which both cultures, including this writer's, can be studied and reflected upon. The autoethnographic research methodology is ideal for this research, particularly because studies on attitudes and behaviors regarding increased consumerism and wasteful practices in Kuwait are limited or nonexistent and are only known by subjective impressions of the Kuwaiti community (Duncan, 2004). Similarly, there is limited literature in regard to application of sustainable design theories

into real-world practices. These are necessary in order to understand the subjective impressions from people involved in a practical academic sustainable design program (Duncan, 2004).

This autoethnographic research is comprised of two main components. The first studies historical phenomena and explores contrasting personal, familial, and cultural attitudes and lived experiences in Kuwait as it relates to sustainability. Through theoretical analysis, I examine how these practices of sustainability and environmental awareness came to exist within my personal sphere of knowledge and among Kuwaiti officials. I also examine how values related to environmental responsibility can be instilled through education and transformed on a cultural level to create motivation for action.

The second component in the autoethnography explores contemporary experiences of alumni from a graduate sustainable design program in the United States. This component explores the experiences of these alumni, focusing on practical skills and their applicability to localized contexts. Through theoretical analysis I examine how theories of sustainability are synthesized into practical application in an educational setting in the U.S., and how former alumni and I perceive the practicality and applicability of the program as it translates to localized contexts, such as Kuwait.

### **Research Limitations and Scope**

Autoethnographic research depends on the subjective and perhaps biased telling and retelling of events and experiences that are often channeled through a single-person perspective. This autoethnography represents unique life stories that may not reflect the majority's experiences. As a Kuwaiti interacting with research subjects, my cultural

background, biases, and experiences contribute an individualized perspective on the data and narratives collected. The sample in this research is comprised of two alumni from one sustainability-focused design program in the United States. The contact list of the research sample was compiled without the involvement of the academic institution, resulting in a smaller sample size. The small sample size within the population affects the diversity of voices and experiences in the final narrative. Similarly, limited time constraints played a factor in both the academic institutions' noninvolvement and the amount of data collected and analyzed.

This research recognizes the interrelated social, technological, environmental, economic, political aspects of sustainability. However, the scope of this research focuses only on the social, environmental, and technological aspects of design for sustainability. The aim of this research is to contribute to the remediation of the excessive consumer waste problem, primarily caused by office and household solid wastes, while acknowledging that other serious sources of waste such as electronic waste exist. In setting the delimitations of this research, a single graduate sustainable design program was selected from a population of eleven graduate programs in the United States. The academic institution in this research was chosen for its multidisciplinary approach, which includes graphics, packaging, and product designs, and its relevance to Kuwait University. Through focusing on one particular program, I will be able to cross-reference the findings with other sustainable design programs in future research.

## **Research Implications**

It is hoped that the findings of this research will benefit accreditation organizations, academic design programs, and academic researchers in the field of sustainable design. This research will offer accreditation organizations such as the National Association of Schools of Art and Design (NASAD) the criteria needed to develop standards for sustainability-focused design programs. The results of this research will culminate in general recommendations for integrating sustainability into design education suitable for various local contexts.

It is hoped that administrators, program directors, and educators apply the recommendations and conclusions from this research to affect real change, not only in academic settings, but also in localized natural environments, economies, and societies. This paper provides researchers with the groundwork for future studies regarding academic improvements in sustainable design. Finally, this research will also provide a roadmap for academic institutions in Kuwait to build sustainable design programs. By adopting sustainable practices to reduce waste, this step forward will allow the Kuwaiti society to craft a new vision for a sustainable future. This research also contributes to the social sciences and the fields of environmental education and sustainable design education.

## **Chapter Organization**

Chapter Two provides a historical review of the evolution of design production throughout human history, the development of environmental education, and standards and guidelines for integrating sustainability into design education. In the first section, design practices and production are examined, starting from the pre-industrial era through the industrial era, and then to the post-industrial era. This section investigates the environmental, social, and economic factors that were influenced by design practices and production.

The second section covers the advent of environmental education, charting its course from Aristotle to the UN advocating for education for sustainable development. Additionally, this section covers how the awareness of environmental concerns has shifted from a field of strictly scientific inquiry and incorporated aspects of both activism and real world politics. The third section of this chapter presents current guidelines and components for developing a design for sustainability program, such as curriculum content, pedagogical approaches, and evaluations. All of these ideations have contributed to the current conception of what sustainable design is today. The literature review explores the social advancements and technological innovations that shifted the course of civilizations.

Chapter Three presents justifications for my choice of using autoethnography as a research design to answer my research questions. Examples and precedents are provided from the literature to defend my claims that by researching people's lived experiences of gaining awareness, values, knowledge, and intellectual and practical skills regarding sustainable design, one can observe how the learning process takes place, and ultimately

replicate them in academic settings. This chapter also sets the parameters for assessing the preconceived goals and components of the final autoethnographic research.

Chapter Four describes the method in which this research was conducted. In this chapter, I explain in detail the two sample sizes this research is drawn from: The Kuwaiti culture and the Sustainable Design culture. It begins with a description of my research sample and collected data, such as personal memories, reflexive field notes, interviews, historical reviews, and peer reviews. The writing process is nonlinear, drawing data from various sources, and subjectively filtering them into the final narrative. The chapter also explains how the final narrative was coded and analyzed theoretically.

In Chapter Five, the autoethnography explores: How the interest of sustainability and environmental practices came to exist within my personal sphere of knowledge and among Kuwaiti officials; and how values related to environmental responsibility can be instilled through education and transformed on a cultural level to create motivation for action. This chapter is comprised of two components, each consisting of several narrative threads that are woven together throughout the autoethnography. In the first component, I began with painting a picture of contemporary Kuwait using demographic and vivid sensory data. I then discuss the pre-oil generation of my Kuwaiti elders and follow with an examination of how my family's core values have shaped my personal philosophy. Next, I demonstrate how these values have manifested throughout my professional and academic endeavors. I evaluate Kuwait's current short and long-term waste management strategies and my contribution to the integration of sustainable development education in Kuwait.

In the second component, I shift the focus towards examining an academic sustainable design program in the United States through the narratives of two alumni. I began with presenting an overview of the curriculum, program, and backgrounds of the alumni, integrating my own voice and reflections throughout. Next, overall experiences are discussed in the program, both in the classroom and out in the field. We particularly delve into two practical courses: “Applied theories of sustainability” and “contextual research”. The synthesis of the second component of this narrative shaped my understanding of how to effectively apply the theories of sustainability into a practical design field.

In the theoretical analysis of Chapter Six, six themes emerge: Values transmission and development, behavior change versus conformity, facilitating behavior change, collectivism and motivation for action, the viability of systems, and the spread of new ideas. Referring to supporting examples from my narrative, I reveal the process of how individual, familial, and cultural practices developed a philosophy of sustainability. I utilize nine well-established theories and frameworks to supplement my subjective interpretation of these attitudes and behaviors. These theories and models are: social learning theory, the two-stage model of value transmission and development (Herman, 2005), situational awareness theory, the transtheoretical model (Prochaska, Johnson, & Lee, 1998), rational choice theory, collectivism theory, systems theory, the viable systems model (Mele, Pels, & Polese, 2010), and diffusion of innovation theory.

The seventh and final chapter of this research presents my recommendations for developing academic sustainable design programs, plans for future research in the field, limitations, and conclusion. This research has uncovered several critical considerations to include within a design for sustainability curriculum and pedagogy. These components encompass student's awareness of environmental issues, values development, knowledge of sustainability theories, case studies, practical tools, human-centered research methodologies, interdisciplinary collaboration, community-based projects, and innovation. There is a consensus among the research participants in creating an educational environment that encourages a sustainability mentality, the development of personal attributes, values, civic responsibility, leadership capabilities, and team management skills.

## **CHAPTER TWO: REVIEW OF THE LITERATURE**

Design is an area that has undergone tremendous evolution over time. In the process of fulfilling its primary role of coming up with new and enhanced looks and functionality of commodities, design plays a significant role in a variety of specialty professions. However, it is important to note that a significant part of a product's design is based on past designs that have kept up with technology and other changes in society to evolve over time. Additionally, other fields such as physics, chemistry, and engineering have played a major part in facilitating the evolution of design. The global need for environmentalists in different disciplines and specialties has also been vital in enhancing the developments of the design industry.

Through current knowledge, human needs and their available resources, significant changes have been witnessed in the field of design, and the trend will undoubtedly continue. Apparently, the needs, knowledge, and resources are constantly changing, making them vital aspects for new and enhanced product design. This paper will commence by elaborating upon the history of design, particularly, its evolution during the pre-industrial, industrial, and post-industrial periods. The literature review showcases significant changes that design has undergone since the post-industrial period to the present, particularly, the development of design for sustainability. This chapter will conclude by explaining existing academic standards and guidelines for developing a design for sustainability program.

## **The History and Evolution of Design Production**

The history of design can be traced back to the fifteenth century. During the pre-industrial era, product design was carried out by a few skilled individuals. During that period, the impact of products on the environment was less significant since there was no mass production. However, the products that were developed during the pre-industrial era acted as a foundation for the gradual and steady evolution of design production that was witnessed during the industrial era. Over the course of history, the field of design has evolved gradually. Since it began, the discipline of design has been an essential aspect of human life. Although the evolution of design has played a significant role in enhancing human civilization, its adverse effects on the environment have been increasing rapidly, especially during the period that followed the industrial revolution of the nineteenth century. The post-industrial era, however, embraced the green design movement and sustainability that paid close attention to remedying the adverse effects of product design on the environment.

### **Design of the Pre-Industrial Era**

Before the industrial era, artisans and craftsmen worked to create practical and functional products for daily living. Artisans used their artistic and craft skills to develop high-quality, distinctive functional products in small quantities, usually by hand or simple mechanized methods (Oxford English Dictionary, 1999a). Examples of artisanal professions include calligrapher, illustrator, furniture-maker, clockmaker, jeweler, glassblower, and engraver. Craftsmen, on the other hand, are process-oriented, skilled workers who create processes and procedures to assemble products in efficient ways (Oxford English Dictionary, 1999b). The focus is on the processes, as well as the product

itself. Examples of craft professions include papermaker, book-binder, book-printer, carpenter, tailor, weaver, and coiner. A single worker may occupy the role of both artisan and craftsman, or two individuals may collaborate together to conceptualize and create products. Often people in those professions possess knowledge in art, design, mathematics, geometry, chemistry, physics, and/or engineering.

Artisans and craftsmen of the pre-industrial era worked manually on their designs. Prints, hand tools, objects, jewelry, textiles, and furniture were more time-consuming to produce. They chose the materials for their products based on the product's lifespan, intended use, and other desired qualities such as weight, strength, malleability, durability, and availability. For example, metal and rock were often used to preserve design products such as currency, jewelry, contracts, or decrees, throughout decades and generations. Alternatively, clay, wood, plant, or animal substances were used to produce design products, such as manuscripts, pottery, crafts, and clothing, when durability was less of a consideration.

Due to the limited access of certain materials, the practices of reusing, repurposing, and recycling have been a necessary and critical part of making products, spanning different cultures and times (Thomas, 1997). Archaeologists have deduced from waste remnants that recycling has been a historically popular practice that was predominantly dictated by supply and demand (Lim, 2014). The practice of repurposing was also motivated by the economic benefits of reusing items in functional condition and recycling products instead of the demanding process of extracting raw materials (Lim, 2014). Additionally, in populated areas, the lack of public waste removal created the impetus for recycling as a means for eliminating and repurposing waste (Black Dog

Publishing, 2006). Throughout history, most cultures were creative with their recycling and repurposing practices. An example of this ingenuity is the use of composting, as a method of repurposing organic waste. This practice was used throughout much of human history, with the earliest example of such practices dating back to Neolithic civilizations around 6800 B.C. in ancient Greece (Diaz & De Bertoldi, 2007).

According to archaeologists, prehistoric man deliberately repurposed broken tools made of bone and flint to create new utensils (Ross, 2013). In fact, archaeological studies have shown that the amount of household waste in ancient dumpsites was significantly less during times of material scarcity (Black Dog Publishing, 2006). Many professions included recycling as an aspect of their duties, such as blacksmiths, tailors, and papermakers. Examples of early recycling include the repurposing of old rags and clothing into paper, low-grade board, or quilts; pottery fragments being reused as raw materials; and, metal scraps repurposed into tools and armor (Lim, 2014; Moore-Colyer, 1990; The Economist, 2007; Waxman, 2016). Recycling and reusing were common practices by cultures that had the capacity and proper motivation (Lim, 2014).

Archaeological evidence also shows that ancient Mesopotamians recycled bitumen from oil into adhesive (Schwartz & Hollander, 2000). Moreover, glass has been melted and repurposed since the imperial Byzantine age (Lim, 2014). During the Roman empire, the practice of repurposing and recycling materials was evident through the melting of bronze coins for the use of building statues (Lim, 2014). In addition, ancient Romans also used beeswax as a reusable writing surface on wooden tablets for daily notetaking, since wax shavings could be remelted back into the tablets after each use (O'Hare, 2016).

For more permanent purposes, ink was invented to record and document information in the form of drawing and writing. The first traces of the use of ink date back to cave paintings more than 40,000 years ago (Morris, 2014), using minerals such as hematite, iron limonite, ground calcite, carbon, with animal fat as a binding material (Encyclopedia of Stone Age Art, 2017). Ink, as a widely used design production material, was first used for writing around 2500 B.C. by the ancient Egyptians and the Chinese (Sarton, 1967), using soot, charcoal, and animal glue (Ward, 2008). However, paper was not invented until 100 B.C. (Carr, 2017). Until then, ancient civilizations applied ink on various other surfaces such as rocks, bark, animal shells, and bamboo.

The invention and evolution of paper by the ancient Chinese is considered one of the greatest inventions in human history because of its huge impact on civilization. Initially, the paper-making industry relied heavily on plant-based fibers such as mulberry, hemp, gampi, bamboo, rice straw, and cotton (Atwood, 2016). In ancient China, paper was not primarily used for writing; rather, it was used for various design productions such as playing cards, paper cups, wrapping paper, padding, wallpaper, toilet paper, and napkins (Clart, 2015; Meggs & Purvis, 2005, p. 35). These examples were the earliest instances of disposable byproducts. Likewise, paper packages of spices, vegetables, and hardware were first recorded in Egypt in 1035, another early instance of the use of paper as a disposable product (Shenoy, 2016). With the rapid development in the industrial era, paper-making spread gradually over the next 1700 years, moving to Japan and expanding westward to medieval India, the Islamic world, ancient Egypt, and then to Europe and America (Holik, 2006).

Prior to the invention of paper, manuscripts were expensive and heavy to transport, which made them an elite privilege. In ancient China, manuscripts were made from bone tablets and bamboo scrolls (Kent, 1996). In other places, they were created using animal skins, sometimes consisting of three hundred hides (Meggs & Purvis, 2005). As paper spread to new cultures, it started to replace these older mediums of writing. Additionally, the manner and in which it was used and made from took on locally specific traits. For instance, the papyrus paper, which was widely used in the Arab world, was made from the Nile River grass to create manuscripts (Kurlansky, 2017). Over time, manuscripts evolved to more simplified versions, which were easily transportable and could even fit into saddlebags (Meggs & Purvis, 2005, p. 50). The development of ink followed the development of paper. During the first century B.C., carbon black ink was used for its long durability and wide accessibility. However, the limited choices of writing surfaces that carbon black ink had prompted the invention of new inks and colors that could be compatible with non-absorbent papers. According to Meggs and Purvis (2005), “Colors were created from a variety of mineral, animal, and vegetable matter” (p. 42).

Through small-scale printing and distribution, paper contributed monumentally to widespread literacy and the propagation of specific religions. In the second century, the invention of woodblocks and movable-type made small-scale printing of manuscripts easier, yet the process was time-consuming, extremely expensive, and required a great deal of labor (Meggs & Purvis, 2005; Needham & Tsuen-Hsuei, 1985). In fact, religious manuscripts were the first kind of printed materials (Duiker & Spielvogel, 2007). Judaic, Christian, and Islamic faiths capitalized on paper’s lightweight and transportable qualities

to spread language, religions, thoughts, culture, and laws (Meggs & Purvis, 2005).

Scholars, artisans, and craftsmen continued to utilize and develop the medium of paper in order to find more efficient, cost-effective methods to communicate ideas. As paper became more accessible and easier to produce, it allowed larger populations to engage with paper products.

Johannes Gutenberg's invention of the printing press in the fifteenth century made large quantities of manuscripts faster, cheaper, and less laborious to produce. He developed a metal letter-casting technique with a compatible oil-based ink, which stayed moist until it touched the paper surface (Childress, 2008; Hook, 2010; Rhodes & Streeter, 1999). The new ink was a slight transformation of the carbon-based ink with an inclusion of copper and titanium (Spilsbury, 2016). In the mid-seventeenth century, early industrialists realized the commercial opportunity for recycling paper documents into new paper (Zahedieh, 2010). A century later, a method for removing printing inks from paper (now called de-inking) was invented in Germany in order to recycle paper efficiently (University of Southern Indiana, 2017).

Gutenberg's invention enabled mass production and significantly reduced the final cost of printed materials. The large production of prints acted as a source of stability and unification for languages (Meggs & Purvis, 2005, p. 85). Latin, German, French, English, and Arabic became typographic mass media that communicated a unified voice to distant audiences (Meggs & Purvis, 2005, p. 85). The spread of mass media largely contributed to the growth of unity and fueled the spirit of nationalism and patriotism among affected regions (Meggs & Purvis, 2005, p. 85). The invention of the printing press provided a

prototype for mechanized mass production that would later become a hallmark of the Industrial Revolution (Meggs & Purvis, 2005, p. 85).

### **Design of the Industrial Era**

In the nineteenth and early twentieth century, an unprecedented increase in consumerism, mass production, and commensurate use of natural resources helped build economies. The Industrial Revolution caused social and economic shifts worldwide (Meggs & Purvis, 2005, p. 134). The rise of chemical manufacturing, iron and steel production, and alternative energy sources prompted the acceleration of this era (Meggs & Purvis, 2005). Initially, this sudden development greatly improved the standard of living throughout industrialized countries (Meggs & Purvis, 2005). Societies rapidly transitioned from agrarian to industrialized economies. This resulted in an explosive population growth in cities and urban areas (Meggs & Purvis, 2005). Politically, there was also a shift from an aristocratic model towards a capitalist model, embraced by merchants and consumers (Meggs & Purvis, 2005). Based on those socio-political changes, novel design processes and production were developed to satisfy the emerging needs of urban growth.

According to Meggs and Purvis (2005), “Civilization was shifting from an interest in humanist values toward a preoccupation with material goods and that people were losing their ties with nature, aesthetic experience, and spiritual values” (p. 134). Design of the industrial era was inspired by the new capitalistic conception of mass production and maximization of profits. Productivity was exponentially increased by use of gasoline and electricity (Meggs & Purvis, 2005). This change in non-renewable power sources

spurred investment in machines to achieve mass production such as publications, signage, and advertisements (Meggs & Purvis, 2005).

As new technologies of the industrial era emerged, products were designed without regard to environmental, social, or public health issues (Meggs & Purvis, 2005). For example, the papermaking process shifted from recycled plant-based pulp from old clothing and rags to wood-based fibers from forests. These technological advances are directly associated with negative short and long-term health issues. Products were created with excessive use of harmful chemicals and toxic heavy metals in the manufacturing process of paper, packaging, and printing inks, exposing the workforce and consumers to often hazardous substances (Holusha, 1990; McDonough and Braungart, 2002; Meggs & Purvis, 2005). In other instances, businesses made an economic decision to outsource their product manufacturing in developing countries, where “occupational health standards” are less strict than in developed countries or “perhaps even nonexistent” (McDonough and Braungart, 2002, p. 4). With the development and widespread use of machinery, there was less demand for human labor in factories (Meggs & Purvis, 2005). This technological shift was associated with poor living conditions, job loss, family dysfunction, health decline, and economic depression (Meggs & Purvis, 2005).

The rising urban population created high demand for affordable printed products, hand and mechanical tools, hardware, furniture, and textiles, giving merchants impetus to make technological advancements that would accommodate these rising needs (Meggs & Purvis, 2005). The rise of mass produced products resulted in a market saturation that in turn lowered prices of manufactured products (Meggs & Purvis, 2005). This, along with

the low costs of paper, wood, and metal products, resulted in increased usage of natural resources (Meggs & Purvis, 2005).

During this era, large corporations and industries made high profits utilizing cost-effective, time-efficient design production methods. A great focus was placed on building a competitive economy without consideration to detrimental environmental implications for the planet and its inhabitants. Earth's non-renewable natural resources were exploited for the sake of consumerism and self-interest (Meggs & Purvis, 2005).

American paper mills, for instance, originally used the traditional Chinese method of making paper from recycled cotton rags and clothing. After the invention of the steam engine in the nineteenth century, paper mills were able to use wood pulp and fibers from trees, a non-renewable source, to make paper. Significant numbers of trees are required to produce paper. According to Marion (2011), 17 trees need to be cut down in order to produce one ton of paper, which is equivalent to over 140,000 sheets of U.S. letter size paper (Bertola, 2014). According to the National Aeronautics and Space Administration (NASA), "Nearly four billion trees worldwide are cut down each year for paper" (Martin, 2011). It is well-known that such manufacturing of paper contributes to deforestation and other unfavorable environmental implications such as global warming, decreased biodiversity, and imbalanced ecosystems (Bertola, 2014; Marion, 2011).

The Industrial Revolution set the stage for the culture of mass production and mass consumption that flourished throughout the twentieth century. Industrial papermaking methods allowed for the mass production and distribution of written material (Füssel, 2005). The accessibility and affordability of written materials to industrialized populations contributed to the growth of formal education and literacy on a

mass scale, during this era (Füssel, 2005). Industrial concepts of design became popular in many art and design schools, with a focus on increased production and maximum profits. These approaches to the development of consumer-driven designs were further enhanced through strategically persuasive, high-profile advertising campaigns that dominated mass media channels through the media of print, billboards, and television commercials. The overall commercial message that consumers received was that consumption of products was a positive symbol of success, happiness, and well-being, with little or no mention of the negative effects these culturally accepted behaviors would cause in the long run.

Mass production of consumer and industrial products thrived throughout the mid-twentieth century. In 1955, *Life Magazine* first used the phrase “throwaway society” to describe overconsumption driven by consumerism (*Life Magazine*, 1955). The practice of repair was lost when products were produced and purchased cheaply and the repair of a product was no longer cost effective. Thus, consumers opted for the economic option of throwing away old products and purchasing brand new ones. As a result, increased consumption and solid waste became global problems. Blewitt (2013) noted that about eighty percent of all consumer products were discarded after a single use.

Paper and plastic-based products are some of the most widely discarded single-use items in our daily lives. These include disposable containers, cups, and eating utensils, multi-layer packaging, advertising, and junk mail. Similarly, a culture has emerged that values disposable products as a matter of convenience over reusable and refillable ones. The trend towards using high volumes of disposable products such as food packaging, table settings, celebration goods, and cleaning supplies demonstrates the

lack of concern about future environmental planning. Furthermore, home, office, and school printing abilities, which increased exponentially with the invention of the personal printer, contribute greatly to global paper waste.

The industrial era ushered in a new way of living that continues to have a significant impact on the environment. As populations exploded and industries expanded in the twentieth century, many available resources began to be depleted and pollution became noticeable in many of the major industrialized cities. While more people were moving to urban centers, living and raising families in polluted cities lowered the quality of life in measurable ways. Overflowing landfills, depletion of non-renewable resources, deforestation, and excessive use of chemicals, all contributed to poor air and water quality, the extinction of living species, and a general degradation of environmental wellness. These behaviors reflect a serious neglect of the environment and an overall decrease of consideration for the concepts of “reuse, refill, repair, and recycle.” Thus, design production has begun to address emerging environmental issues.

### **Design of the Post-Industrial Era**

**The green design movement.** By the 1960s, the green design movement appeared as a response to the growing issues and negative impacts that the Industrial Revolution had on the environment. One of the major influences in bringing these issues to the forefront of public awareness was a book called *Silent Spring* by Rachel Carson (Griswold, 2012). Using scientific evidence, Carson explained the reality of environmental concerns in a casual language understandable to the layperson. The basic premise of *Silent Spring*, which was a bestseller then and a classic environmental treatise now, hinges on the basic idea that if humankind poisoned nature, nature would in turn

poison humankind (Griswold, 2012). As a result of this accessible knowledge about what was happening to the environment, people began to consider the negative effects of industrialization. The environmental movement, along with other social movements of the 1960s, such as the civil rights movement, the anti-Vietnam War movement, and the women's movement, influenced and shaped governmental regulations (Hanasky, 2015). Additionally, after the oil crisis in 1973–1974, the use of solar power peaked (Handfield, Melnyk, Calantone, & Curkovic, 2001; McDonough & Braungart, 2002). The green design movement became popular out of a desire to preserve natural resources while satisfying human needs. This optimistic environmental movement fueled the “green design” philosophy of recyclables, less consumerism, and increased use of renewable resources. Green design was aimed at creating harmony between manmade and natural environments (Prabaharan, 2012). During the 1980s, all these combined factors gave a new impetus for businesses to develop more eco-friendly approaches (Andrews, 1999).

Prabaharan (2012) defined green design as the development of environmentally-friendly products and infrastructures. Designs that fit this definition were also labeled as ecological design, green design, eco-design, and design for the environment (McLennan, 2004). Adhikary (2010) stated that the objective of green design is the preservation and protection of the environment and all of its components (Wang, 2014; Watt, 2010). Eyring (1992) and McDonough and Braungart (2002) argued that green design focuses on three major issues: The intentional use of responsible, renewable resources; the use of fewer toxins; and the reduction of solid waste. Examples of such environmentally-friendly practices would be the utilization of recycled paper and bio-inks, the intentional use of less materials in packaging by reducing thickness and weight, and the repurposing

of discarded rubber, metal, and plastic items into new design products (Abellán, 2016; Suib, 2013).

As the green design movement progressed, criteria were set to categorize design products according to whether or not they were environmentally-friendly. These products were referred to as “green products”. Eyring (1992) defined a green product as one that produces 10 percent less waste than the previous year. Other factors used to identify green products included the amount of materials and energy used, product efficiency, greenhouse gasses emitted, and impact on the environment (Abellán, 2016; Coad, 2012; Neiva de Figueiredo & Guillen, 2016).

***The Bauhaus design movement.*** Green design borrowed resource conservation methods from the Bauhaus movement, which was a design and architectural movement that originated in 1919 in Germany. Due to the scarcity of resources and economic instability produced by the two World Wars, the Bauhaus movement utilized a strategic approach of creating “more with less”. Although the impetus for each movement was different, they shared certain practices regarding minimalistic approaches, resource conservation, and material reduction. According to Dieter Rams, a German industrial designer who was influenced by the Bauhaus movement, the ten criteria and qualities of good design are identified as, “Innovative, useful, aesthetic, understandable, unobtrusive, honest, long-lasting, thorough down to the last detail, environmentally-friendly, and uses as little design as possible” (Lynch & Hatcher, 2011). These methods, which are still relevant today, have shaped architecture, industrial design, and graphic design for the past century.

While the Bauhaus movement was a reaction to economic distress and the green movement was a response to rising environmental concerns, both attempted to address real-world problems through design production. However, as the green movement progressed, designers realized that implementing strategies of “making things less bad” would not culminate in the elimination of environmental problems (McDonough & Braungart, 2002, p. 45). Consequently, a new philosophy for design was developed to incorporate the social, economic, and environmental factors into design practices in order to cultivate harmony between the human and the natural world.

**Design for sustainability.** In 1980, the term “sustainable development” was first introduced in the *World Conservation Strategy* report prepared by the International Union for Conservation of Nature (IUCN) in Switzerland (Dzeng, 2014). Four years later, in London, the international conference on Environment and Economics concluded that sustainable development requires the mutual consideration of both the environmental and economic aspects of societal development (Kelly, 2009). In 1987, the UN adopted and developed these concepts further in the report titled *Our Common Future* (also known as the *Brundtland* report) (Brundtland, 1987). This report was a “call for political action” and “a global agenda for change” published by the UN World Commission on Environment and Development (WCED) (Brundtland, 1987). Their attempt was to espouse equal emphasis on the three pillars of sustainability (social, economic, and environmental) in order to achieve sustainable development (Brundtland, 1987).

The UN defined sustainable development as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987, p. 41). Additionally, Sikdar (2003) stated, “Natural resources

belong to all humans whose aspiration to higher standards of living should not be rendered limited” (p. 1928). In this seminal report the UN recommended that manufacturing standards be upgraded to meet sustainable development goals and for all products, including appliances, to be redesigned so they are more resource-efficient, energy-efficient, and cost-effective (Brundtland, 1987). Sustainable development goals, as espoused by the UN, would include the three pillars within the design and manufacturing practices. In the twenty-first century, consistent with the UN’s vision, sustainable design has been adopted by architects, engineers, urban planners, developers, builders, manufacturers, and designers (Casey, 2013; Ceschin & Gaziulusoy, 2016; McLennan, 2004).

***Sustainable design principles.*** In 2015, as discussed in Chapter One of this dissertation, it could be deduced that the importance of design for sustainability within the UN Sustainable Development Goals (SDGs) for the 2030 Agenda are closely related to design innovation, design education, design production, product utilization, and product end-of-life. UN Goals that are directly achieved through design for sustainability include: (1) Clean water and sanitation; (2) affordable and clean energy; (3) climate action; (4) life below water; (5) life on land; (6) industry, innovation, and infrastructure; (7) sustainable cities and communities; (8) responsible consumption and production; (9) good health and well-being; (10) decent work and economic growth (United Nations, 2015b). From the general UN SDGs and their associated targets, principles and criteria for the practice of sustainable design can be extracted. Applying those criteria to sustainable design education, planning, production, consumption, and recycling is

integral to the realization of those SDGs and ultimately creates a balance between economic, social and environmental realities.

These parameters and criteria cover aspects of education, production, and planetary health that are directly relevant to the practices of sustainable design. The UN advocated that by increasing education and public awareness campaigns regarding climate change and sustainable development, the human connection with nature would be reinforced and cultivated (United Nations, 2015i; United Nations, 2015j). Ideally, this advocacy would inform multiple facets of sustainable design practices, encouraging sustainable production and consumption patterns (United Nations, 2015i; United Nations, 2015j).

The UN argued that an increase in technological innovations, resource efficiency, and diversification in regard to sustainable design can achieve higher levels of economic growth without environmental degradation (United Nations, 2015f; United Nations, 2015g). They also argued that industrial sectors should implement scientific research, professional training and development, and technological innovations focused on sustainable practices. In regard to energy, sustainable design planning requires the utilization of cost-effective, renewable, and clean energy use in design production processes (United Nations, 2015e). In the case of natural resources, the UN advocated for the efficient use of renewable materials in production in order to eliminate waste and secure resource availability (United Nations, 2015i).

The elimination of water waste and increased water-use efficiency in industrial and consumer sectors requires the implementation of existing sustainable technologies and the invention of new ones (United Nations, 2015d). In the model of a supply chain,

new innovations regarding packaging design, product design, and technology are required in order to reduce waste in the entire chain, starting from the initial collection of raw materials, to the production, transportation, storage, consumption, and finally recycling processes (United Nations, 2015i). In order to prevent pollution and improve the quality of air, water, and soil, it is essential to utilize or invent new production processes without the use of hazardous chemicals or fossil fuels (United Nations, 2015j). Additionally, design production and products should eliminate the use of toxins, heavy metals, and hazardous chemicals in order to reduce the number of deaths and illnesses of workers and consumers exposed to those contaminants (United Nations, 2015c).

The UN also suggested responsible consumption and reduction of adverse environmental effects associated with the waste generation of cities and communities through practices and patterns of “prevention, reduction, recycling, and reuse” (United Nations, 2015h; United Nations, 2015i). Furthermore, by developing reliable and accessible recycling infrastructures for both “biological and technical cycles”, economic development and human well-being would increase (McDonough & Braungart, 2002, p. 179; United Nations, 2015g).

Ultimately the UN is advocating for a synthesis of criteria and parameters for sustainable practices that affect all social, economic, and environmental realities. Such sustainability practices are beneficial not only for humankind but also for all species on this planet. These practices aid in the prevention of all kinds of marine and land pollution, which would subsequently inhibit the loss of biodiversity, extinction of endangered species, and degradation of natural habitats (United Nations, 2015k; United Nations, 2015l).

The UN is not alone in putting forth recommendations for sustainable practices. Multiple academics, scholars, and designers have developed principles for sustainable design that align with the UN SDGs. Among these scholars is David Bergman (2013), who emphasized the importance of maintaining a balanced coexistence of humanity and nature in sustainable design. Bergman (2013) stated that sustainable design is “design that meets human needs while preserving the health of planetary life” (as cited in Bergman, 2013, p. 20). Other academics, such as Carlo Vezzoli (2003) have gone as far as to proclaim that sustainable development is the ultimate solution to all the environmental problems caused by humanity. The practice of sustainability, when in harmony with culture, would eliminate waste, nourish nature, encourage the use of local and renewable resources, reduce cost, increase profit, promote well-being, and inspire social change.

Edwards (2010) provided a short historical perspective on sustainable development and extracted four key areas for activity that impact the design and construction industries, including: (1) Designing for sustainable consumption, production, and services, (2) building sustainable communities, (3) utilizing local and renewable materials and energy resources efficiently, and (4) adapting industries for future climate change. Additionally, Elmansy (n.d.) identified six principles of design for sustainability: Form, usability, cost-effectiveness, renewable energy, recyclable materials, and durability.

The first principle that Elmansy (n.d.) identified was the design form and its impact on positions of secondary packaging, storage space, transportation cost, energy consumption, and fuel emissions. Concerning the second principle of usability, Elmansy

(n.d.) discussed how a user-centered design product would consider the safety and health of consumers, fit the cultural context of product implementation, and be accepted by consumers, thus promoting responsible and sustainable consumerism. The third principle that Elmansy (n.d.) covered was the product's cost-effective quality that impacts consumers' purchasing decisions and behaviors regarding reusability, repair, disposal, and social change. The fourth principle is the use of renewable clean energy in the product's manufacturing process, thus reducing carbon emissions (Elmansy, n.d.). The fifth principle is the use of renewable and recyclable natural materials in addition to material innovations that would help reduce cost (Elmansy, n.d.). The last principle, as discussed by Elmansy (n.d.), covers durability that influences the product's long-lasting properties and continuous recycling, hence maintaining a high quality product.

Zero-waste is defined as an ethical, economic, and efficient strategy that emulates sustainable natural cycles, where discarded materials from one system feed into other systems (Cortese, 2003; Finnigan, 2014). Davidson (2011) argued that zero-waste is more than just the elimination of waste. It also focuses on the restructuring and redesigning of production and distribution systems. Greyson (2007) argued that the goals of achieving zero-waste and sustainable development have obvious potential as preventive approaches to achieve a balanced ecosystem. Sustainable design aims at zero-waste and considers the product's entire life-cycle, known as the supply chain (McDonough & Braungart, 2002). The supply chain begins with the choice of raw materials, how they are handled and prepared through processing, and continues through to the product's end-of-life (McDonough & Braungart, 2002). This approach means that there will be a shift away from a linear economy in favor of a more circular economy, with sustainable practices

that achieve an effective ecological balance (Cooper, 2005; McDonough & Braungart, 2002).

*Biomimicry design science.* The field of sustainable design, in its quest for creating perfect ecological harmony in manufacturing and material production, has adopted the science of biomimicry, which combines the disciplines of biology and design to meet human needs (Biomimicry 3.8, 2016; Cortese, 2003, p. 18). Janine Benyus (1997) pointed out that organisms and natural systems are the ultimate product of 3.8 billion years of research and development on Earth (Benyus, 1997, pp. 3-4). An early example of biomimicry was Leonardo da Vinci's (1452–1519) study of birds in his attempt to enable human flight. Other examples include submarines, cameras, computer processors, radar, and airbag folding techniques. Although these examples represent biomimicry inventions, they were not designed with sustainability in mind.

Achieving optimal harmony with the environment requires manmade systems to closely mimic natural ecosystems by utilizing nature as mentor, model, and measure (Benyus, 1997, p. 3). The integration of biomimicry in sustainable design conceives of design that is inspired by nature's time-tested and perfectly adapted forms, systems, and elements that are resource efficient, energy efficient, economic, renewable, recyclable, and produce no waste (Biomimicry 3.8, 2016; Cortese, 2003). This integration would aid innovations such as zero-waste products and systems by mimicking those attributes found in nature, thereby, closing the loop on waste products by incorporating them into industrial and natural cycles (Cortese, 2003; McDonough and Braungart, 2002).

When biomimicry is applied in sustainable design, for instance, designers can learn to create non-toxic radiant color effects, without the use of pigments, similar to the

colors found on butterfly wings and peacock feathers (Vanderbilt, 2012). Neither butterfly wings nor peacock feathers contain pigments (Ball, 2012; Evolution News, 2011). They are constructed of microscopic geometrical patterns that allow some light waves to be absorbed and others to be reflected, refracted, and scattered at different wavelengths (known as structural coloration), producing intense and vivid colors (Ball, 2012; Evolution News, 2011).

Another example of utilizing biomimicry in sustainable design is the use of hollow structures found in plants, bones, and honeycombs (Krulwich, 2013). According to Charles Darwin, “the honeycomb is a masterpiece of engineering. It is ‘absolutely perfect in economizing labor and wax’” (as cited in Krulwich, 2013). Hollow structures are often characterized by their maximum strength, maximum use of space, minimal material use, minimal weight, energy efficiency, and relatively high compression properties (Krulwich, 2013). The hollow structure concept was adapted by Ecofont®, who invented a typeface that incorporates imperceptible blank holes within each character, reducing ink consumption by 39 percent and saving equal proportions of money annually on ink and toner (Milošević, Nedeljković, Banjanin, Novaković, & Kašiković, 2016). Similarly, the Swiss construction company Ecocell® has invented recyclable concrete honeycomb panels, inspired by natural hollow structures, that utilize recovered paper and wood from renewable resources (Ecocell, 2015). This panel design exploits the benefits of the hollow structure, such as being lightweight, cost effective, resource efficient, ecological, and able to sustain high degrees of compression (Ecocell, 2015).

Another example of utilizing biomimicry in sustainable design is the use of folding mechanisms found in plants, specifically flower buds that are triggered to open with an increase in water (as cited in DaMatta, Ronchi, Maestri, & Barros, 2007). The Swedish design studio called Tomorrow Machine, in collaboration with the Innventia research institute, have adapted bio-folding mechanisms for a self-expanding noodle package that transforms into a bowl when water is poured into it (Tomorrow Machine, 2013). This folding and expanding design, which employs features found in plant structures, saves energy in transportation and storage space when compressed, uses minimal amounts of material, and is economical as well as biodegradable (Tomorrow Machine, 2013).

While the previously mentioned examples have utilized properties found in nature for design purposes, Graham Wiles, of the United Kingdom, mimicked the zero-waste properties of natural ecological systems and applied it in a recycling system for products' end-of life (Oppenheim, 2008; Pawlyn, 2013). Wiles's collaborative project is called the ABLE Project and is widely known as the "From Cardboard to Caviar" project (Oppenheim, 2008). Wiles, who worked at the end of the supply chain, had set up an upcycling production chain between local businesses to collect waste products and sell them to other businesses, transforming a "cradle to grave" cycle into a "cradle to cradle" cycle (McDonough & Braungart, 2002; Oppenheim, 2008). McDonough and Braungart (2002) defined the biological upcycling as a planned recycling process that utilizes discarded biomaterials that can be fed into other bio-systems to function as "nutrients", thereby producing zero-waste. Leonora Oppenheim (2008) described the process of Wiles project as follows:

The project takes cardboard from restaurants and shops, shreds it and sells it as horse bedding. When the horse bedding needs replacing it is picked up and composted in a worm farm. The compost goes onto plant beds and the extra worms are fed to the fish farm where sturgeon are bred and caviar is produced. The caviar is then sold back to the restaurants where the cardboard was collected in the first place. (Oppenheim, 2008)

Another type of upcycling is called *technical upcycling*. McDonough and Braungart (2002) defined technical upcycling as a planned recycling process where discarded materials can maintain their high quality in an infinite loop of recycling as well as produce zero-waste, thus reducing the product's final cost. In contrast to Wile's project, most of what is popularly referred to as recycling is considered downcycling (McDonough & Braungart, 2002). McDonough and Braungart (2002) defined downcycling as an unplanned recycling process, where discarded materials were not originally intended for recycling. These materials tend to lose much of their quality over time, cost more in production, generate waste, introduce harmful chemical additives, and will ultimately end up in a landfill, which by definition is not sustainable (McDonough & Braungart, 2002).

Biomimicry science and methodology are practiced today by engineers, architects, designers, and business leaders worldwide (Biomimicry 3.8, 2016). According to a research design consultancy and education firm, "It's estimated that by 2030, bio-inspired products and services will generate \$1.6 trillion to the global GDP" (Biomimicry 3.8, 2016). However, for sustainability to thrive, all segments of society including

government, businesses, and consumers, must have common understanding, values, and vision of sustainability in order to achieve an overall positive change.

*A cultural paradigm shift.* Regardless of the preponderance of scientific evidence that continues to point to the negative impacts on quality of life for humans and all species on Earth, the process of worldwide remediation of environmental problems is lagging behind. In general, economic growth and increased consumerism are viewed positively by most societies, unaware of their association with depletion of natural resources and wasteful practices that contribute to environmental problems (Meadows, 1997). In order for the practices of sustainability to be accepted in a culture on a large scale, people from all socio-economic and educational brackets will need to be educated and made aware of current negative impacts and consequences of these practices (Elmansy, n.d.; Findeli, 2001). In regard to these negative impacts, Cortese (2003) argued that a transformative cultural shift in values and behaviors will be required by country leaders, professionals, and the general population. Meadows (1997) discussed the complexity and multiple ways of approaching institutional change. However, he stated that the most important transformation of all is a paradigm shift. “The change sought is a deep cultural shift — the most difficult to achieve — but one of the most important leverage points for institutional transformation” (Meadows, 1997 as cited in Cortese, 2003). In order for sustainable development to take root in society, societies need to comprehend the essence and operating principles of sustainability. Societies need to learn sustainable ways of consumerism and waste management. Policymakers, business leaders, researchers, academics, and professionals specializing in sustainability must lead the way for a positive ideological cultural shift in society.

***Professional development.*** It is widely accepted that education plays a vital role in preparing professionals to advance the necessary cultural transformation towards sustainable development (Cortese, 2003; Svanström, Lozano-García, & Rowe, 2008, p. 340). According to Cortese (2003), a cultural shift would accelerate more rapidly through education. Education would prepare future professionals to implement solutions for societies to “live off nature’s interest, not its capital, for generations to come” (Cortese, 2003, pp. 15–16).

Education will prepare future professionals in sustainability to upgrade traditional social and technological structures and systems in society to conform with sustainability (Cortese, 2003). Through education, future professionals will be aware of the negative effects and consequences of unsustainable practices (Chambers, Simmons, & Wackernagel 2000; Cortese, 2003; Ryan & Durning 1997); understand how ecological systems are critical for humans existence (Cortese, 2003); develop an appreciation for nature and acquisition of environmental values (Cortese, 2003); learn to manage human activities so that they would restore ecosystems and increase biodiversity (Cortese, 2003); and finally, learn to incorporate human factors and consumer-centered methodologies in proposed solutions so that consumers would actually accept and adopt these changes, ultimately achieving long-lasting outcomes of social change (Elmansy, n.d.; Findeli, 2001).

The field of design has evolved since its onset during the pre-industrial era. During that particular time, product design was mainly practiced by relatively few individuals who specialized in the field and thus there were no significant adverse impacts on the environment. The design methods and commodities that were created

during that time, however, acted as a cornerstone for the steady evolution of industry that took place during the industrial era. Unlike the pre-industrial era, the industrial period embraced mass production that paid no attention to the environment and social aspects, a factor that resulted in a myriad of adverse effects, especially to the environment. Much emphasis was placed on building a competitive economy that embraced massive sales and profits without paying attention to the negative effects that mass production had on the environment. Nevertheless, the post-industrial era took an approach of responding to the environmental issues that were witnessed during the industrial era by embracing the green design movement and design for sustainability. This dissertation will examine the three periods of pre-industrial, industrial, and post-industrial to show how design has evolved over time, while significantly shifting the course of civilizations.

### **The History and Evolution of Environmental Education**

Ecological systems are made up of constituent interrelated parts. Effects on the environment depend on all eco-systems that operate on Earth, including all living species, natural resources, and most importantly, human systems and activities. Nature studies commenced during the early period of the eighteenth century when Jean Jacques Rousseau emphasized the importance of learning from nature. Conservation education is another area that emerged after the dust bowl and economic depression that focused on learned lessons for sustaining humans during times of scarce resources. Environmental education began due to the devastating impact that the Industrial Revolution brought on the environment. Education for sustainable development, was a political global call for action to curb the adverse environmental effects, spread social justice, and build economies.

## **Nature Study**

During the fourth century BC, Aristotle, with his view that students should learn about the “real world,” could have been the earliest proponent of environmental education (as cited in Disinger & Monroe, 1994, p. 10). Much later in the 1700’s, Swiss scholastic philosopher Jean-Jacques Rousseau encouraged his students to learn by immersing themselves directly in nature, in addition to reading books (McCrea, 2006; Younkins, 2005). A century later, Louis Agassiz, a Swiss-American biologist, took a firmer stance, insisting that his students “study nature, not books” (Disinger & Monroe, 1994, p. 10). Wilbur Jackman, an American educator, took the first step in translating an environmentalist philosophy into an applied pedagogy when he wrote the book *Nature Study for the Common School* in 1891 (Jackman, 1892), which would later define the nature study movement (McCrea, 2006).

Jackman (1892) described nature study as a science that explores “the world of outdoor objects and phenomena” through direct observation in which it aims to discover new knowledge or increase the “joy of living” (pp. 4–5). In 1905, the first president of the American Nature Study Society, Liberty Hyde Bailey, refused to refer to nature study as a science as he thought it would be overly abstract and inapplicable (Bailey, 1911; McCrea, 2006) — a position that scholars reaffirmed a century later. During the 1920’s, ecology was established as a scientific field to provide a comprehensive view of the natural environment and ecosystems (Environment and Ecology, 2016; Kolasa & Pickett, 2005; McCrea, 2006).

## **Conservation Education**

During the Great Depression and Dust Bowl in the early 1930's, American farmers endured times of scarcity and quickly learned the meaning and value of conservation (McCrea, 2006; National Oceanic and Atmospheric Administration [NOAA], 2009). Realizing the struggles of their constituents, federal, state, and non-government natural resource agencies supported the conservation education (CE) movement (McCrea, 2006). The U.S. Department of Agriculture defined CE as the study of conserving natural resources for future generations with an emphasis on examining the relationship between natural resources and ecosystems (U.S. Forest Service, 2013). Meanwhile, John Dewey, a progressive educational philosopher and reformer, was challenging the current U.S. educational system by advocating for a more student-centered, holistic approach to education through learning by doing, lifelong learning, and integrated and interdisciplinary efforts (Dewey, 1933; Kliebard, 2004; McCrea, 2006). Dewey's progressive idea of "learning by doing" surprisingly aligned with early philosophers' conceptions of learning through nature or outside-of-school contexts. Dewey's educational reform created a foundation for the ideal learning environment in which sustainability education exists today (McCrea, 2006; Trimmingham et al., 2008). In the mid-1930's, The National Education Association championed CE nationwide (Disinger, 2005, p. 141; Funderburk, 1948, p. 28; McCrea, 2006). The state of Wisconsin became the first to require teachers to have "adequate preparation in the conservation of natural resources" and a decade later was the first state to offer a degree program in CE (as cited in McCrea, 2006, p. 3). In the 1950's, educators working in CE formed the Conservation Education Association (McCrea, 2006). Internationally, the term

“environmental education” was first professionally used by the International Union for the Conservation of Nature at a meeting in Paris (Disinger, 1983; McCrea, 2006; O’Brien, 2007).

### **Environmental Education**

In the 1970s, new laws began to reflect public concern in regard to scientific evidence of environmental damage (Handfield, Melnyk, Calantone, & Curkovic, 2001). In an effort to promote environmental education (EE), the U.S. Congress passed the National Environmental Education Act of 1970 and for six years funded the construction of environmental education curricula, as well as the professional development of teachers (McCrea, 2006). The UNESCO defined EE as a study that aims to achieve environmental literacy, develop public awareness of environmental issues, and individually and collectively solve environmental problems in order to prevent new ones (Elder, 2003; UNESCO, 1977).

The UN took a significant stance in championing EE through several international conferences. The 1972 UN conference in Sweden identified education as a means to address environmental issues worldwide (McCrea, 2006). Three years later, at a conference in Yugoslavia, the UN ratified the Belgrade Charter, which outlined the basic structure of EE (McCrea, 2006). In 1977, the UN held the intergovernmental conference in the Republic of Georgia to establish the goals, objectives, and guiding principles of EE — a foundation that many educators still use today (McCrea, 2006). Subsequently, in 1980, Hungerford et al. (1989) published a groundbreaking journal article titled “Goals for Curriculum Development in Environmental Education,” which had a significant impact on the future direction of EE (Hungerford, Peyton, & Wilke, 1980; Hungerford &

Volk, 1990; McCrea, 2006). In 1987 in Switzerland, the *Our Common Future* report, presented the idea of “sustainable development” to academia with the stance that social justice, environmental protection, and economic growth are interdependent concepts (McCrea, 2006).

### **Education for Sustainable Development**

Over the next three decades, a debate emerged over whether environmental education (EE) should be replaced with education for sustainable development (ESD), as the latter was recognized as a more comprehensive approach accounting for social, economic, and environmental factors (Kyburz-Graber, Hofer, & Wolfensberger, 2006). However, EE and ESD were seen as coexisting fields meeting similar needs (Kyburz-Graber, Hofer, & Wolfensberger, 2006). The terms sustainability education (SE), education for sustainability (EFS), and ESD are used interchangeably in scholarly articles to describe the practice of teaching for sustainability. However, ESD is the most frequently used term internationally, including the UN (McKeown, Hopkins, Rizi, & Chrystalbridge, 2002). UNESCO (2016) defined ESD as a study that incorporates sustainable development issues into education, requires interactive pedagogical methods, and promotes collaborative critical thinking and decision making. It motivates learners to acquire the knowledge, values, and skills necessary to change their behaviors and take action to build a sustainable future (UNESCO, 2016). The Brundtland Report of 1987 defined sustainable development as “Development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987; García-Serna, Pérez-Barrigón, & Cocero, 2007, p. 8).

During the 1990s, multiple measures were taken to advance environmental education in North America. The U.S. Congress passed the National Environmental Education Act of 1990, which authorized funding for environmental education and training programs, research grants, and student fellowships (McCrea, 2006). In 1996, the North American Association for Environmental Education (NAAEE), founded in 1971, conducted the National Environmental Education Summit in California to focus on fundamental aspects of environmental education in the U.S. and establish collaborative networks throughout the country (McCrea, 2006; Sanera, 1998).

At the same time, the quest for sustainability was adopted in academia, government projects, and many other spheres of life through multiple UN meetings across the globe. In 1992 the UN held the conference on Environment and Development in Brazil to redirect education toward sustainable development, raise public awareness, and encourage training programs (McCrea, 2006; McKeown, Hopkins, Rizi, & Chrystalbridge, 2002). In cooperation with the International Chamber of Commerce, the UN also sponsored a World Congress for Education & Communication on Environment and Development (ECO-ED) as an action-oriented initiative to foster a global cooperative exchange of knowledge related to the environment and sustainable development (McCrea, 2006; UNESCO & UNEP, 1992).

In 2002, the UN brought attention to global conservation of natural resources and passed a resolution to declare 2005–2014 the decade of education for sustainable development (McCrea, 2006; UNESCO, 2005). The 2012 UN conference in Brazil proposed integrating the practice of sustainable development into all academic fields (Bergman, 2013), placing all sustainability-focused disciplines as subfields of

sustainability studies (e.g., design, architecture, international/global studies, legal studies, history, business, management, finance, ecological economics, urban studies and planning, agriculture, environmental science, engineering, energy studies) (Cohen, 2011; Association for the Advancement of Sustainability in Higher Education [AASHE], 2012). Kuwait has taken small steps recently by participating in the 2016 UN convention in Paris and signing the Paris Agreement to make a pledge along with 170 countries to slow global warming in addition to developing public school education curriculum as well as higher education pertaining to sustainability.

Sustainability education in the U.S. and other countries took decades to develop from theory to practice. While Kuwait is lagging behind, the country has taken first steps to address environmental issues, hopefully shortening the timeline to implement sustainability education and practices in the country entirely. An examination of unique lived personal experiences of individual, familial, and cultural factors in Kuwait will assist in the adaptation and implementation of sustainability education and practices, bringing Kuwait into line with other developed countries.

Environmental education was designed to remedy the adverse effects of manufacturing that were witnessed during the industrial period. It played a major role in reducing the adverse environmental effects that were brought by the massive production that took place during the industrial era. The concept of environmental education encompasses unveiling knowledge to enhance our overall understanding of our environment. One of the areas that falls under environmental education is conservation.

The primary role of conservation education is to convey knowledge on how existing natural resources can be conserved for future use, as well as knowledge of the

relationship that exists between humans and the environment. The U.S. government, through Congress has also played a vital role in the funding and construction of curricula that are related to environmental studies. They also supported the professional development and training of educators in environmental education. Finally, education for sustainable development provided additional emphasis on social and economic factors and explained their interconnectivity with environmental factors in order to achieve prosperity and human well-being.

### **Design for Sustainability Program Standards and Guidelines**

Academic standards for sustainable design programs are in their infancy, currently evolving. Changes in curricula include increased focus on an interdisciplinary approach and an emphasis on collaboration to accelerate the progress towards a sustainable future (Cortese, 2003; Designers Accord, 2011). The inclusion of specialized disciplines such as environmental science, ecology, and political science, within design education is a significant component of sustainable development (Cortese, 2003; Designers Accord, 2011; National Association of Schools of Art and Design [NASAD], 2016). These subjects highlight the need for students to attain competence in meeting academic standards in design for sustainability in higher education. Core competencies in a wide range of interdisciplinary subjects are foundational in achieving sustainability objectives (Cortese, 2003; Designers Accord, 2011).

Academic standards are important for all disciplinary fields. They define expected and necessary knowledge and skillsets for students to learn according to their educational level (Louisiana Department of Education [LDOE], 2016). Academic standards provide guidelines for educators to help determine adequate program components for students to

gain proficiency in complex learning outcomes needed in the workforce (LDOE, 2016). Sustainable approaches to design have been gradually adapted by only a few academic design programs in the U.S. as well as on a global scale. Sustainable approaches are becoming more central to human wellbeing, environmental welfare, and economic development of societies (Strange & Bayley, 2008; Zajkowska, 2015). However, it is evident through analysis and review of the literature that many academic design programs have not yet caught up with these positive trends, as full range curriculum in sustainable design are specialized and rare (Fiorentino, 2010; Designers Accord, 2011).

### **Curriculum, Pedagogy, and Evaluation**

Since the integration of sustainable development into design education, a number of design schools have begun to focus on sustainability and eco-friendly products that meet current objectives of purposeful manufacturing and consumerism. While knowledge, attitudes, and values all have a significant position in sustainability approaches, actions are imperative for measurable success and accountability in practice. Effective sustainable design practices need to address social, economic, and environmental concerns simultaneously (Rosen & Kishawy, 2012). Scholars and academics who attended the Designers Accord Summit argued that sustainability should not be considered as an extra-curricular concern, but as a fully integrated discipline (Designers Accord, 2011).

In order for sustainability to be fully integrated into the design curriculum, the curriculum should present sustainability in the context of systems literacy, skills, and experiential learning as well as promoting cross-disciplinary and collaborative pedagogical approaches (Caston, 2013; Designers Accord, 2011). Additionally, scholars

at the Designers Accord (2011) suggested that curriculum should focus on three basic foundations in order to provide a fully realized and effective learning experience for students. These foundations are: Design-relevant thinking (theory, history, math, science, literature), Trans-disciplinary practice (studio and applied projects), and practical application (discipline-specific craft-based activities) (Designers Accord, 2011).

Such integration would be easily realized because design thinking and sustainability thinking share common goals and methods, “Experienced based models, systems thinking, students as initiators, open source perspectives, collaborative methods, measurable outcomes, incentive-based goals, and interdisciplinary perspectives” (Designers Accord, 2011, p. 11). Furthermore, sustainable design curricula need to include core values and ethics courses that teach students the significance of sustainable practices. Ethics courses will allow students the opportunity to examine various environmental, social, political, and economic issues as well as encourage enlightening open discussions (Lehtonen, 2004, p. 200).

Such interdisciplinary integration, which draws from a myriad of subjects, should be a core component of sustainable design pedagogy (Designers Accord, 2011; Medrick, 2013). Rather than having rigid topical boundaries for students’ projects, the curriculum should support safety in experimentation and synthesizing new ideas into core values and practices. Through examining previous case studies and the way that sustainability theories have been developed and applied, it is possible to create a learning environment for students to develop their subjective passions into meaningful interactions with broader ethical considerations (Designers Accord, 2011; Wolff, Sjöblom, Hofman-

Bergholm, & Palmberg, 2017). This will ultimately demonstrate the various real-world applications of sustainable design practices.

The real-world applicability of a student's project should become a crucial part of the evaluation and measurement of the project's success (Designers Accord, 2011; Brundiars & Wiek, 2011). Such a curriculum should encourage students to internalize those values and ethical practices, ideally creating feedback loops of self-evaluation and reflection (Designers Accord, 2011, p. 17; Trimmingham et al., 2008). The intent of such reflexivity in project evaluation and measurement is less about declaring successes and failures, and more to cultivate an ethos within the curriculum and the students that values the gathering of insight through experiential learning (Designers Accord, 2011; Henrickson & Doering, 2013).

Students projects and portfolios should not be evaluated based simply on aesthetics, but also on the number of change agents the project has produced in it's applied environment. Ultimately, a curriculum like this aims not only to teach students the theories of sustainability, but to produce future skilled professionals who want to apply their knowledge in design and everyday practices (Designers Accord, 2011; Henrickson & Doering, 2013).

### **Theory, Skills, and Practice**

The educational systems currently in place that address design for sustainability have progressed in the past few years, but there are still substantial gaps between theoretical knowledge and its practical applications that require improvement. "Higher education can serve as a model of sustainability by fully integrating all aspects of campus life" (Cortese, 2003, p. 15) Community involvement is a natural outgrowth of this

approach, where the students actively participate in ecological solutions at the grassroots level (Trimingham et al., 2008; Zsóka, Szerényi, Széchy, & Kocsis, 2013, p. 127). This community integrated approach allows students to apply their acquired knowledge and skills into real-life situations, and provides faculty with opportunities to focus their teachings towards results-oriented action.

While it is important to have a comprehensive knowledge of the field of design for sustainability, Christiaans and Dorst (1992) argued that students may become “stuck on information gathering, rather than progressing to solution generation” (as cited in Cross, 2004, p. 4). This is not conducive to moving forward as effectively in creative solutions for the future. A more effective approach to design, as researchers have discovered, is the process of analysis through synthesis, which leads to more creative outcomes and practical ideas for problem-solving (Suwa, Gero, & Purcell, 2000; Trimingham et al., 2008). In this approach, designers use an evaluative process of cognitive knowledge that generates new ideas to explore the possibilities for future solutions.

While theories and theoretical frameworks are considered foundational, an excessive focus on imparting theory may result in the field losing its practical application (Grant & Osanloo, 2014). Students often leave institutions of higher education with abstract ideas and few practical skills on how to apply knowledge in diverse contexts. Students need to be involved in what they are learning through experientially applying their practical knowledge within local contexts (Fishman & Krajcik, 2003; Trimingham et al., 2008).

The nature of the field should facilitate students' learning through real-life problem-based projects, thus making it possible for students to analyze what they are taught as well as develop cognitive abilities to be more creative in solving situated real-life problems. It is critical for students to have a paradigm that theories of sustainability are not a set of prescriptive codes but rather an organic, ever-evolving discourse, one which they should feel comfortable to challenge and question (Designers Accord, 2011; Trimmingham et al., 2008). Such a paradigm transforms theory into an evaluation tool for the assessment and accountability of ideas and actions (Designers Accord, 2011; Waas et al., 2014).

### **Creativity and Innovation**

Innovative approaches to technology and design of the future require a more creative, solution-generating process to achieve new answers to complex issues of an ever-expanding world population. Innovation is critical in solving current problems of sustainable design that fulfill real human needs and transform civilizations (Dorst & Cross, 2001; Trimmingham et al., 2008). Albert Einstein stated, "We can't solve problems by using the same kind of thinking we used when we created them" (Calaprice, 2000, p. 317).

Klewitz and Hansen (2011) defined sustainability-oriented innovations as "new or enhanced products, services or processes that reduce the negative environmental and social impact while steadily increasing the success of [a] company" (p. 3). Hansen, Grosse-Dunker, and Reichwald (2009) claimed that achieving long-term sustainability requires inventing new product concepts that incorporate economic, ecological, and social criteria as guiding principles (as cited in Zajkowska, 2015, p. 62). Sustainability-

focused design programs need to facilitate “critical, innovative, and creative learning spaces where students can challenge their own models of thinking and practice, [and] develop their own innovative and creative projects” (Lambrechts, Mulà, Ceulemans, Molderez, & Gaeremynck, 2013, p. 6).

### **Interdisciplinarity and Collaboration**

Jacobs (1989) argued that the structure of segregated disciplines is valuable for specialization and depth of knowledge; however, linkages between disciplines provide a more holistic approach that focuses on themes and problems from current real-world experiences. Jacobs (1989) proposed that students take multi-disciplinary courses to widen their knowledge base. He defined interdisciplinary curriculum as, “A knowledge view and curriculum approach that consciously applies methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience” (Jacobs, 1989, p. 8).

Applying an interdisciplinary approach for sustainable design in higher education requires “cross-campus and cross-discipline collaborations between biologists, anthropologists, historians, sociologists, engineers, and designers” (Designers Accord, 2011, p. 10; Fleming, 2013). However, the two main barriers for integrating sustainability into higher education are known to be the rigid disciplinary structures and the reliance on content-based learning (Jacobs, 1989; Lambrechts, Mulà, Ceulemans, Molderez, & Gaeremynck, 2013, p. 5). Similarly, Cortese (2003) argued that to support the educational shift towards sustainability, higher education must transform the current segregation of disciplines by implementing interdisciplinary and collaborative approaches:

Higher education is generally organized into highly specialized areas of knowledge and traditional disciplines. Designing a sustainable human future requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation. Much of higher education stresses individual learning and competition, resulting in professionals who are ill prepared for cooperative efforts. (Cortese, 2003, p. 16)

Educational settings can provide the space to prepare future leaders to achieve local and global sustainability goals individually and cooperatively through innovation (Cortese, 2003; Elder, 2003; UNESCO, 1977).

Interdisciplinarity, cooperation, and collaboration are thought to be essential components for sustainable design education (Designers Accord, 2011; Fleming, 2013). The connectedness of knowledge from different disciplines, such as environmental sciences, engineering, business, and social sciences, contributes multiple perspectives to solving a sustainable design problem (Khourey-Bowers, 2012; Trimmingham et al., 2008). For example, when design students collaborate with other students from other varied disciplines, their practical sustainable design skills will be enriched. Students are encouraged to learn sustainability through collaborating with other students to solve sustainability design problems together (Designers Accord, 2011; Fleming, 2013).

Academics and professionals, who attended the Designers Accord Summit in 2009, have argued for another perspective to integrating an interdisciplinary approach into sustainable design education (Designers Accord, 2011; Fleming, 2013). This perspective involves peer-to-peer networking and collaborations with students of various specialty disciplines and from different academic programs (Designers Accord, 2011;

Fleming, 2013). The goal of this approach is not for students to master these foreign disciplines at the same level of competence as a specialist would, but to be able to utilize knowledge from other disciplines in a collaborative design work.

In such a setting, students typically have more open access to knowledge-sharing (Designers Accord, 2011; Fleming, 2013). It allows students “to build on each other’s knowledge and experience”, rather than “start from zero” (Designers Accord, 2011, p. 8). Student “systems thinking” also thrives in such a curriculum (Designers Accord, 2011, p. 10). Finally, such an interdisciplinary approach gives the student access to deeper and more meaningful learning opportunities (Designers Accord, 2011; Filho, 2015). Students can here be taught how to internalize sustainability on a personal level by applying discipline-specific design thinking to their problem-solving strategy.

### **Local Context and Community-Based Learning**

Design for sustainability programs “need to empower students to initiate, direct, and become stakeholders in real-world design challenges” (Designers Accord, 2011, p. 3). The programs must allow students to become independent, lifelong learners, leaders, facilitators, and agents of change (Designers Accord, 2011). This can be achieved by “paying attention to their successes, not their limitations or failures” and providing group support that encourages them to take charge and create successes (Designers Accord, 2011, p. 8).

Achieving the visionary goals of global sustainability begins with providing solutions at the local level. Sustainability theories become relevant when applied within a local context. Eyring (1992) argued that sustainable design within institutions of higher education should encourage students to incorporate local context into their design

applications. When local factors are incorporated within a sustainable design project, the solution will become culturally, environmentally, and economically sound for the location where the design will be utilized (Elmansy, n.d.; Fleming, 2013). McDonough and Braungart (2002) stated that the significance of incorporating local factors into a design process is due to the fact that universal sustainable solutions often times cannot be applied to specific locations.

Higher educational institutions by nature are self-contained, insulated from the contexts in which acquired knowledge is relevant. Findeli (2001) argued that, in some cases, students are not connected with their environment and culture during matriculation. Student engagement with the local culture is imperative to ensure continuity of proposed sustainable design solutions in society (Findeli, 2001). Therefore, students must reach out to the community by involving local people (stakeholders and beneficiaries) in the design process to accept and adopt proposed solutions (Elmansy, n.d.; Findeli, 2001).

Community-based projects have been defined as “projects undertaken by departments and/or faculty and students in collaboration with community organizations that respond to community-identified needs and promote civic engagement” (Office of Civic & Community Engagement, 2017). A communal approach to the design process is considered a bottom-up approach, where the society is given the opportunity to express and identify their needs, struggles, and lifestyles to the designer, as opposed to forcing design solutions for them based on ideals divorced from the local context. A community involvement approach is shifting the design process from a product-oriented design towards an integrative solution that focuses on consumer-oriented product design.

Students must engage in safe, fruitful, multi-directional dialogue with community members in order to create a common vision, rather than only addressing superficial needs and requests (Designers Accord, 2011; Legrand, n.d.).

Learning by doing when integrated with communal involvement creates opportunities that help students practice sustainability outside of academia (Trimingham et al., 2008). Academics and scholars have pointed out that external motivational factors of pro-environmental behaviors can be significantly increased through experiential, community-based learning, and engaged participation (Kollmuss & Agyeman, 2002). Community-based projects develop a sense of civic responsibility, enable action-oriented solutions in real-world situations, provide depth in understanding, create a positive local involvement, enrich the lives of the students and the local members of a community, and can inspire beneficial behavioral changes (Designers Accord, 2011; Fleming, 2013). For instance, partnerships with local businesses are an especially positive way for students to learn firsthand about the issues involved within sustainability. This approach may lead to career opportunities as well.

Ultimately, it is crucial for students not to see themselves as passive outside agents but instead as active stakeholders working within the community (Designers Accord, 2011; Schmitz, Stinson, & James, 2010). In order for students to maximize their involvement and impact it is imperative that they cultivate meaningful relationships amongst community members on various levels and in various roles (Designers Accord, 2011; Schmitz, Stinson, & James, 2010). For example, academic institutions can provide a model for such intersectionality by encouraging on-campus community-based projects

involving faculty, administration, students, the school community, end-users, and the design community at large (Designers Accord, 2011; Fleming, 2013).

While admittedly, such practices may seem to be small steps, they are crucial in order to affect bigger change (Designers Accord, 2011; Fleming, 2013). It is crucial to acknowledge taking small steps towards a cultural paradigm shift in order to avoid unintended cultural shock or backlash (Bergman, 2013; Cortese, 2003; Designers Accord, 2011; UNESCO, 2005). If more schools adopt these changes, this will produce a ripple effect resulting in a country-wide attitudinal and behavioral shift in regard to daily sustainability practices, ultimately resulting in a holistic societal transformation which would include entire companies, industries, and economies (Designers Accord, 2011; Gray & Stites, 2013). A sustainable future may take decades to fully realize; however, taking small measures within education and communities can begin to shift civilization towards sustainability (Sanders & Stappers, 2008, p. 9).

In conclusion, academic standards and program evaluation are a vital component of enhancing the quality of environmental education. However, sustainability in design is still an overlooked theoretical and practical field. By incorporating the design for sustainability into higher education in Kuwait, it will not only facilitate a crucial first step to solving the waste problem but also establish Kuwait as a leader for environmental change in the Middle East.

## Summary

To sum up, the theoretical and practical applications of design have undergone tremendous changes over the course of human history. Through technological advances and interdisciplinary integration with other subjects such as physics, chemistry, and engineering, the field of design continues to change with cultural and societal shifts. The current knowledge, human needs, and the available resources have significantly facilitated the changes that have been witnessed in design for many years, and the trend will undoubtedly continue. Currently, we are dealing with the adverse environmental effects that industrial design methods have inflicted, often fueled by a capitalistic drive that focuses solely on profitability and ignores ecological and social factors. Through environmental studies that embrace conservation and sustainability education, a new generation of design professionals can cultivate new design methods, practices, and products, which are both profitable and socially and ecologically sound.

## CHAPTER THREE: RESEARCH DESIGN

### Defining Autoethnography

Autoethnography, as a qualitative research method in the social sciences, focuses on social phenomena in which the researcher and his or her culture are the subjects of study. Autoethnography is “part auto or self and part ethno or culture” (Ellis, 2004, p. 31; Reed-Danahay, 1997, p. 2) and “something different from both of them, greater than its parts” (Ellis, 2004, p. 32). The researcher provides descriptions of personal experiences in relation to cultural groups under study (Adams, Jones, & Ellis, 2015), thus connecting the personal to the “cultural, social, and political” (Ellis, 2004, p. xix).

Autoethnographers provide descriptions and critiques of cultural beliefs, practices, values, politics, and positions in addition to perceptions and experiences of members of a cultural group, as well as their own, in order to gain insight into shared social realities (Adams, Jones, & Ellis, 2015).

In contrast, ethnographers socialize and engage with members from the culture under study, excluding themselves from their research entirely, to merely provide descriptions of that particular group (Hayano, 1979). The introduction of the researcher’s personal voice and reflexivity into the ethnographic narrative allows the autoethnographer to represent — in his or her subjective voice — a multifaceted reality, incorporating multiple voices and viewpoints (Duncan, 2004; Mykhalovskiy, 1996; Tierney & Lincoln, 1997). Ellis, Adams, and Bochner (2011) argued that the method of “autoethnography is both process and product”, comprised of writing phases of ethnography and autobiography combined to create the final product.

The autoethnographic approach challenges conventional research methods by including the researcher as a subject and humanizing other research participants (Spry, 2001). The researcher becomes a significant part of the research in the way he or she interacts, represents, and relates to the research participants (Spry, 2001). Additionally, the autoethnographic research design recognizes “subjectivity, emotionality, and the researcher's [direct] influence on research”, instead of avoiding them (Ellis, Adams, & Bochner, 2011).

Autoethnography showcases the power of stories as a means by which sense-making and researcher reflexivity create meaningful descriptions and critiques of culture (Adams, Jones, & Ellis, 2015). Through composing a personal narrative within a cultural context, the storytelling portrays the struggles of people discovering “what to do, how to live”, and attaches meanings to overcoming adversity (Bochner & Ellis, 2006, p. 111). According to Bochner and Ellis (2006), autoethnography is an “ethical practice” that serves a “caregiving” role; the shared stories are essentially “gifts” that prompt motivation (p. 111). According to Adams, Jones, and Ellis (2015):

Through the use of personal experience, autoethnography offers insight into how a person makes sense of cultural norms, experiences, and practices. Autoethnographers offer complex, insider accounts of sense-making and show how/why particular experiences are challenging, important, and/or transformative. In turn, autoethnographers provide a perspective that others can use to make sense of similar experiences. (p. 27)

## **Employing Autoethnography**

Autoethnographic design is ideal for situations where specific cultural language and knowledge cannot be derived from literature due to insufficient research, but are possessed by specific members of a community (Duncan, 2004). Particularly, as stated by Duncan (2004), when only a few people have “the specialist language [and] cognitive awareness” in a specific field of study (p. 2), autoethnography serves as the means to extract descriptive nuances of their practices. The advantage provided by Duncan (2004) for using autoethnography directly applies to this research, where knowledge of practical applications of sustainable design is utilized by design professionals in the United States.

This researcher relates to both the Kuwaiti culture and the sustainable design culture. In the first component of this research, my “involvement and intimacy” with the human subjects is deeply personal (Hayano, 1979, p. 99), as I consider myself a “native” member of the Kuwaiti culture (Martin, 1974 as cited in Hayano, 1979, p. 100). Since I was born and raised in Kuwait, the culture’s norms, beliefs, practices, and values towards consumerism and the environment have left an indelible imprint on my identity. In the second component, I interact with alumni and former faculty who possess content knowledge in sustainable design. My background in theoretical aspects of sustainability and practical knowledge in design, respectively, allow me to deeply engage with research participants from the sustainable design community. Thus, autoethnography is the appropriate approach to describe, reflect, and analyze experiences of individuals within a particular culture, who share “one or more” common identities (Hayano, 1979, p. 100). This research design aligns with my desire to learn and explore unique experiences of individuals who come from shared cultures. Essentially, the autoethnographic approach

enables the fusion of both cultures in order to bridge the gap between theory and practice of sustainable design.

My agenda for this research aligns with Kuwait University's obligation to develop a design for sustainability program. In the first component of this research, my intention is to illustrate the severity of the waste problem in Kuwait. The second component focuses on identifying a solution to address this issue. Ultimately, my personal objective in expanding the design field is to "close the loop" on solid waste materials, commercial packaging, and industrial products in the country (McDonough & Braungart, 2002, p. 57). Since the autoethnographic approach recognizes the researcher's own socio-political agendas (Adams & Jones, 2008), this paradigm aligns with the purpose of this research.

The autoethnographic approach provides the ideal platform from which both culture and the researcher can be studied and reflected upon. It serves to accomplish a greater level of depth through incorporating a range of perspectives and both qualitative and quantitative data. This approach allows for a subjective-objective fusion, starting with a bottom-up insider's approach while integrating a top-down outsider's approach through the application of behavioral theories. From an aesthetic standpoint, the narrative and the analysis are assigned to two separate chapters in order to distinguish elements of individual experiences from theoretical and subjective interpretations. This separation allows readers the opportunity to make their own reflections and interpretations.

Although this research focus is directed toward the struggles of municipal waste in Kuwait, my intention is to also provide general recommendations for developing practical sustainable design programs anywhere.

## **Types of Representation Forms**

Historically, in ethnographic research, John Van Maanen is considered the pioneer in offering researchers three representational forms for combining the researcher's voice alongside other cultural voices through, "Realist tales, impressionist tales, and confessional tales" (as cited in Adams, Jones, & Ellis, 2015, p. 83). Building from Van Mannen's contribution to the field, current viewpoints in autoethnographic research introduced four types of representation forms: Realism, impressionism, expressionism, and conceptualism (Adams, Jones, & Ellis, 2015). Autoethnographers can employ any of these writing forms for the final autoethnographic narrative — whether before or after finding "a logic or story line that connects the characters, experiences, fieldwork, interviews, and ideas" (Adams, Jones, & Ellis, 2015, p. 82).

Realism, as the first form of representation, allows the researcher to use personal voice as a means to provide "thick descriptions" (Geertz, 1973, p. 10) and understand culture as "fully, complexly, and evocatively as possible" (Adams, Jones, & Ellis, 2015, p. 83). The second form of representation is impressionism, which focuses on creating an overall evocative experience through language, rhythm, silence, and sensory experiences (Adams, Jones, & Ellis, 2015). The third form of representation, expressionism, primarily addresses the researcher's internal feelings and experiences, from a deep subjective perspective, to expose the vulnerability of the storyteller.

In both realism and impressionism, the focus of the data falls heavily on the ethnographic component of the autoethnography, whereas in expressionism the narrative focuses on the autobiographical component (Adams, Jones, & Ellis, 2015).

Conceptualism, as the fourth form of autoethnographic representation, introduces an

innovative way of writing that is highly reflexive, intellectual, philosophical, and often futuristic (Adams, Jones, & Ellis, 2015). A conceptualist storyteller uses universally understood, yet “unexpected ideas, perspectives, and experiences” aimed at engaging the reader in questioning assumptions and critical thinking (Adams, Jones, & Ellis, 2015, p. 86).

The composition of this research will employ realism as a form of representation. The rationale behind this choice is that much of the data pulls heavily from the research subjects, and treats them as primary sources of data for this study. Realism provides a narrative style that is ideal for addressing real-life problems and seeking real-life solutions, since it strives to comprehend culture as realistically as possible.

### **Narrative as a Method of Inquiry**

The autoethnographer writes personal stories and narratives as a method of inquiry and data collection. Through self-observation and reflexive investigation, this type of narrative explores dialogues, feelings, and emotions around contextual positions and events (Maréchal, 2010). Researching self and social life can be emotional and uncertain when maintaining dual roles as researcher and subject of research (Adams, Jones, & Ellis, 2015). Therefore, autoethnographers must be prepared for the messiness and chaos inherent in this research method (Adams, Jones, & Ellis, 2015). In constructing a personal story, narrative inquiry creates opposing tensions (Ellis & Ellingson, 2008). Autoethnography plays a dual role in that it allows the researcher to become the researched and invites the juxtaposition of the self with others while being aesthetically subjective and objectively analytic (Ellis & Ellingson, 2008, pp. 450–459; Reed-Danahay, 1997, p. 2).

**Content and form.** Analytically, autoethnography “[focuses] on developing theoretical explanations of broader social phenomena”, while, aesthetically, it “[opens] up conversations and [evokes] emotional responses” (Ellis & Ellingson, 2008, p. 445). A researcher using autoethnography as the method of inquiry develops skills in integrating both content and form (Ellis, 2004, p. xix; Richardson, 2000, p. 923). Combining the analytic with the aesthetic offers an opportunity for presenting different worldviews and promotes understanding and social change.

**Writing process.** Ellis (2004) advocated that autoethnographers support “the conventions of literary writing and expression” (p. xix); hence, the primary data sources include observations, memories, and interviews. As for secondary data, literature from social sciences, humanities, and historical background of the culture, formulate layers of factual descriptions and theoretical grounds for analysis. As connections are drawn, personal experiences and literature are interwoven into multiple voices within the narrative.

Richardson and St. Pierre (2005) argued, “The more different voices are honored within [qualitative research], the stronger — and more interesting — that community will be” (p. 959). As various data are compiled, examined, and analyzed, the characters engage in real and critical dialogues about a specific phenomenon of struggle (Adams, Jones, & Ellis, 2015). This character engagement features “concrete action, emotion, embodiment, self-consciousness, and introspection portrayed in dialogue, scenes, characterization, and plot [lines]” (Ellis, 2004, p. xix). The narrative writing process is nonlinear. Sparkes (1996) argued, “[Stories] circle round and round, where endings are

multiple and often unfinished” (p. 483) as the researcher subjectively plans beginnings and endings to fit an agenda.

**Product implications.** Autoethnographers experience a self-identity transformation in assigning meaning to their cultural identities through the writing process (Boyd, 2008; Sykes, 2014). They insert themselves into an inquiry reflexively, critiquing their place within a particular society to uncover underlying relationships, power positions, cultural taboos, and unconscious experiences (Adams, Jones, & Ellis, 2015). This personalized perspective explores a phenomenon from the inside. As Adams, Jones, and Ellis (2015) explained, the combining of personal experience with existing theory provides an understanding of self and contributes to the understanding of social life. A self-reflexive analysis of the researcher’s position within socio-historical contexts invites readers to reflect upon their own life experiences, their constructions of self, and their interactions with others (Bochner & Ellis, 1996; Goodall, 1998; Spry, 2001).

### **Goals of Autoethnography**

Ongoing debate surrounds specific criteria for critiquing the quality and components of an autoethnography. The first substantive goal of autoethnography, according to the literature, is to make a contribution to the understanding of social life (Bochner, 2000; Adams, Jones, & Ellis, 2015; Richardson, 2000). Second, researchers agree that aesthetic merit is important in the crafting of a story, demonstrating a satisfyingly complex narrative structure that is artistically shaped, emotionally provoking, and engaging (Bochner, 2000; Adams, Jones, & Ellis, 2015; Richardson & St. Pierre, 2005). Bochner (2000) adds that the complexity of structure in framing the narrative contributes to aesthetic quality. Narrative as an art form creates an aesthetic that makes

the information conveyed pleasing to consume. The final aesthetic structure often includes an identifiable beginning, middle, and end with coherent plot lines and dramatization. Reflexivity, personal vulnerability, and honesty constitute a third goal of autoethnography, which highlights the researcher's dual role of both producer and product of the narrative (Bochner, 2000; Adams, Jones, & Ellis, 2015; Richardson, 2000). The fourth goal is the inclusion of detailed sensory evidence of embodied lived experiences (Bochner, 2000; Richardson, 2000). The final goal is for the narrative to have an impact on both the researcher and the reader — intellectually and emotionally — and produce new questions or motivations for actions (Bochner, 2000; Richardson, 2000).

## CHAPTER FOUR: METHOD

The autoethnography was composed using narrative as a method of inquiry to collect qualitative data. This autoethnographic research was conducted by selecting the sample, collecting primary qualitative data, incorporating additional quantitative data, employing an autoethnographic form of representation (realism), finding a narrative plot by extracting specific data, writing the final narrative, then coding and analyzing to complete the final autoethnographic piece. This exploratory research will seek to answer: (1) how the interest of sustainability and environmental practices came to exist within my personal sphere of knowledge and among Kuwaiti officials; (2) how the values related to environmental responsibility can be instilled through education and transformed on a cultural level to create motivation for action; (3) how theories of sustainability are synthesized into practical application in an educational setting in the U.S.; and (4) how former alumni and I perceive the practicality and applicability of the program as it translates to their localized contexts.

The purpose of exploring the first question is to illustrate the magnitude of overconsumption and Kuwait's solid waste problem and to address the need for a positive social change. Through the second question, I aim to generalize individualistic (personal, familial, and cultural) learning experiences in Kuwait into a micro setting, such as a school environment. As for the third and fourth questions, I explore learning outcomes of alumni and pedagogical methods regarding practical skills of sustainable design and their applicability to localized contexts.

The composition of this work included various phases of development. I conducted interviews to incorporate other people's voices, peer reviews to solicit

objective feedback, and gathered factual and historical background information to provide in-depth context. The entire process consisted of self reflection, assessment, filling in the gaps, and integration of theory. During the coding process, I discovered a sequence of attitudinal and behavioral changes; I then theoretically analyzed them through the exploration of social learning theory, situational awareness theory, the two-stage model of value transmission and development (Herman, 2005), in part, the transtheoretical model (Prochaska, Johnson, & Lee, 1998), rational choice theory, collectivism theory, systems theory, the viable systems model (Mele, Pels, & Polese, 2010), and diffusion of innovation theory.

## **Research Sample**

### **Kuwaiti Culture**

**Culture selection.** There are many countries undergoing environmental crisis and problems of solid waste disposal. However, Kuwait was chosen as a representative culture of such circumstances. Since I was born and raised in Kuwait, I witnessed negative environmental impacts, accumulation of waste, and pollutants due to indifferent attitudes and behaviors of people living in Kuwait. As a result of my personal involvement and cultural understanding of the country, Kuwait was selected as the ideal culture for this research.

**Research informants.** The characters and voices that provided the content basis for this autoethnography came from a wide variety of sources. Those sources included interview participants, survey respondents, excerpts of professionals in sustainability from relevant periodicals, blog comments from people with opinions about the situation in Kuwait, and anecdotal information from different subjects. In order to gather

background information required for this autoethnography, I interviewed my maternal grandmother, father, mother, aunt, and two cousins.

Survey responses used in this research were selected from my previously conducted survey on environmental awareness in Kuwait (Almudhaf, 2015). From a large pool of anonymous survey respondents living in Kuwait, I subjectively selected six respondents based on the relevance of their comments to the narrative's topic. Quotations from consultants, entrepreneurs, and educators in sustainability were also cited from relevant periodicals. Additionally, I extracted two comments from a blog post that discussed recycling in Kuwait; this culture-focused blog frequently posts about the country's environmental issues. I also relied on personal anecdotal information from different subjects such as family, friends, colleagues, government officials, Kuwaiti citizens, non-immigrants, immigrants, illegal residents, and intergovernmental organizations.

**Documentation.** The pool of reviewed sources for the autoethnography included: International and local periodicals, intergovernmental organizations' (IGO) databases, local and global databases, reports and academic articles, and profiles of large corporations and small businesses. Additionally, I conducted a historical review of the past half-century in Kuwait focusing on educational, economic, political, cultural, geographic and environmental trends. These reliable data sources displayed on Table 1 helped provide context, background and objective factual data to support both the research and the final autoethnographic narrative. These sources focused mainly on Kuwait but also covered other countries such as Switzerland and America.

Table 1  
*Pool of Reviewed Sources for the Autoethnography*

Source Title	<u>Local / International News</u>	<u>Report / Academic Article</u>	<u>Local / Global Database</u>	<u>Intergovernmental Organization Database (IGO)</u>	<u>Historical Review</u>	<u>Company Profile</u>
Beatona Kuwaiti Periodical	•		•		•	
BioEnergy Consultancy International Organization	•	•	•			
EcoMENA Middle Eastern Resource	•	•	•		•	
EnviroGorge Magazine	•		•			
Environmental Expert Global Resource	•	•	•			•
Green Prophet Middle Eastern Newsletter	•		•		•	
Green Target Recycling Company						•
Index Mundi Country Facts			•		•	
Khaleejesque Culture Magazine	•		•			
Kuwait Central Statistical Bureau			•			

<u>Source Title</u>	<u>Local / International News</u>	<u>Report / Academic Article</u>	<u>Local / Global Database</u>	<u>Intergovernmental Organization Database (IGO)</u>	<u>Historical Review</u>	<u>Company Profile</u>
Kuwait Environmental Protection Agency	•	•				
Kuwait Green Line Non-profit Organization	•	•	•			
Kuwait Journal of Science		•			•	
Kuwait Ministry of Education	•	•				
Kuwait Paper Dump						•
Kuwait University Online Library		•	•		•	
Metal Recycling Company						•
Statista Global Resource			•			
Tanzifco Municipal Waste Management						•
U.S. Central Intelligence Agency (CIA)			•			
U.S. Environmental Protection Agency		•	•			•
U.S. Organisation for Economic Cooperation and Development	•	•	•			
United Nations Statistics Division	•	•		•	•	
World Bank	•	•		•	•	
World Economic Forum Swiss Non-profit Organization		•	•			
World Factbook		•	•			

## **Sustainable Design Culture**

**Program selection.** Investigation of two reliable database sources revealed a wide variety of sustainability fields around the world: Over 300 programs from the Sustainability: Science, Practice, & Policy (SSPP) e-Journal and 469 programs from the Association for the Advancement of Sustainability in Higher Education (AASHE) (Cohen, 2011; AASHE, 2012). While there are many general design programs in the United States, SSPP and AASHE identified only eleven master's level sustainability-focused design programs within seven academic institutions.

I screened these programs according to the specialties of packaging design, graphic/print design, industrial/product design, and interior design. However, two of those programs offer a multidisciplinary design program that admits students from all creative/design fields. Each school's website was examined to ensure the information was current about each of the programs. Doctoral programs in sustainability studies were excluded from the sample size, as they were only general sustainability science and not design-focused. Therefore, this research focuses on one program from the sample of currently operational sustainable design master's programs, as identified in Table 2.

Table 2

*Master's Programs in Sustainability-focused Design in the U.S. in 2015*

<u>State</u>	<u>School</u>	<u>Degree</u>	<u>Tracks</u>
MA	Boston Architectural College (Online)	Masters	Interior Design
MA	Boston Architectural College (Online)	Masters	Graphic Design
PA	Carnegie Mellon University	Masters	Multidisciplinary
NY	Fashion Institute of Technology	Masters	Interior Environments
KS	Kansas State University	Masters	Interior Architecture
MN	Minneapolis College of Art Design (Online)	Masters	Graphic Design
MN	Minneapolis College of Art Design (Online)	Masters	Product Design
MN	Minneapolis College of Art Design (Online)	Masters	Packaging Design
PA	Philadelphia University	Masters	Interior Design
PA	Philadelphia University	Masters	Industrial Design
GA	Savannah College of Art and Design	Masters	Multidisciplinary

I initially selected an academic program from Table 2 to conduct my research. My selection was based on three considerations. I have selected this school on the basis of my previous relationship there. In addition, I have formerly conducted research on the school's program that was intended to provide groundwork for this research. The cultivated relationship with the selected school would allow greater accessibility to data sets. After six weeks of correspondence, I was granted permission to collaborate with the academic institution; however two weeks later, they expressed their unwillingness to collaborate with me on said research.

This situation led me to select an alternative academic institution from Table 2. The academic institution in this research was chosen for two reasons. The first rationale for my program selection was its focus in the areas of graphics, packaging, and product design. The second reason was based on the program's relevance to my research agenda. Due to time constraints, I chose to pursue individuals previously involved with the selected academic institution (alumni) in order to avoid misdirected research time. Thus, obtaining the institution's formal permission was ethically unnecessary. Although I considered researching the practical learning outcomes of multiple programs, I decided to focus on one program in order to cross-reference different program contents and pedagogical perspectives (implications) with other sustainable design programs in future research.

**Research participants.** The research sample included alumni as full members of the sustainable design cultural group under study. The academic institution's non-involvement resulted in a smaller sample size since I independently compiled the contact list. Fourteen alumni and two former faculty were invited via e-mail to participate in a recorded telephone interview. This e-mail included a cover letter addressing a detailed "lay summary" of the study and a consent form (Adams, Jones, & Ellis, 2015, p. 49). When participants signed the written consent forms, a telephone interview was scheduled. In order to protect the anonymity of participants' identities, interviewees were assigned pseudonyms. Due to time constraints, subjects who expressed early interest in participating were interviewed. Considering the nonrandom method of participation, two alumni agreed to partake in this research. Those who agreed to participate were not representative of the whole population due to "nonprobability sampling" (Trochim,

2000). Nonetheless, the data collected from alumni sufficiently addressed the research questions.

**Program documentation.** Publicly accessible documentation sources included the program curriculum, course descriptions, and the academic institution's website materials, such as faculty biographies and alumni portfolios. These supplementary data sources allowed me to familiarize myself with the program. My understanding of the sustainable design program provided context for the participants' responses.

**Reflexive field notes.** My initial review of the information gathered from website materials provided sufficient background information about the program. Additionally, listening to and engaging with participants' interview responses allowed me to gain insight on specialized language and practical knowledge used by the culture under study. The reflexive field notes on both programs' website materials and interviews provided supplementary data for this research and offered relevant context regarding the sustainable design culture.

## **Data Collection**

### **Kuwaiti Culture**

**Protecting human subjects.** The human subjects for the first component of this research consisted of immediate family members and extended relatives: Mother, father, maternal grandmother, aunt, and two cousins. Verbal informed consents were obtained informally during telephone interviews to audio-record and publish identified excerpts. Participants were given the choice to refuse to answer any question that might make them feel uncomfortable. Due to the realism representation used in this autoethnographic research, I decided that presenting identifiable subjects, my immediate family members,

would strengthen the narrative. However, extended relatives' identities were kept anonymous. This research poses very minimal risk to the human subjects, based on the Institutional Review Board (IRB) at the University of Minnesota. At the completion of this research, all data files obtained from the interviews were destroyed.

**Incorporating other voices.** In an effort to complement the subjective human dimension of the narrative, interviews were conducted and various online written responses were gathered. Multiple telephone interviews with family members were conducted over the course of one month. Semi-structured interviews addressed questions from my fellow researchers and me, and evoked personal stories concerning resource conservation, over consumption, consumerism, and environmental awareness.

I created and shared a timeline of historical events with interviewees in order to get them to reflect and expand upon said events. The input gathered from family interviews helped expand the range of voices contributing to the narrative. Additionally, to complement the existing narrative, a subjective selection of other people's voices from outside of my family circle was incorporated. These voices were derived primarily from my own previously conducted survey (Almudhaf, 2015), and second-hand data collected from periodicals and online blog comments (Mark, 2011). The new data were arranged and intertwined with the narrative arches.

**Documentation.** In an effort to provide more context and background for the narrative, multiple layers of the Kuwaiti culture were combined in a historical review, including demographic information, political and economic conditions, and society's relationship with the environment. After compiling this information, a timeline was developed of major historical events in Kuwait ranging from the early twentieth century

to the early twenty-first century. These multiple layers were interwoven with my own accounts and arranged chronologically.

**Field notes.** My descriptive and reflexive field notes cited a collection of personal stories, memories, thoughts, feelings, life history, and knowledge acquisition in regard to environmental conservation, consumerism, and sustainable practices. They consisted of vivid sensory data, including explicit descriptions of private and public moments, events, places, characters, experiences, and dialogues that occurred in my life from my own perspective. I shared my field notes with my peers to help establish greater depth and further self-reflection. The writing evolved organically and the unorganized notes were recorded in a raw journalistic manner. While writing my field notes, I relied on narrative as a method of inquiry. These notes served as my primary source of data for constructing my narrative about the Kuwaiti culture.

### **Sustainable Design Culture**

**Protecting human subjects.** The human subjects for the second component of this research consisted of graduate program alumni. In order to protect anonymity, interview participants were assigned pseudonyms. The total sample was invited via email to participate in telephone interviews, which included a cover letter explaining: (1) The researcher's identity and background; (2) the purpose of the study; (3) the reasons for selecting the study sample; (4) the duration of the study; (5) the researcher's ultimate utilization of the findings; (6) the confidentiality and protection of human subjects; and (7) the voluntary nature of participation in the study (Adams, Jones, & Ellis, 2015). Before the commencement of this project, formal approval was obtained from the Institutional Review Board (IRB) at the University of Minnesota to ensure that human

subjects would be sufficiently protected (Adams, Jones, & Ellis, 2015). This research poses very minimal risk to the human subjects, based on the IRB at the University of Minnesota. At the completion of this research, all data files obtained from the graduate program were destroyed. The final research product does not identify the program nor the participants to protect the identities of all participating subjects.

**Interviews.** The primary interview method that I utilized was semi-structured in form. By utilizing semi-structured interviews, I created a space in which I could direct, rather than dictate, the course of the interview while also allowing the participants a degree of flexibility. Specific questions were carefully worded in a non-biased, non-threatening manner to allow the interviewees the opportunity to provide unforeseen insights. This method allowed for an overlap of autoethnographic interview types, including oral histories, personal narratives, and topical interviews (Adams, Jones, & Ellis, 2015, p. 54).

The content of these interviews consisted of past experiences, personal reflections, and commentary on a variety of specific subjects (Adams, Jones, & Ellis, 2015). Each interview lasted between 30 to 40 minutes and was audio-recorded. Both participants agreed to participate in follow-up interviews of similar length. As the interviews were semi-structured, I maintained my engagement and took notes in order to mitigate the fluidness of the dialogue between the participant and myself. Each de-identified audio-recorded interview was transcribed verbatim by a third party transcription service. Incentives were offered to each interviewee in the form of e-gift cards and were made available within a day of completion. The transcriptions were organized and compiled in digital formats on a secure University of Minnesota cloud

drive. Each transcription and audio-recording was filed according to the participant's pseudonyms and role for efficient retrieval. All interview files obtained were destroyed after the the research was completed.

**Program documentation.** Specific data from public documentation sources from the graduate program, previously identified in the sample section, were stored in digital formats. Relevant data from the available sources were compiled and organized based on practical sustainability skills and adaptability to localized contexts. This data compilation stage streamlined the data coding phase.

**Reflexive field notes.** Data contained within my field notes were collected from reviewing and reflecting on documentation sources from the graduate program under study. My notes also provided descriptions of interview content, including: word choices, hesitations, silences, tones, and emphasis (Adams, Jones, & Ellis, 2015). I retell stories, conversations, and interactions from my perspective through “listening, telling, and retelling” (Adams, Jones, & Ellis, 2015). After gathering information from the above mentioned sources, I journaled personal field notes including wonderings, feelings, questions, insights, perceptions, and reflections related to the program's sustainable design solutions. All my field notes were stored and organized in digital formats.

## **Writing Process**

### **Kuwaiti Culture**

**Initial screening of data.** After compiling my descriptive and reflexive field notes, I reviewed them for compelling narrative arches, utilizing most of the data from the field notes as the primary source. Supplementary data sources included interviews, survey responses, excerpts from periodicals, blog comments, and factual documentation

(as displayed in Table 1). Data from interviews, surveys, periodicals, and blogs were used to expand the number of voices in the autoethnography. Factual data were used to infuse the narrative with objective, contextual background information. After reviewing the above mentioned data, I selected portions that would expand and answer my first research question.

**Initial writing.** The project was initially conceived to be an autobiography. I constructed a narrative from my field notes, the primary data source, to explore the first research question of how the interest of sustainability and environmental practices came to exist within my personal sphere of knowledge and among Kuwaiti officials. I started the writing process by finding my own narrative and plot lines from the field notes. The data were arranged chronologically and edited. Thus, the narrative developed a beginning, middle, and end.

**Peer review.** The autoethnography was created through an interactive process in order to fill the gaps within the narrative. A roundtable discussion was organized for the purpose of collecting feedback and constructing a roadmap for the autoethnography. The twenty-minute roundtable discussion included five people. The session began with the introduction of the autobiography as an autoethnography to my peers and by expressing a desire for uninhibited discussion and critique. I read the narrative aloud before leaving the room. In my absence, a tape recorder was left to document the peer review session, which was then transcribed. The peer review yielded valuable insights with respect to the components and criteria for autoethnography, background and cultural context of the narrative, researcher and subject positionality, and aesthetic writing choices for narrator

and subjects' voices. The reviews were considered and led to further refinement of the research questions and reconstruction of the narrative.

**Interweaving of context.** In an effort to provide more context and background for the narrative, a historical review of Kuwaiti culture was conducted with reference mainly to demographic information, political and economic conditions, and society's relationship with the environment. After compiling this information, I developed a timeline ranging from the early twentieth century to the early twenty-first century that incorporated major global events, Kuwaiti historical events, and my family members' significant life events. The multi-layered data were then interwoven cohesively within my own accounts and were arranged chronologically.

### **Sustainable Design Culture**

**Initial screening of data.** The narrative writing process incorporates subjective screening of data to fit the researcher's agenda (Sparkes, 1996). In addition, I selected data from all the collected materials to answer the third and fourth research questions of this treatise. Data relevant to practical knowledge, skill sets, and applicability to localized contexts were selected. After screening the program documentation, reflexive field notes, and interviews, I searched for an engaging narrative to compose a story line comprised of elements encompassing beginnings, plot lines, and endings.

**Initial writing.** The autoethnographic narrative process is nonlinear, ever-changing, and dynamic. Given this fact, I approached this research with open expectations in order to prepare for the messiness and chaos inherent in this research method (Adams, Jones, & Ellis, 2015). Initial data selections changed and continued to take shape as the narrative evolved. Additional data selections were fit to function.

The final product of this autoethnographic research is composed of both the narrative and theoretical analysis. I showcase the writing process and theoretical analysis with equal emphasis (as cited in Ellis, Adams, & Bochner, 2011; Ronai, 1996). The analysis reflects the acquisition of new knowledge and insight, and is presented in a manner that makes the data relevant to both readers familiar with the topic and those engaging with it for the first time (Ellis, Adams, & Bochner, 2011; Manning & Adams, 2015). The final narrative invites readers to encounter “emergent experiences” as they occurred to the researcher (as cited in Ellis, Adams, & Bochner, 2011, p. 6; Ronai, 1992), thereby forging a deep and meaningful connection between the readers and the research process (Ellis, Adams, & Bochner, 2011; Manning & Adams, 2015).

**Interweaving of context.** The selected primary and supplementary data were synthesized to produce a cohesive autoethnography. Interview responses from alumni were used as the primary source to expand on the subject matter addressed in the first component of the autoethnography. My own voice, perspectives, and opinions were supplied by my subjective field notes. Program documentation data were integrated into the narrative, providing contextual background information. All selected data were interwoven and integrated into a single narrative. Additional data were drawn from interviews with family members to provide relevant information for comparison between Kuwait and the United States.

## Data Analysis

### Kuwaiti Culture

**Data coding.** I scrutinized the written autoethnography manually, searching for common words which were distinguished through a process of word-by-word coding (Charmaz, 2014, p. 124). Words relevant to the topic which address the question of “what?” such as “waste”, “conservation”, and “natural resources” were not accounted for in the coding process. Rather, words related to the first research question of “how” environmental sustainability became of personal and cultural interest were identified, including those such as “habit,” “behavior,” “conscious/unconscious,” “awareness/unawareness,” “attitude,” and “action.” The “word-by-word” coding method has been used in qualitative research to isolate words from their original context to control for preconceptions and prevent premature analysis (Charmaz, 2014, p. 124). The narrative was then coded by “segments” (Charmaz, 2014, p. 124), which refers to the process of identifying the contexts behind the coded words in which they were found throughout the composition. These segments often represented significant subjective events and experiences such as interactions with family and coworkers, as well as intergenerational transmissions of culture.

**Themes and theoretical analysis.** Patterns discovered in the coding process allowed for themes to emerge from the data, specifically, attitudinal and behavioral changes. Examining the process of how my own interest in sustainability developed illustrated the major role of human interactions and the emergence of critical thinking. The lived personal experiences were examined using social learning theory and situational awareness theory. As more individual, familial, and cultural behaviors were

observed within the narrative, additional theoretical models were needed to explain attitudinal and behavioral changes, specifically, the two-stage model of value transmission and development (Herman, 2005) and in part by the transtheoretical model (Prochaska, Johnson, & Lee, 1998). Analyzing the evolution of my habits, values, and behaviors throughout the narrative prompted me to consider a second question. This second question addressed how values related to environmental responsibility can be instilled through education and transformed on a cultural level to create motivation for action. This analytic process revealed an unexpected opportunity for investigation, which the first research question did not address.

### **Sustainable Design Culture**

**Data coding.** The coding process of this section is similar to the Kuwaiti Culture section previously discussed. The coding process utilized a grounded theory approach of “word-by-word coding” and “coding by segments” (Charmaz, 2014, p. 124). Words relevant to practicality and applicability to the local context were coded to answer the third and fourth research questions. Relevant words such as “skills,” “practices,” “exercises,” “applied theories,” “attitudes,” and “actions” were coded. I initially coded words to isolate them from their original contexts to control for my preconceptions and prevent premature analysis (Charmaz, 2014, p. 124). A secondary coding incorporated “coding by segments” to reveal the contexts behind the previously coded words and allow for themes to emerge (Charmaz, 2014, p. 124). These segments often represented significant events and experiences such as interactions with professors and classmates, as well as communications with community members. Changes in research direction were embraced after the coding exposed unanticipated themes.

**Themes and theoretical analysis.** After coding the interviews, program documentation, and reflexive field notes, I organized the findings into specific themes: collectivism and motivation for action, the viability of systems, and the spread of new ideas. To help explain the emergent themes, I theoretically analyzed the findings using a bottom-up, top-down approach (Ellis, 2004; Adams, Jones, & Ellis, 2015) through the exploration of rational choice theory, collectivism theory, systems theory, the viable systems model (Mele, Pels, & Polese, 2010), and diffusion of innovation theory.

## CHAPTER FIVE: AUTOETHNOGRAPHY

Walking the streets of Kuwait City with its skyscrapers, shiny glass, and beautiful architecture, one would see a rapidly developing country, knowing a wealth of oil underneath was making it all possible. Yet, headlines from environmental organizations, such as World Wide Fund for Nature (WWF), Global Footprint Network, United Nations Development Programme (UNDP), EcoMENA, and the *Green Prophet Newsletter*, all highlighted the mounting problem of waste in the Middle East, with Kuwait ranked first in per capita ecological footprint amongst nations worldwide with populations greater than one million (Kloosterman, 2014; McLellan, Iyengar, Jeffries, & Oerlemans, 2014; Zafar, 2016). Taking measures to preserve the environment did not reach the governmental level until Kuwait was ranked one of the highest per capita waste generators in the world (Kloosterman, 2014; McLellan, Iyengar, Jeffries, & Oerlemans, 2014; Zafar, 2016).

“Reduce, reuse, recycle” is a foreign concept to the majority of people living in Kuwait. In response to a first-hand survey, one citizen agreed that it is a “completely non-existent” mindset (Almudhaf, 2015, p. 246). As evidence, billowing black smoke from seven million tires burning in the desert of Irhayyah near Al-Jahra City in 2012 was viewed from satellites in space (See Figure 1) (Aburawa, 2012). Recent studies indicate that Kuwait generates more than two million tons of waste per year (Aburawa, 2012; Alsabih, 2014). Closed landfills have been leaching methane gases and contaminating groundwater, spreading stench and disease to people living in areas near landfills. Overfilled dumpsters in avenues behind beautiful buildings hide a rubbish problem. Garbage floats on the gulf shore and a blanket of trash stretches into the distance as far as

the eye can see, covering beautiful parks. All these vivid scenes are supporting evidence of the four thousand tons per day of household waste accumulating at exponential rates (Alsabih, 2014).

In a young country that only gained nation status in 1961, where today the average yearly per-capita income is \$89,000 tax-free (UNDP, 2016), consumer goods are plentiful with little infrastructure to manage the waste that affluence produces. The nationals were only a third of the total population of 3.9 million in 2014, with immigrants accounting for almost 69 percent, in addition to 93,000 illegal residents (United States Central Intelligence Agency [CIA], 2014 as cited in Index Mundi, 2015). In other words, the majority of people residing in Kuwait are foreigners, riding the wave of tax-free living. After Kuwait became an exporter of oil in 1951, oil revenues funded a *Public-work Programme* that began to attract foreign workers from East Asia and the Arab region (Stokes & Gorman, 2010).

In the 1970s, foreign workers more than doubled in various occupations (Worldmark Encyclopedia of Nations, 2007). Those jobs included municipal laborers, street sweepers, janitors, and household workers such as maids, drivers, cooks, and gardeners (Tanzifco, 2014). There is not a single Kuwaiti street sweeper in the country. This position is limited to foreigners; at least one foreign street sweeper is spotted on every road, street, avenue, corner, sidewalk, and traffic light trying to outrace the piles of litter to keep Kuwait clean.

The environmental situation in Kuwait was not always so dire. According to my maternal grandmother, who was born and raised during the pre-oil times, when Kuwait City and its population were small, household waste was significantly less (S. Alsayegh,

personal communication, February 9, 2012). Products were sold in bulk, with consumers providing their own refillable containers at the store (S. Alsayegh, personal communication, February 9, 2012). Animal waste and crafting waste were all reused at that time (S. Alsayegh, personal communication, February 9, 2012). Any city waste was carried out by animals into the desert and dumped away from the city (S. Alsayegh, personal communication, February 9, 2012). This was the Kuwait — known then as Al Kout — that shaped the values of my elders.

As a Kuwaiti national growing up, the habits of my elders were ingrained in me. First, my maternal grandmother passed along her learned conservation values and practices from the pre-oil Kuwaiti culture. In many ways, she was like a second mother to me. My grandmother, Sarah, was born in 1940, which was the lowest economic point of poverty in Kuwait history (Al-Jassar, 2009). Resources were scarce because trade, the major economic industry, was affected by a Kuwaiti-Saudi economic blockade, which started in 1921 and lasted fifteen years (Al-Jassar, 2009, p. 80). My grandmother's practice of utilizing resources to maximum utility was deeply ingrained by necessity, as she was raised during a time of poverty (S. Alsayegh, personal communication, February 9, 2012). As an artisan and tailor, she demonstrated her ingenuity by sewing dolls for neighborhood children from even the smallest scraps of fabric (S. Alsayegh, personal communication, February 9, 2012). My grandmother, a humanist, not only raised her family as such, but she was also well-known in the community for her civic involvement, particularly serving the community during the Iraqi invasion in 1990.

On the other side of the family, my paternal grandfather Mohammad was a sea captain making a living by trade during a time when pearl divers, sea vessels, and import-export was the commerce that established an economy under the protection of the British (W. Almudhaf, personal communication, April 30, 2016). My father Wael, who also lived during the economic downturn, learned conservation practices and transmitted them to his children through daily interactions: “Finish your plate”; “Did you turn off the lights in your room?”; “Don’t be running the water while you do that.” It disturbs my father when people use running water and a hose to wash a car when all that is needed is a bucket of water. My father told me, “During the Iraq invasion, when water was cut off for a time, we young men volunteered to drive water trucks every day to get water to the people” (W. Almudhaf, personal communication, April 30, 2016).

The electricity was cut for a time just before the liberation as the oil wells were burning (W. Almudhaf, personal communication, April 30, 2016). My father told me, “Every man and woman volunteered out of responsibility with firefighters from other countries including the U.S. and U.K.” (W. Almudhaf, personal communication, April 30, 2016). As a product of his history, my father never took for granted our resources, the need to take care of what we have, and the need to not be wasteful (W. Almudhaf, personal communication, April 30, 2016).

Modeling a self-sustaining household for his children, my father immersed himself in gardening. He has always been a supporter of local products and foods, growing fruits and vegetables abundantly in our backyard. We rarely purchased fresh produce, but when necessary, we purchased from local farmers’ greenhouses. As I grew up, our meats of chicken, duck, and lamb were raised in our backyard and milk came

from a neighbor's cow until governmental laws banned raising farm animals in cities. In Kuwait, growing one's own organics is a time-intensive undertaking since the climate is characterized by long hot, dry summers and short warm, sometimes rainy, winters (Kuwait Central Statistical Bureau, 2016). Our self-sustaining household required little public assistance or national economic consumerism.

To this day, my grandmother and father maintain an entire storage room allocated for reusable packaging materials, and they have passed along this practice to me. As a result, I view packaging quite differently than most people I know, especially now, knowing that 45 percent of industrial solid waste in Kuwait is packaging (Alhumoud & Al-Kandari, 2008). Since packaging is a mass produced byproduct with a short lifespan, consumers often dispose of it negligently.

Another major influence on my attitudes about utilizing resources was my mother Ahlam. When my mother cooked, she would hand me food packaging as she emptied the contents for me to lick clean. Leftovers of rice in the strainer, sauce in the pan, and even the very last drop of milk was consumed. After the Iraqi invasion in 1991, when I was about seven years old, I recall a crucial moment of understanding my family's attitudes about food. My mother handed me a yogurt container, and casually I asked, "Can I just throw it? I'm feeling lazy." Looking very seriously into my eyes, she said, "Some people in the world wish they had this very last drop" (A. Almuhausen, personal communication, 1992). This incident made me conscious of one major purpose of my family's practices: We do not waste.

The practices of resource conservation that I learned in my internal home environment contrasted with my external societal environment. After all, I was born in 1985, at a time of rapid growth, practically non-existent unemployment, and a completely free education. A time of plenty, yet my instilled values were like that of my elders who were brought up in times of scarcity. I saw my friends litter on the street and say, “Someone will pick it up.” I walked by gutters full of litter and wondered how others could be so wasteful. One survey respondent echoed my thoughts:

Our society needs more awareness because many of us tolerate the environmental issues. The thing that disturbs me most is the drivers who throw their trash from the car's window. It indicates carelessness and recklessness. (Almudhaf, 2015, p. 248)

As I grew, moving more into society outside my home, I carried my value of mindful consumption and conservation. In 2008, at age twenty-three, I volunteered as a secretary at Kuwait University, where I couldn't help but notice how much paper was wasted. While paper piled up in trash bins was a normal practice, I naturally became troubled. According to the Kuwait Central Statistical Bureau (2011), paper waste is 21 percent of all waste collected and deposited in landfills ranked as the second in quantities of waste in Kuwait (Al Qallaf, Al-Kandari, Yousef, Al Mutairi, & Fouzy, 2016).

At the University, I had an idea to reuse the paper and asked permission to do so. Specific paper that was confidential had to be shredded and go to landfills. However, I instituted the idea of reusing trash paper for creating notepads from the unused side. I designed a visual manual with instructions on how to create a personal notepad, shared it online with staff and students at the college. On a webpage I explained the purpose of the

project, believing that we could do something positive about the wasted paper. The project was received with enthusiasm and playfulness by the majority. However, while the concept of reusing paper was helpful, it only delayed the deposit in landfills. Thus another creative solution was needed.

From 2009 to 2011, while working as a graphic designer at Kuwait University, I participated in projects for repurposing paper waste. As we were transferring paper records in the archival storage room into digital documents, stacks of files four feet high surrounded us. I discovered a business called Newair, a division of a larger company that was recycling paper. The company collected paper waste, shredded the confidential documents, and shipped it to a recycling plant abroad. When we finished that year-long digital archive project, the company placed recycling bins in all copyrooms. Recycling had finally arrived at Kuwait University.

Travel to other countries with my family has further contributed to my evolving interest in sustainable practices. In 2010, on a vacation to Switzerland, I was astounded to learn there were no grocery bags available in stores. Every shopper was required to supply their own. Intrigued, I researched the nation of Switzerland and discovered they are one of the leading countries in sustainable practices (Sachs et al., 2016). The Swiss government requires the material separation of household waste, which is enforced with penalties for noncompliance (The Swiss Confederation, 2009). Not only are the Swiss recycling rates among the highest in the world, but non-recyclable waste is incinerated in clean processes to generate electricity and heat for the country (The Swiss Confederation, 2009; UN Statistics Division, 2011).

In 2000, Switzerland banned landfilling as a waste management option and all non-recyclable combustible waste was sent to one of the country's twenty-eight municipal solid waste incinerators (The Swiss Confederation, 2009). I realized that Switzerland is at the forefront of the sustainable waste management spectrum, shining as an example for developing countries. Those who are environmentally aware in Kuwait are ready to make behavioral changes:

I . . . hope for you to raise the awareness of reusing the grocery plastic bags more than once. It is a purposeful way to bring the same plastic bags back to the grocery store to carry groceries again instead of discarding, wasting, and polluting the environment. (Almudhaf, 2015, p. 246)

In 2011, I moved to the United States for graduate studies at Virginia Commonwealth University (VCU) and lived alone in a small apartment near campus. As I went to dispose of my trash the first time, I asked the management where the trash receptacles were located. Imagine my surprise to see recycling bins for different types of materials. I couldn't believe the infrastructure was easily available in my little apartment building. Already I had accumulated cleaned glass containers under my sink out of habit and quickly learned how to dispose of them in mindfully environmental ways. In school, I saw recycling bins clearly marked for materials all over campus. For me, this was a novel idea, but brilliantly simple. In fact, VCU was ranked among the top sixteen percent of North American colleges and universities and was the only university in Virginia to receive an *A* grade in recycling practices according to the *College Sustainability Report Card 2011* (Buckley, 2010). I was fortunate to be attending a university that was progressive in sustainable practices, which sparked my interest in sustainability practices.

About the time I was to make a decision about my thesis area of interest, I was inspired while reading about a banana. One of many fruits, the banana is a perfect example of sustainable packaging. The banana peel protects the fruit for an appropriate amount of time before it starts to decompose and return back to the soil as fertilizer, unlike hard plastic that can exist for up to a thousand years before decomposing, all the while destroying natural ecosystems. Nature is so innovative in handling waste as it operates in a cyclical process nourishing various living networks, species, and the soil (McDonough & Braungart, 2002). My conservationist attitudes combined with the concept of recycling had evolved to an understanding of sustainable practices. Sustainable practices harmonize the environment, economy, and society's immediate needs without compromising the ability to satisfy future needs (U.S. EPA, 2013). McLennan (2004) stated, sustainable designs "seek to maximize the quality of the built environment, while minimizing or eliminating negative impact to the natural environment" (McLennan, 2004, p. 4). As I learned about the field of sustainable design, I found it aligned with my personal values and research interests, which developed through my lived experiences growing up in Kuwait, a developing country, and through traveling abroad to developed countries such as Switzerland and the United States. I was intrigued to learn more about the history of waste management decision-making in Kuwait.

The environmental crisis in Kuwait began after oil was exported in 1951, when landfills were created and filled beyond capacity, becoming mountains of solid waste. With population growth and urban spread, housing came closer to the mountainous landfills (Aburawa, 2012), as was witnessed in the city of Al Qurain in 1989 (see Figure

2) (Jassim, 2010). For a decade, not only did the mountainous landfills assault the senses visually, aversive odors from toxic gas emissions became a public health hazard to surrounding communities. The intense air and land pollution caused various cancerous diseases (Alhajri, 2004); they also increased asthma, and caused skin, eye, and respiratory system irritations” (A. Almudhaf, personal communication, October 12, 2016).

Furthermore, due to the shallow depths of groundwater throughout the country, serious hazards and contamination emerged in groundwater near landfill sites (Aburawa, 2012; Zafar, 2016). In fact, Glenn Platt, a senior project manager for Kuwait Engineering Office International Consultants (KEOIC), cautioned that poorly “capped-off” landfills produce toxins that leech into groundwater, among other dangers (The Media Line, 2009). Clearly, the system in place was no longer serving the population; therefore, the government began to consider methods of reducing landfill problems and explore new waste management solutions.

In a country the size of New Jersey, with fourteen landfills closed for more than two decades and four still in use (Aburawa, 2012), Kuwaiti officials began consulting with local municipal waste experts to discover suitable options for Al Qurain City. Feeling public pressure, the government acted quickly by moving and burying overflowing landfill waste, which unfortunately contained decomposing-resistant plastic. Underground pipes were installed for toxic gases to exit the ground for burn-off, reducing aversive smells (Alsarawi, 2004). Kuwaiti officials built playgrounds, parks, and other aesthetically appealing landscapes to cover these landfills (Alsarawi, 2004), temporarily solving the complaint problem.

This narrative brings us to the current year. Today, the Kuwaiti government, partnering with the UN Sustainability Platform, is instituting a major incineration project with the latest technology (Partnerships Technical Bureau of Kuwait [PTB], 2015). The partnership claims that the payoff will be twofold: Levels of pollution would be greatly reduced and energy could be generated from the incineration process (PTB, 2015). This would respond to Kuwait's crisis of meeting electricity demands since 2007, especially during the summer season (Jacob, 2016). In spite of these efforts, incinerators contribute to the depletion of natural resources since they support a linear reconfiguration of resources rather than a cyclical and sustainable one. Without plans to recycle material resources before incineration, the country risks the loss of valuable material assets, which could otherwise benefit the economy. One survey respondent shared this sentiment:

We have to care about the recycling and reusing our waste whether [it's] the government [or] private business. The amount of waste is worth billions and the amount of waste we have is tremendous. We should benefit from [our] waste because it is a strong source of income for the country. (Almudhaf, 2015, p. 248)

While the incineration plant helps reduce waste placed in the ground temporarily, it may not be the best long term sustainable solution. The time has come for environmental responsibility and actions. One Kuwaiti resident echoed similar frustrations, "The environment situation in Kuwait is a disaster. If nothing changed now, the next generations will live in pollution and disease" (Almudhaf, 2015, p. 248). The band-aid solutions of burying and burning waste only delay addressing the overall problem of an antiquated system of waste management.

Private businesses in Kuwait have taken small steps in moving from short to long-term sustainable waste management practices. While their role is limited to trash collection only, businesses such as West Wind Environmental Systems, Newair Recycling Center (went out of business in 2014), The Green Target Company, and Metal & Recycling Company (MRC) claim to provide recycling services. With few publicity efforts for those recycling companies, few people know of their existence. Until there are awareness and educational campaigns about recycling, some people living in Kuwait will continue to feel frustration, as expressed by the following blog comment:

[MRC is] not doing this for the environment. They couldn't give a damn about the environment. They mostly sell off all the collected trash to recycling companies in Oman and UAE for a handsome profit. In fact they cannot even be considered a recycling company, they are really a collection service. Personally I will never use them. I prefer throwing my trash away the traditional way and benefiting the poor Bengali guys who sift through it and recover the recyclables than sell them off to those greedy bastards. In fact I often separate cans and bottles anyway just to make their lives easier. (Yeni, 2011)

While private businesses have begun to think cyclically, the municipality of Kuwait has yet to construct a contemporary and sustainable waste management infrastructure. Environmentally aware people are especially dissatisfied with the myopic delay of the government, as expressed by the following blog comment: "The municipality should take initiative and earn their damn salaries by setting up a [recycling] system country-wide. We're in 2011!! The UK (which was late in the game) have been recycling since the late nineties!" (BuYousef, 2011).

Working within the limited landfill infrastructure of Kuwait, another private business supported the manufacturing of biodegradable materials. Entrepreneur Hussain Alsidrah began manufacturing shopping bags that take eighteen to twenty-four months to decompose as opposed to the conventional plastic bags that take up to four-hundred years (Abu Aldahab, 2012). The decomposition of the biodegradable shopping bags, facilitated by retained moisture from parks planted over closed landfills, provides nutrients to the soil.

When the government's and public's collective conscience develops attitudes and behaviors that support sustainable consumerism and waste management, Kuwait will be golden again. Education and awareness, infrastructure development, and governmental oversight will take perhaps a generation or more, similar to Switzerland and the United States. Switzerland passed its first environmental law as early as 1900 and continued to augment their legislation as new challenges appeared (Woschnack, 2000). Their first and largest non-profit awareness organization has been educating the public about the environment since 1909 (Pro Natura, 2016). Similarly, the backbone of the United States environmental practices was developed over four decades ago. This included environmental education programs and environmental awareness media campaigns (Campaign for Environmental Literacy, 2007).

The Kuwaiti government is taking steps toward long-term sustainability practices; however, changes in the society will not be realized for many decades. In order to support a sustainable infrastructure effectively, the society needs to understand and embrace the philosophies, values, and practices of sustainability. Currently, the government is encouraging and supporting colleges, universities, and educational institutions wishing to

incorporate sustainable and environmental education, hoping to affect daily practices concerning waste (Albazzaz, 2014). For example, the intermediate educational curriculum in Kuwaiti public schools is now developed to support environmental education (Albazzaz, 2014). Recently, scholars in the Arab world have exhibited interest in how Arab nations will work to preserve the environment, as stated by Dr. Mohammed Aboelenein, chairman of the department of sociology at United Arab Emirates (UAE) University:

Environmental issues in general and waste management in particular are recent issues on the Arab World's agenda. Currently, there aren't clear environmental policies in most Arab countries. Recently, mega projects announced by governments around the Gulf are heartening, but in the end the race against waste will rely on individual consumers. Attitudes are not easy to change. It took years for the U.S. to alter people's attitudes towards waste. The Arab governments should study — and maybe copy — successful models around the world. (as cited in Aburawa, 2012)

Dr. Aboelenein, advocates a three-pronged approach: (1) Combining education from the grade school level, (2) awareness-raising campaigns in the media for the general public, and (3) profit motives where consumers are given cash incentives to sort or recycle their household waste. Leonard (2010) theorizes that until there are laws regarding the disposal and handling of household waste along with enforcement, environmentally conscious behaviors are unlikely. One survey respondent agreed: "Kuwait's land and sea is full of garbage and the main reason is if there is no penalty

people will misbehave” (Almudhaf, 2015, p. 249). A government-supported educational social movement will motivate individuals to be conscious of personal consumer waste, to understand the advantages of reusing and recycling materials, and adopt a lifestyle of sustainability.

As a Kuwaiti educator and researcher who continues to learn about sustainability, I find myself looking for practical approaches to solve Kuwait’s environmental challenges. Discussions with my advisor at Kuwait University focused on bringing the field of Design for Sustainability to the university. Through my recent academic research pursuits at the University of Minnesota, I began to investigate a hands-on design for a sustainability program located in the United States.

From seven graduate design for sustainability programs, I decided to focus on one academic program for my research. This program offers a graduate degree in Design for Sustainability that is accredited by the National Association of Schools of Art and Design (NASAD). It admits students from different parts of the world with a wide range of creative backgrounds. I became more excited to investigate this program since it offers a curriculum that fully integrates sustainability into design education. As I continued to research, I was surprised to find out that this curriculum is constructed to meet students’ needs in multiple disciplines without providing any specialized tracks. Instead, it invites students from various disciplines to attend the same classes together.

The curriculum offers a total of nine core courses and three electives, all within sustainability. One of the first core courses is designed to help students gain proficiency in design software and presentation skills. Three of the core courses provide students with design thinking instruments, research tools, and user-centered design methodologies. Five

additional courses focus on practical design skills, including strategic project-planning, innovation, development, and execution. In regard to elective courses, the curriculum offers two sustainability-related electives to complement students' primary specialties, as well as one free elective from any department and subject.

The design for sustainability program has grown since my research participants, Amy White and Mia Davis, were students in the program. They recalled that specialty classes, such as architecture and graphic design, had more students than the sustainability classes, which only had four to twelve students. It occurred to me that smaller classes created a learning environment that allowed for more personal contact and made possible practical studies and projects in the curriculum.

As I continued to learn more about their backgrounds and their reasons for joining the design for sustainability program, the more I connected with them on a personal level. I learned of a tragic accident involving coal mining in Mia Davis's family. She had experienced adverse environmental impacts first-hand, related to the blasting of mountain tops by coal mining companies. Davis recounted:

I come from an area of the country . . . that [has] a lot of coal mining . . . Both of my grandfathers were coal miners. One died of black lung . . . So it's pretty evident to see a lot of environmental destruction and pollution in that region. (M. Davis, personal communication, 27 February, 2017)

Prior to attending the design for sustainability program in 2010, Mia's undergraduate studies in the U.S. focused on art education and graphic design. Mia believed that education should provide more opportunities for students to make a difference in their communities, rather than create unfulfilling design work. As she

expressed to me, certain moral and ethical aspects of her previous graphic design job disturbed her: “I did a lot of food service advertisements, hamburgers and iced tea and french fries and just thought, this is not what I wanna do with the rest of my life” (M. Davis, personal communication, 27 February, 2017). Mia added that she did not want to continue to design inserts for magazines or newspapers. Like me, Davis wanted to make a substantial impact on society, and so she decided to enter into the design for sustainability program.

After graduation, Mia’s career in sustainable design became far more gratifying. She works at a company whose president was one of the founding members of the U.S. Green Building Council (USGBC), which influenced her to become certified as a Green Associate in Leadership in Energy and Environmental Design (LEED GA). She expressed that this experience has further strengthened her commitment to, and belief in, high-efficiency design and building standards. Mia strongly believes that LEED certification, although expensive, is worthwhile and that all sustainability designers should embrace it. The knowledge and skills attained at the graduate school equipped her to lead a behavioral and technological change campaign towards energy conservation, saving her workplace two million dollars within two years. Mia’s success makes me believe that even though Kuwait ranks at the top of per capita waste generators in the world (Kloosterman, 2014; McLellan, Iyengar, Jeffries, & Oerlemans, 2014; Zafar, 2016), it is possible to create a prodigious change through activism and education.

Unlike Mia, before joining the design for sustainability program in 2015, Amy White stated that she “didn’t know about [sustainability] at all” (A. White, personal communication, 21 February, 2017). Previously, Amy studied undergraduate-level

architecture in two different schools from different cultures, neither of which integrated sustainability. One of the programs was located in her home country in Europe, while the other was in the United States. The new architectural perspective in sustainability encouraged Amy to join the program. She believed that such a perspective would provide her with an advantage in her future career. My research supported Amy's hunch; consultants worldwide have projected that sustainability products and services will be leading the future of design in years to come (Biomimicry 3.8, 2016). With time, she began to notice the differences between her educational background and her recently acquired sustainable architecture studies. Amy admitted that her previous architectural experience was limited to drafting, and so the rare occasions of speaking with clients made her very nervous. She added that her former training emphasized aesthetics over function. She knew how to design beautiful buildings, but those drawings were simply glamorous and the buildings she designed did not truly contribute to their surroundings:

Before, I just made something pretty and it's good. But now pretty is not important to me. Now the reason behind it is more important. How is it going to work? How is it going to help the community? How is it going to help the environment? Is it the right thing to do? If it's not, how will we redesign it? (A. White, personal communication, 21 February, 2017)

I connected with both Mia and Amy on several levels. Much like Amy, it was not until I came to the U.S. for graduate studies that I learned about the bigger picture of sustainability and how I could utilize it to create a positive impact on Kuwait. As with both of them, my undergraduate studies in Kuwait did not integrate sustainability into design education. Like Mia, I experienced first-hand environmental destruction from my

personal experience in Kuwait and my freelancing career in graphic design focused primarily on corporate identities. After ten years of practice, I started to question the value and contribution of my design work to society, as I placed more focus on profitability for my clients and distinguishability among their competitors.

In her design for sustainability program, Amy emphasized that despite the fact that most students came from various cultural and interdisciplinary backgrounds, they were all exposed to the same course materials. Amy and Mia went on to explain that within each course, professors taught sustainability topics in a manner that related the content to all cultures and disciplines. These topics covered a wide variety of fields including graphic, product, fashion, and service designs as well as architecture, agriculture, engineering, and more. This interdisciplinary approach provided Amy and Mia with insight into collaborative efforts between all disciplines, which I regard as paramount for solving environmental issues. Such a collaborative effort can be applied in Kuwait to achieve zero-waste initiatives such as Graham Wiles's brilliant collaborative project "From Cardboard to Caviar" (Oppenheim, 2008).

As the school's official website advertised, Amy reported that many aspects of the program incorporated hands-on learning experiences. Some professors were very committed to supporting and empowering their students; they provided resources, referrals, information, consultations, invited guest speakers, and advocated for their students. Mia reported that the professors participated with students in their projects and some of them even led the sustainability projects.

However, Amy revealed that other aspects of the program were more of a hands-off experience. Some professors only gave lectures and the necessary tools for students to

advance in their project. Those professors purposefully reduced their involvement to a minimum so that students would learn to become independent. Despite the differences, I believe both learning experiences to be valuable to the students' overall professional development, as White also stated.

The courses at the design for sustainability program varied in format from lectures, seminars, studios, to field-based. According to both Amy and Mia, classes were located on-campus, yet students did most of their work in the field. From personal academic experience as a design student and an art education student, I believe that seminars, studios, and field-based formats develop one's cognitive, discourse, practical, and action research abilities. Compared with the sustainability science graduate courses that I took, which were more concentrated on passive learning methods, I was struck by the level of theoretical, cognitive, and practical engagement that Amy and Mia experienced.

In most courses, Amy reported that students had an extensive 10-week, semester-long project that involved many supporting readings, classroom exercises, and field research. In lectures and seminars, Amy noted that students were assigned "tons of reading" materials and added, "I was doing about 150–200 pages per week" (A. White, personal communication, 2 March, 2017). White believed that the readings helped her develop awareness of environmental issues, environmentally-sound values, and gain understanding of sustainability theories and practices.

Amy White took a variety of courses, including the applied theories of sustainability course. I asked her, "How did you apply those idealistic, abstract theories into your practice?" She responded without hesitation; for her, sustainability theories

were very practical, since these abstract concepts were tested by real people in real-life situations. Amy further explained that during this course, she was exposed to a multitude of case studies that showcased international companies and individuals who had worked for an extended time in various spheres of sustainability and environmental issues.

Mia Davis earnestly agreed that most of the sustainability theories that she studied during this course were quite practical and helped to quickly settle her into her current job. Mia expressed to me that her entire academic journey was productive and gratifying. She particularly highlighted the impact that the history of sustainability had upon her, a topic she was first introduced to in the applied theories of sustainability course. Like Amy, Davis indicated that this course introduced her to numerous sustainability cases from around the world, such as manufacturing operations, energy-efficient buildings, and communities committed to zero-waste goals. She believed that her understanding of abstract theories was significantly improved through both case studies and practical projects. It struck me that case studies were a significant component that was missing in the three graduate sustainability courses that I took during my graduate studies. Those sustainability science courses were focused entirely on theories and theoretical frameworks. The lack of case studies made it difficult for me and other students to begin to apply those theories into our practical fields.

Amy explained to me that the professors encouraged learning through reflection, critical analysis, discussion-based learning, and students' presentations. During the applied theories in sustainability course, White recounted that they would discuss in class what sustainability meant to them, develop their personal voice, and brainstorm ideas on sustainability. Particularly, reflections and journaling made it easy for Amy to

comprehend, process, and relate the theories of sustainability to her specialized field. She explained to me that this course also entailed a project where students conducted contextual research and developed action plans for local companies interested in sustainability.

As I ascertained, field-based courses taught students how to conduct contextual research, apply human factors and user-centered design methodologies, as well as utilize data collection tools to enhance their design thinking process. Although the contextual research course primarily involved fieldwork, White stated that it also included lectures. Davis described this course as, “A great overview of design research methods: Going into the field and doing ethnographies, being able to observe and interview people . . . being able to come back and synthesize the data through affinity diagram, analysis, [and] mind-mapping” (M. Davis, personal communication, 27 March, 2017). Amy had a very similar experience, “We did a lot of autoethnographic research . . . [We learned] how to collect information properly and how to use it” (A. White, personal communication, 2 March, 2017). Mia emphasized to me the importance of conducting contextual research in sustainable design practice and its value to society, explaining:

I think in my line of work, [contextual research] is invaluable . . . I don't think we would ever be able to have a successful product if we did not test it in the field prior to release. This just has to be part of the job. It's not a question. (M. Davis, personal communication, 9 March, 2017)

Indeed, my research revealed that contextual, user-centered, and action research are key for sustainability solutions to be accepted and adopted by society (Elmansy, n.d.; Findeli, 2001).

This course was one of Amy's favorite courses in the program, as she truly appreciated how the contextual research course interwove theory with practical research. She worked on many exciting projects with fellow students on the topic of sustainability and waste reduction, involving private and public organizations, businesses, and consumers. In one project, Amy described to me that students worked in groups to conduct field-based research in regard to the waste problem in the city through the perception of society. Amy recounted that the professor advised the students before they began their projects, "To know more about this topic, you have to forget everything that you knew completely [about waste], and [then] go ask people what they think waste is" (A. White, personal communication, 2 March, 2017).

After conducting interviews, Amy and her group discovered that people's perception of waste in the city was much different than their previous assumptions. She described to me their prior research concerning the city waste, and how stunned she was by the extent of consumer product waste, such as "food, clothing, furniture, and everything" (A. White, personal communication, 2 March, 2017). However, Amy went on to add that the group was surprised to find from the interviews that "a lot of people in [the city] actually liked reusing . . . they're trying to reduce waste" (A. White, personal communication, 2 March, 2017). In light of her direct personal observations, she was amazed. "Interviews [presented] us [with] the unexpectable, like [multiple] angles on the whole situation" (A. White, personal communication, 2 March, 2017). Prior to this, Amy never had the opportunity to carry out social research and "only did research . . . online, like . . . Google®" (A. White, personal communication, 2 March, 2017). As an educator, I believe students need to actively engage with their research and data collection,

particularly in the case of Kuwait where databases have limited accessibility and are likely not current. Autoethnographic research is especially unexplored when it comes to consumer attitude, behavior, and waste; thus, it is imperative for students to engage with locals in Kuwait to extract those descriptive nuances. In doing so, the boundaries between school and community are opened and the classroom is no longer isolated (Cortese, 2003).

White pointed out to me that most of the projects at the design for sustainability program were collaborative group work, except for the final project that was individual. The largest group that she worked with consisted of nine students, all from different professional backgrounds such as: design management, industrial design, architecture, fashion design, graphic design, and interior design. According to White, by working with people from multidisciplinary fields, a person starts to realize how people from different backgrounds approach problems involving design uniquely. Amy then recalled her first collaborative experience at the program, stating, “At first it was very difficult because most of us just used to work with [people from the same discipline]” (A. White, personal communication, 21 February, 2017). She explained, “We all have different approaches on how to collect information, how to process information, [and] how to come up with ideas” (A. White, personal communication, 21 February, 2017). A. White continued to describe her first collaborative project:

The first project, at the beginning, was a nightmare because we could not communicate to each other. Like, they were pressuring their ways, the designers would be pushing their ways. But, I think in the middle of the project we finally found the middle ground and we let each other do whatever they think [is] right to do, but we also, like, find a compromise, and then we had an amazing project all together. (A. White, personal communication, 21 February, 2017)

Even though White described that project as quite challenging and difficult, she identified it to me as an incredible success. According to her, the main reason that made it successful was its interdisciplinarity. Yet another reason for its success, according to her, was that the “project actually got picked up by [the] community and they’re going to continue doing it” (A. White, personal communication, 21 February, 2017).

After Amy’s first collaborative experience, she began to understand how interdisciplinary group dynamics work and started to appreciate the variety of backgrounds contributing to a single project. This invaluable experience taught White how to assemble her own team. She explained, “I was able to put a group together in group work environment. It seems after that project, I never had a [communication] problem like that” (A. White, personal communication, 21 February, 2017). White compared her previous collaborative project experience with her individual final project, stating:

I actually enjoyed working with different people. And when I went through in my own project, I really missed design managers . . . because they were doing things that I don't really like doing, but that's what they do. Yeah, I wish I had them all the time, honestly. (A. White, personal communication, 21 February, 2017)

Amy stressed the significant impact the multicultural atmosphere had on her learning process. She elaborated that having students from a variety of professional and cultural backgrounds provided her with a holistic experience by sharing their perspectives with one another. In addition, Amy's engagement in the community and communication with stakeholders and beneficiaries has significantly improved her communication skills and self-confidence.

Mia stated that students would do community work as part of their course work as well as to meet their volunteer hours requirement. Mia reported that the program required every student to do at least ten hours of sustainability-related volunteer work in the community each quarter. Both Mia and Amy claimed they exceeded the required volunteer hours, which were definitely not required by the school. Thus, I sensed that the students must have internalized the sustainability practices into their personal ways of living and developed a higher civic responsibility evident in their consideration of themselves as part of their community.

The most valuable experience that Amy gained throughout her educational years at the design for sustainability program was her involvement in community projects. Based on her proposed research, she concluded that cooperation instead of competition helps companies to attain better results when it comes to sustainability. Amy mentioned that the most sustainable and successful businesses tend to work together. She was able to

implement her findings in two community projects. The first community project involved working with local companies from agriculture, energy, and retail sectors. After the group presented the findings from that research, including a collaborative plan promoting sustainability, the local companies were convinced and graciously agreed to cooperate with each other to achieve long-term sustainability. The second group project, as Amy specified, involved working with governmental organizations. Once again, Amy's group presented a collaborative sustainability plan, producing parallel results, as the representatives of those organizations also embraced it. However, Amy did not follow-up on how either of those proposed project plans took off or impacted the community.

I agree with Amy. The collaboration between multiple disciplines greatly enriches students learning experiences and design projects' outcomes (Cortese, 2003; Designers Accord, 2011). Applying this approach to Kuwait University appears challenging, yet remains possible. Kuwait University is structured into specialized disciplines that are segregated into sub-colleges within the university. One way to adopt an interdisciplinary approach in the undergraduate level would be through collaboration between relevant colleges, such as the college of architecture, college of business, college of engineering, college of science, college of education, college of social sciences, and college of life sciences. Once sustainability is fully integrated into the design curriculum, core courses should be made available, in collaboration with other colleges, to sophomore, junior, and senior students from different disciplines. Another way of integrating an interdisciplinary approach in the graduate level is to mimic the aforementioned program where Amy and Mia studied, by admitting students from different backgrounds.

Due to the requirement for collaborative efforts between different colleges, the implementation of such an interdisciplinary approach in sustainable design education will take a year or more to establish. The program should aim to make sustainable living an integral part of the educational experience by encouraging students to internalize values and ethical practices. The lessons learned from this autoethnography will help inform curriculum and pedagogical components for the development of a design for sustainability program at Kuwait University.

Immediate results after the establishment of the program will be manifested within a year due to the nature of the community-based learning approach. For example, students' abilities to lead and initiate projects with governmental and non-governmental organizations, institutions, and businesses in the community will promote sustainability and inspire greater social change. Ultimately, Kuwait University will contribute to society by creating awareness and introducing sustainable practices as a way of life. Significant program outcomes will take about four to five years to become visible, when the newly matriculated professionals take their sustainable practices into their careers. Early student involvement in the community will open up career venues and opportunities for them after graduation.

## CHAPTER SIX: THEORETICAL ANALYSIS

This section analyzes lived experiences — of both people living in Kuwait and those of alumni — with respect to individual, familial, and cultural factors. These factors are understood through a number of theoretical frameworks. Because of the importance of personal values in determining an individual's stance towards the importance of conservation, Herman's (2005) theories on value transmission and development through social learning theory were used. The discussion of value development contributes to the next portion of analysis, in which the congruence or incongruence between an individual's environment and their values (and their ability to notice any incongruence) is considered (Gilson, 1994). In order for values to be translated into material changes, an intervention must be introduced on the basis of those values to guide and inspire behavior change (Prochaska, Johnson, & Lee, 1998). For this reason, planned interventions to influence behavioral change are considered (Prochaska, Johnson, & Lee, 1998).

This chapter considers the motivational barriers to implementing changes to increase sustainability practices. Specifically, the problems presented by rational choice theory, in which actors are treated as self-interested or at least primarily interested in their own immediate community, are considered (Herrnstein, 1990). Collectivism theory has also helped explain the complex phenomena of social change and social institutions. The non-viability of existing competitive systems of doing business is examined. Therefore, systems theory and the viable systems model are applied to understand systematic relationships between individuals and organizations and how people can work together to produce agreeable solutions (Mele, Pels, & Polese, 2010). Overcoming the inherently competitive mindset of most influential actors requires the diffusion of ideas about a

more cooperative and collaborative way of doing business. For this reason, diffusion of innovation theory is considered (Kaminski, 2011).

### **Values Transmission and Development**

Through my personal and familial narratives, it is evident that my personal values were strongly influenced by cultural factors and my family's background. In my household, the precedent for self-sustainment and resource responsibility led me to acquire my family's conservationist values. These familial values had to be first internalized before they could be transformed from habits to more conscious practices.

Herman (2005) combined the theories of Sigmund Freud, Erik Erikson, Lawrence Kohlberg, and Carol Gilligan on the subjects of identity, values, and moral development and proposed a two-stage theoretical model of values transmission and development. The first stage is the transmission of values that "begins at birth, extends through childhood, and focuses upon socialization within the contexts of home, school, and society" (Herman, 2005, p. 3). Herman's first stage also aligns with principles of social learning theory. This theory explains acquired and imprinted subconscious behaviors through exposure to consistent repetitious acts modeled by others (Bandura, 1977). Vicarious learning within a particular social context leads to mirrored behaviors, producing habits over time through the unconscious mimicking of others (Bandura, 1977).

Herman's second stage involves the developmental approach to values that is "accessible around adolescence, extends into adulthood, and focuses upon cognition and individuation" (Herman, 2005, pp. 3–4). This stage is an individualistic transformative process requiring the individual to take steps toward owning his or her personal values, become empowered with personal choices, and break free from societal expectations

(Herman, 2005, p. 25). However, the degree to which individuals are confronted with the possibility of change can vary depending on individual, parental, familial, and societal factors (Herman, 2005).

**Stage I: Values transmission and social learning.** Herman's stage one and social learning theory can help explain the intergenerational transmission of values. For example, my elders adopted conservation practices and passed them down to their children. From an anthropological perspective, Wendell Oswalt (1986) described how patterns and characteristics of a culture are learned from relatives and other members of the community and acquired through observation, imitation, and trial and error (as cited in Duranti, 1997, p. 24). With no greater awareness or acceptable motivations or reasons, I emulated the conservation-oriented values of my parents that were passed to me at an early age. Franz Boas articulated the relationship between a culture and its natural environment, noting that culture produces outcomes, which can have long-lasting effects, whether recognized as positive or negative, for the collective (as cited in Duranti, 1997, p. 25). Further, a culture can produce outcomes that may have negative, unintended consequences on the environment.

The unconscious transmission of cultural traits can negatively impact society. For instance, the start of Kuwait's oil exportation in 1951 attracted foreigners into domestic and municipal cleaning jobs, altering the public's perception of cleaning. Soon after, the idea that cleaning was somebody else's job or the mentality that "Someone will pick it up" became the norm. Since the general population was not invested in the country's cleanliness, littering became a subconscious habit for people living in Kuwait, contributing to its ranking as one of the highest per capita waste generators in the world

today (Kloosterman, 2014; McLellan, Iyengar, Jeffries, & Oerlemans, 2014; Zafar, 2016).

Another outcome of Kuwait's oil exportation is the wealth it brought to the country, which altered the majority's perception of the value of money. As people enjoyed a high standard of living, small monetary recycling incentives became obsolete, as stated by a person living in Kuwait, "I prefer throwing my trash away the traditional way and benefiting the poor Bengali guys who sift through it and recover the recyclables" (Yeni, 2011). Social learning theory helps explain how monetary incentives were viewed as insignificant to generations of high income families; recycling was then perceived to be a job for those of lower socioeconomic status.

In regard to both Mia Davis's and Amy White's educational backgrounds, they were influenced by the cultures of their non-sustainability-focused programs. As Amy White stated, her practice of architecture reflected her program values and direction, which drew heavily on aesthetic values. Based on social learning theory, Mia, too, acquired values of economic profitability during her graphic design education. Those values conflicted with her own and it was not until she was practicing in her freelancing career that she questioned the value of her design practice. Both Amy White and Mia Davis followed the practices that their academic programs modeled for them.

Similarly, the U.S. design for sustainability program provided opportunities for their students to fully immerse themselves in practices of sustainability inside and outside of school settings. The social learning environment at the design for sustainability program contributed to a higher level of engagement and practice in classrooms as in local communities. In the classroom, students values and beliefs are challenged in order

to reform cognitive inconsistencies and transform their worldviews. This high-level engagement encouraged both Amy White and Mia Davis to develop civic responsibility, evident in their exceeding their required volunteer hours to serve their community. Not only did the program aid them in fully integrating sustainability into their professions, but inspired them to adopt it into their personal daily lifestyles. The professors and administrators in the program had modeled the sustainability practices they preached to students, as stated by both Amy and Mia. Although social learning theory is relevant to the subconscious repetitions acts modeled by others, it was not always the case in this academic program.

**Stage II: Values development.** Individuals who practice subconscious habits lack the reasoning that leads to a change in behavioral patterns. Herman (2005) noted that an individual within a society needs to question and internalize the transmitted values from the surrounding environment in order to break free from societal norms and become an agent of change. The instance of my mother asking me to finish the last drop of yogurt was a pivotal moment that allowed me to start thinking critically. My lack of desire to comply with my mother's conservation of resources provided an opportunity for her to explain to me the reason for these habits. Conservation habits that were once a subconscious behavior became a conscious choice for me. Transmitted habits modeled by my elders shifted into conscious practices when the negative consequences of non-conservation actions were convincingly conveyed to me.

On a larger scale, the Kuwaiti government experienced a turning point when the urban spread of Al Qurain brought the city's population closer to a landfill site. Once concerns regarding pollution and health hazards became evident, the Kuwaiti government

was forced to critically examine the negative consequences of its landfill waste management habits, the same habits that dated back to the Al Kout generation. Acquired values of preservation of the environment and human well-being led the Kuwaiti government to consider sustainable solutions for waste management such as composting, recycling, and the integration of environmental education into school curriculums. As Herman (2005) theorized, evaluation of transmitted habits through critical thinking can lead to the development and refinement of values, producing new, meaningful behaviors. For the government, this meant starting to think about more environmental and sustainable solutions for the future of Kuwait.

Comparably, Mia Davis had profoundly experienced first-hand environmental destruction in her life, watching her grandparent die of an illness directly stemming from coal mining. This tragic incident, I believe, instilled in her attitudes and values of social justice as well as environmental preservation and protection rather than values of profitability and capitalism. Mia Davis was forced to develop her values when she witnessed the negative effects of rampant economic growth on her own family.

The value development process is not always a voluntary one; developing values do not always translate well into ultimate commitments. In other words, when two values of Mia Davis came into conflict — economic prosperity and family well-being — a number of possibilities for amending the conflict present themselves. As it happens, rather than rationalizing the opposition to minimize cognitive dissonance and conflicting beliefs, Mia developed strong environmental preservation and protection values. Values that she would not likely have felt so strongly without this personal experience.

## **Behavior Change versus Conformity**

According to situational awareness theory, when a person possesses a high degree of situational awareness, he or she will be able to recognize controllable variables in the surrounding environment and become empowered to create change (Gilson, 1994). In contrast, when an individual is unaware of controllable variables, he or she will tend to conform to a given context rather than try to change it. As expressed in the autoethnography, evolving personal and cultural commitments to sustainability has led to advance waste management methods by changing specific contextual variables in a system.

**Change.** On a personal level, situational awareness theory helped explain how my internalized values and practices of conservation enabled me to influence my new work environment. At Kuwait University, my value of material reuse collided with the norm of wasting paper, prompting me to change the situation. Specifically, I recognized that paper waste could have potential for a second life through notepads. Another example indicative of situational awareness theory was the team project of Kuwait University's digital archive. When everyone else's initial thought was to trash the paper records, my values and heightened awareness allowed me to see an opportunity to recycle waste paper abroad. By acting as an agent of change, I played a role in producing an enduring relationship between the university and the recycling company, surpassing the original scope of the project and bringing environmental awareness to university employees through the newly available recycling bins. Through these positive experiences, I recognized greater opportunities for influencing attitudes toward sustainability through various social contexts such as education, legislation, and policies.

In Kuwait, the government and at least two private businesses demonstrated situational awareness in their visionary approach toward contributing to sustainability. For example, the Metal & Recycling Company's (MRC) refusal to send recyclable materials to landfills created an opportunity for change. The company altered a contextual variable by redirecting waste materials from a linear to a cyclical reconfiguration of resources. Similarly, the progressive entrepreneur Hussain Alsidrah contributed to changing another controllable variable by manufacturing biodegradable shopping bags. Additionally, the government showed evidence of situational awareness by integrating environmental education into public school curricula.

A government-supported educational movement would heighten awareness of the current waste management situation and move Kuwaiti society toward a sustainable future. Each of these governmental and non-governmental initiatives involved taking actions within a complex and dynamic system to achieve environmental sustainability goals and objectives.

Situational awareness is also perceived through Amy White's and Mia Davis's experiences during their design for sustainability studies. Their situational awareness was heightened by the program's pedagogical concentration in leadership, communication, interdisciplinary collaboration, and community involvement, which produced empowered design professionals and change agents. This empowerment is evident by Amy White's successful community group projects as well as Mia Davis's extraordinary career achievement of saving her workplace two million dollars within two years by leading a social campaign and introducing technological improvements. The efficacy of this

approach is evident by the dramatic change that Amy underwent as she stated that she never heard of sustainability before joining this academic program.

**Conformity.** When people are situationally unaware, they will conform to a system regardless of whether that system is modern or antiquated. The Kuwaiti government, when handling Al Qurain's mounting problem of landfill waste, conformed to waste management solutions that dated back to the Al Kout era. The same antiquated, short-sighted mindset of burying and burning has persisted into the present day as evidenced by the government's transition from a landfill-based infrastructure to the use of a high-end incineration plant. The incineration plant was ultimately an unsustainable pursuit of a cleaner alternative to solving the mounting problem of waste.

In other countries, Switzerland and the United States have taken the lead in influencing behavioral changes. Switzerland's progressive environmental legislation required shoppers to supply their own shopping bags. Aware of the threat to biodiversity posed by negligent disposal of plastic bags, the Swiss government took steps to prepare society for this lifestyle change. During my visit to Switzerland, I witnessed people in the country conforming to this new practice. Similarly, environmental organizations in the U.S. have partnered with institutions of higher education to provide accessible recycling bins in campuses nationwide (Aluminum Company of America [Alcoa], 2013). As a new international student, I observed everyone around me separating various waste materials into designated bins. I soon found myself conforming to the recycling norm.

## **Facilitating Behavior Change**

Scholars have acknowledged the presence of various developmental steps associated with behavioral change (Prochaska, Johnson, & Lee, 1998). An external force such as an intervention can influence behavioral changes. The term “intervention” denotes an externally-derived intentional force to ultimately produce a behavioral change (Prochaska, Johnson, & Lee, 1998). An educator can act as an interventionist by designing and implementing projects or interventions that yield behavioral changes (Glanz, Lewis, & Rimmers, 1990, p. 17; Herek, 1986). A component of the transtheoretical model of behavioral change is a type of planned intervention known as “consciousness-raising” (Prochaska, Johnson, and Lee, 1998, as cited in World Bank, 2010, p. 4). This manner of intervention is intended to increase awareness of the problem through informative educational materials (as cited in World Bank, 2010, p. 4).

As an educator at Kuwait University, my resource conservation values and personal objectives motivated me to create an intervention aimed at a social behavioral change. I designed and distributed a manual instructing students and staff on how to create notepads from scrap paper. The host webpage and manual were devoted to education and raising awareness through the use of visual references and information related to reusing paper waste. The project was perceived as feasible, affordable, and was successfully accepted by the majority of its targeted audience.

Educators at the design for sustainability program demonstrated the use of planned interventions that facilitate behavioral change. These interventions increased Amy White’s and Mia Davis’s awareness and commitments to sustainability and helped them improve their values. Interventions such as reflexive writing, critical thinking, and

discussion of sustainability issues helped students to develop personal understanding of course materials as well as long-lasting attitudes and values towards sustainability.

Students sustainability values were intensified and reinforced by impactful personal and cultural experiences, requiring students to get involved in hands-on sustainability-related projects and field work. By having students observe the direct positive effects of sustainable design on community members and local businesses with whom they interacted, those values were comparably strengthened.

### **Collectivism and Motivation for Action**

Rational choice theory and collectivism theory have helped increase the sociological understanding of this autoethnographic piece and helped explain the complex phenomena of social change and social institutions. Under rational choice theory, it is assumed that people make logical choices based on behaviors that maximize their personal gains, rather than those that are relatively costly or cause inconvenience, thus those choices govern their behaviors (Herrnstein, 1990). This theory has bases in behavioral economics, political theory, and sociology. Sociologists use this theory to help explain the rational thinking behind people's actions, such as weighing the benefits and costs within social interactions and how their rational behaviors contribute to a stable social order. In this theory, it is assumed that people behave the way they do because they believe that the actions that they choose have more benefits than costs.

On the other hand, collectivism theory refers to the concept that individuals should prioritize the good of society over their own self interests (Vocabulary.com, n.d.). In this theory, it is also known that the actions of the collective stem from the thoughts and actions of those individuals, therefore the collective actions disappear when the

individuals change their ways of thinking and acting (Von Mises, 2012). Collectivists focus on communal, societal, and national interests in various types of political, economic, and educational systems. They point to the idea that power should be in the hands of the collective, rather than a small group of individuals who exert the most influence over the collective (Vocabulary.com, n.d.).

The combination of rational choice theory and collectivism theory help interpret human decision-making and motivation for action. The intention behind exploring those theories is to help increase the understanding of how to motivate individuals and communities to adopt sustainability practices. This theoretical combination intends to enhance pedagogical approaches to teaching design for sustainability.

This autoethnographic research revealed that individuals within the investigated academic program are extremely group-oriented in their behaviors. Individuals within the academic program are willing to collaborate to serve the interests of present and future generations. A strong example of collectivism is showcased by Amy White and Mia Davis during their interdisciplinary collaborative work and community-based projects. They described the high degree of community, business, and government involvement and collaboration throughout their multiple real-life projects. Another example, is the businesses' agreements to collaborate with competitors in order to promote a greater cause of sustainability to strengthen the local community. Amy White supported this point by arguing that collaboration is essential and competition is not beneficial to sustainability.

## **The Viability of Systems**

Systems theory serves as the theoretical foundation for understanding human interactions and the formation and preservation of organizations. In particular, I apply the theoretical viable systems model in order to understand how humans can work together to produce certain agreeable outcomes (Mele, Pels, & Polese, 2010). According to Mele, Pels, and Polese (2010), the viable systems model is applied to understand systematic relationships between individuals and organizations. The researchers stated:

According to the viable system model, competitive firm behavior is strictly linked to the ability to identify and manage functions and relationships, thereby establishing communication channels, organizing information flow, and rationalizing and harmonizing a firm's development aligned with all external relationships. (Mele, Pels, & Polese, 2010, p. 131)

The viable systems model is particularly useful in application to sustainability, given that this model is focused on viability. From a sustainability perspective, not only are manmade systems considered nonviable, but human activity can actually make natural systems nonviable too. Thus, the viable system model serves to assist in the determination of system viability, both in a natural and manmade context. It is important to recognize that the viable systems model is applied on the organizational level, whereas the aforementioned rational choice theory is applied on the individual level. Even though individuals, of course, comprise organizations, models and perspectives applied on the organizational level provide different perspectives on issues, especially within a sustainability context.

The viable systems model provides a theoretical framework to help determine how organizations operate through the systems that they both generate and affect. More generally: “For the organizations, it is fundamental to consider the compatibility between systemic actors (consonance) and to improve the effective harmonic interaction between them (resonance)” (Mele, Pels, & Polese, 2010, p. 131). Organizations are viable if they are resilient, that is, if they are able to respond to changes in their environment through existing processes or internal changes to those processes.

As Amy White pointed out, the competitive mindset and lack of cooperative dynamics among businesses and organizations do not help sustainability progress. If viability is the ability “to survive in a particular context due to continual dynamic processes and several kinds of internal changes” (Mele, Pels, & Polese, 2010, p. 131), then competition is not viable precisely because it encourages a resistance to internal changes of the communal system as a whole. Competitive organizations would need to revise their behaviors to pursue a strategy that gives them comparatively more cooperative strength. Their motivation would not be their own success but rather the growth and resilience of the broader community.

### **The Spread of New Ideas**

Diffusion of innovation theory, also called diffusion theory, is a communication-based approach to help explain how the spread of new technologies, ideas, and innovations occur (Kaminski, 2011). Effectively, diffusion theory helps bridge the gap between the aforementioned theories and models that operate on the individual and organizational level. Diffusion theory helps explain both personal and collective actions across both individuals and organizations (Kaminski, 2011). In other words, diffusion

theory relies on the understanding that there are actors who influence the development, acceptance, application, and maintenance of innovations (Kaminski, 2011); such actors fall under five categories labeled as innovators, early adopters, early majority, late majority, and laggards (Kaminski, 2011; Rogers & Shoemaker, 1971). In this sequence, innovators comprise 2.5 percent of the population, early adopters 13.5 percent, early majority 34 percent, late majority 34 percent, and laggards comprise 16 percent of the population (Sinek, 2009). Sinek (2009) argued that a person may represent a different category in different circumstances and times. He claimed that mass acceptance of a new idea begins after the tipping point of 15 to 18 percent penetration in society (Sinek, 2009).

Scholars explain the five stages of diffusion or the spread of new ideas in society in order to understand who adopts new changes and in what sequence: The first and second groups of innovators and early adopters are comfortable in taking actions that support and reflect their beliefs and worldviews (Kaminski, 2011; Sinek, 2009). Those are considered influential actors for the early majority group (Kaminski, 2011; Sinek, 2009). The third group of early majority wait for the product to mature in its abilities and follow the early adopters (Rogers & Shoemaker, 1971). The fourth group of late majority are described as the cynical majority that are far more cautious (Sinek, 2009). They wait for the change to penetrate 50 percent of society before they begin to adopt the change (Rogers & Shoemaker, 1971). And the final stage of diffusion includes the final 16 percent of laggards who do not adopt the change unless otherwise enforced (Sinek, 2009).

Applying this theory to both Mia Davis and Amy White's experiences in the sustainability program would categorize them as innovators in their local community and as early adopters on a global scale. Course materials and classroom exercises served as trials of new concepts and ideas within sustainability. Amy White reported that the reason that helped her adopt the sustainability theories and practices was that they were already tested. These exercises do more than just reinforce the concepts, they serve as evidence to those who might be skeptical about the actual practicality of the ideas and concepts. Moreover, the small class sizes in the design for sustainability program portray the first group of influential actors or innovators for the next generation of sustainable development. The effects of those actors are broadened by the inherently collaborative and community-based nature of the field. Through community involvement, students are empowered to promote these practices to influence early adopters of community members, local businesses, and organizations who share similar beliefs and support sustainability. With increased and consistent community involvement and awareness over time, the two groups of students and early adopters would grow to reach a tipping point of 15 to 18 percent penetration in society, thus encouraging the early majority to start adopting those practices after they perceive the benefits (Sinek, 2009).

There will always be at least some resistance by influential actors at each stage. Individuals committed to a capitalist competitive approach may resist the changes that sustainable design demands. Amy White highlighted the degree to which a competitive focus within businesses that excludes the possibility of working with one's competitors can hamper sustainable development and growth. Since the changes that she suggested

would require businesses to collaborative to reduce pollution and heighten sustainability, those changes are not intuitive, at least not within a competitive paradigm.

By understanding the different groups of people and stages of change within diffusion of innovation theory, sustainable design educators and students can be much more strategic in introducing changes into society and identifying reasons of resistance to change. Moreover, applying this theory has allowed me to better understand the importance of influential actors in the adoption of innovative sustainability ideas, approaches, and initiatives. Identifying appropriate communication channels for each group is essential for the adoption of sustainability practices, design solutions, and technological innovations.

### **Summary**

To summarize, through the use of theory, I was able to analyze my personal experiences and describe how they related to behavioral change theories on a macro level. The theoretical models used were social learning theory, the two-stage model of value transmission and development (Herman, 2005), situational awareness theory, and planned intervention as described by the transtheoretical model (Prochaska, Johnson, & Lee, 1998). I learned from the analysis experience that stages of human development can be controlled by externally transmitted culture, internalized individual values development, and planned behavioral change interventions. Through the autoethnography, I realized that my personal story is unique and does not represent the experiences of most people living in Kuwait. However, through theoretical analysis and reflection, I was able to recognize and describe the commonalities and differences in a

way that will ultimately assist in the construction of a sustainable development educational system for developing countries.

My professional development has significantly improved by the understanding of these theoretical frameworks and approaches. The field of sustainability includes spaces of information and data that require interpretation. Much of this data involve human attitudes and behaviors, which are fundamental to solving environmental problems. Data that involves humans are analyzed using theories, models, and approaches on human motivation, systems, organizational behavior, and communication. The utilization of these established theoretical frameworks help explain and ground this autoethnographic research.

## **CHAPTER SEVEN: RECOMMENDATIONS AND CONCLUSION**

### **Dissertation Summary**

Since the nineteenth century, there has been a worldwide waste problem, in particular within the country of Kuwait. With the onset of the Industrial Revolution, worldwide waste problems have increased, creating an economic and consumer culture of mass production and product maximization. In an attempt to seek economic advantage, developed countries often operate in regions with less stringent or nonexistent environmental laws without regard to environmental, social, or public health issues. This process exposes populations to harmful substances and it contributes to unfavorable environmental conditions such as global warming, decreased biodiversity, and unbalanced ecosystems.

The waste problem creates a social dilemma that could be solved by mindset alterations and adjustments, including attitudinal and behavioral change. Methods for creating behavioral and attitudinal change include, encouraging intimacy between individuals and their environment, community collaboration and commitment to zero-waste, increasing individual awareness of negative environmental issues, and increasing the general knowledge of sustainability.

This research explores the waste problem that is closely associated with outcomes of prints/graphics, products, and packaging designs. Therefore, educational and professional development with regard to sustainable design specialties is of particular importance. Societies need a social paradigm shift that complies wholly with sustainability goals, principles, and standards which can be developed through the integration of sustainability into design education. Values related to environmental

responsibility can be instilled through education, integrated into professional practicum, and finally transformed on a cultural level to create motivation for action. Thus, the development of academic sustainable design programs can be integral to creating solutions to the waste problem.

In order to solve these environmental waste issues, traditional academic design programs need to take a firmer stance toward fully integrating sustainability into their programs. Currently, few academic design for sustainability programs exist worldwide, and many traditional design programs have yet to integrate sustainability. Traditional design programs often include only a single sustainability course in their curriculum and perhaps one student project per semester addresses sustainability. However, change is a gradual process and it will take time for collaborative efforts to come to fruition.

### **Recommendations**

A key objective of this dissertation is the development of practical guidelines for the integration of sustainability into academic design programs. As such, the following recommendations rely on both the review of the relevant theoretical material and the in-depth analysis of the autoethnographic data collected in the course of the research.

Analysis of the autoethnographic data reveals that the level of sustainability consciousness rises significantly during a time of crisis, whether environmental or economic. This assumption was verified by the analysis of my family background which showed that older generations seem to have strong sustainability-related values because they recall the negative experience of poverty and famine. Living through an environmental crisis, as in the case of Mia Davis's experiences with coal mining and my own with the waste problem in Kuwait similarly raises sustainability consciousness.

Therefore, developing awareness of, and personal connection with a contemporary crisis is key to internalizing the values and attitudes, developing an internal drive and passion towards sustainability, and adopting conscious behaviors that reflect those beliefs. For example, students in Kuwait need to understand and feel how a crisis of landfill waste can affect their lives, the lives of their loved ones, and the environment they live in. Therefore, the first recommendation is to reinforce sustainable design practices with critical thinking and emotional investment.

Academic sustainability programs should place a great focus on strengthening the intimacy between students and their surrounding environment to develop a desire to preserve local ecological systems and prevent the drastic consequences of unrestricted waste. In order to accomplish this, it is necessary to ensure that students are introduced to the negative consequences of unsustainable practices. These consequences should be specific and tied to the local environment so that students can feel them empirically.

Second, once the interest and importance of sustainability practices is strongly underpinned, it is necessary to ensure that students are taught to apply these practices in their activities. Research has revealed that the effectiveness of design for sustainability programs is largely determined by their practical applicability in localized contexts. Thus, it is critical for educators to teach students not only relevant sustainability theories and frameworks, but also practical sustainability tools that would sufficiently equip and prepare future professionals to become agents of change.

In this view, there are numerous solutions that can help raise the practicality of a sustainability program. The analysis of the autoethnographic data has shown that educators should prepare planned interventions to allow for profound student

participation, discussion, and embodiment. Course materials such as case studies demonstrate for students the various applications of those sustainability theories and reinforce their understanding of them. Discussions of those case studies enhance students critical thinking and problem-solving skills. Another example of an effective planned intervention is to allow students to conduct first-hand contextual research and participate in real-world projects. Those interventions allow students to plan and/or implement innovative strategies and solutions that are applicable to localized contexts.

Review of the literature shows that most traditional academic design programs currently confine sustainability to very few courses and projects each semester. Such an insignificant focus on sustainability problems creates an impression that these problems are not a priority. As a result, the value of sustainability practices remains underestimated. In this view, it is recommended that design programs fully integrate sustainability into their curriculum to emphasize the importance of sustainability, which would help students develop a firm conviction that sustainability is an indispensable part of their future professions.

This research has revealed that interdisciplinarity is a critical factor often overlooked when integrating sustainability into design education. As a result, a single-discipline sustainability program deprives students of a holistic, real-life experience because it neglects teaching the necessary skills for future design professionals to communicate and collaborate with other professionals in different disciplines. At the undergraduate level, interdisciplinarity can be achieved through collaborative efforts between discipline-focused colleges.

Design for sustainability courses can become available to students from multi-disciplinary colleges. However, at the graduate level, a design for sustainability program can achieve interdisciplinarity by admitting graduate students from different professional backgrounds. Therefore, to reinforce collaboration and interdisciplinarity, programs should enable students to participate in local sustainability-related group projects. The cooperation in such projects leads to numerous benefits concerning raising sustainability-related consciousness. Most importantly, it helps students to explore the already existing practices in sustainability design that provide a substantial value for their communities. Students can further adopt these practices or some ideas underpinning them to apply to their individual projects. Moreover, collaborative projects are useful regarding developing sustainable thinking in students through engaging them in the atmosphere of teamwork focused on finding sustainable solutions and innovative decisions.

The final recommendation is to allow students to initiate, direct, and acquaint themselves with local companies. Academic programs should strengthen students' ties with their community by facilitating their consideration of themselves as stakeholders in the community. Those ties will help students become independent, lifelong learners, committed to sustainability practices. Students' abilities to lead and initiate community-based projects will introduce sustainable practices as a way of life and inspire greater social change. It may likewise assist students in achieving a clearer idea of available career prospects in sustainability. Most importantly, community participation will positively influence and develop students' values and a sense of civic responsibility towards the wellbeing of their local community. Students' engagement in their community will also open up career opportunities for them after graduation.

In summary, sustainability programs should be structured to assist modern generations with understanding the essentials of this practice. Major emphasis should be placed on specific community problems that need to be addressed, particular tasks that can be completed, and the tangible benefits that should be expected in the long run. The programs should have a strong regional identity so that students relate to the problems they interact with. It is assumed that increased situational awareness is a crucial step to the student's active inclusion and implementation of sustainable practices in their professional work and lifestyle. Students will become agents of change through curriculum and pedagogy that emphasizes aspects of innovation, interdisciplinary collaboration, community involvement, leadership, first-hand research, and communication, which are practiced through real-world projects within the students' community.

### **Future Research Agenda**

Sustainability as a philosophy, idealistic in nature, becomes relevant when it is applied within a local context. Future research will need to highlight “the integration of the three components of sustainable development — economic development, social development, and environmental protection — as interdependent and mutually reinforcing pillars” into sustainability-focused design programs (United Nations General Assembly, 2005, pp. 11–12). Knowing the contextual factors will enable sustainable designers to create a solution that is environmentally, economically, and culturally sound for the location where the design will be utilized. For example, unique sustainable solutions in Switzerland would not apply to Egypt, due to differing economies, resources, climates, laws, and culture. Likewise, adopting an existing academic sustainable design

program from the U.S. to Kuwait would be irrelevant to the local context without adjusting for the different social, environmental, and economic factors.

In order to integrate local context into sustainability-focused design programs for Kuwait, my future research agenda will focus on compiling contextual factors related to the three pillars of sustainability from sustainable design programs within the U.S. and measuring the degree of applicability of those programs in relation to their local context. Through comparative case studies, this exploratory research will seek to answer two questions: (a) What are the contextual categorical factors incorporated within sustainability-focused design graduate-level programs currently operating within the U.S.? and (b) How applicable are these programs to their local context? This research will investigate current operational sustainable design master's programs, as identified in Table 2.

This study will use triangulation, a process of corroborating evidence from different types of data and sources to increase validity of the research results (Day, 2000). Data sources will include: (a) documentation sources from a literature review; (b) graduate program catalogs, course syllabi, and curricula; and (c) qualitative surveys and interviews with graduate program directors, faculty, students, and alumni in the sustainability-focused design programs identified in Table 2.

The literature review will utilize UMN library resources to search the MNCAT database using the following keywords: "Sustainability", "education", "standards", "criteria", "accreditation", "sustainable design", "context", "curriculum" and "environmental, economic, social" to identify relevant journal articles, research papers, and books. In order to collect program related materials and data, permission will be

obtained from the institutions and access to institutional intranets and websites will be granted.

Contextual categories will be identified and compiled into a working spreadsheet in Microsoft Excel. Only contextually relevant text as it relates to the three pillars of sustainability will be coded as a “contextual category”. After the data are compiled, the first step will be to check for completeness and whether there are missing data. Next, the coded data will be organized according to the three pillars and allow for coding overlap across pillars. Initial analysis of the contextual categories will aid in the design of qualitative surveys and interview guides. Prior to distributing surveys and conducting interviews, formal approval will be obtained from the Institutional Review Board (IRB) to assure third-party approval that human subjects will be sufficiently and ethically protected (Yin, 2014).

An online survey will be distributed to the entire research study population via each school’s official email system. With nonprobability sampling, returned surveys may or may not be representative of the whole population (Trochim, 2000). Interviews will be conducted either in-person or over the phone, audio-recorded, and transcribed by a third-party service. Completed surveys and transcripts will be saved to a cloud drive along with the compiled contextual categorical data.

Data collected about each of the three pillars of sustainability and their contextual categories will set the ground for the descriptive case study analysis. Data will be coded to identify common themes and diagrams will be designed to further conceptualize the data (Yin, 2014). The themes that emerge will act as recommended criteria for developing a contextualized sustainability-focused design program.

The resulting set of compiled contextualized criteria for applicability will provide opportunity for additional research for generalizability. These criteria intend to facilitate program directors around the world to build applicable sustainability-focused programs situated to their specific local context. The results from this research are intended to be far-reaching.

### **Limitations**

The present research rests largely upon the analysis of autoethnographic data, which is subjective in its nature. As such, the research participants share their individual views on the subject, which might be unique in their character and cannot be regarded as a common experience of Kuwait residents. Meanwhile, the analysis of the autoethnographic data was performed through the lens of the relevant theories and the previously performed research in this field. Another limitation is the small size of the sample which might affect the reliability of the research findings. The small size of the sample was determined by the fact that the research participants were recruited independently of the academic institutions which led to a lower participation. Finally, the limited timeline had an impact on the volume of data collected and the number of people engaged in the study.

### **Conclusion**

The waste problem in Kuwait has been increasing in severity throughout the past decade. The rapid pace of its progression was initially triggered by the industrial revolution that marked the worldwide onset of the age of consumption. In this view, the integration of sustainability practices into modern design seems to be especially

important, as it is the only way of preserving the environment and avoiding further destruction of ecosystems.

This research explores an existing academic design program that fully integrates sustainability into its curriculum in order to guide traditional design programs in integrating sustainability in a practical and applicable sense. A notable finding of this research is that sustainability should be integrated at an interdisciplinary level for students to experience a holistic, collaborative, and real-world practice. Furthermore, another key finding of this research is the necessity of teaching sustainability theories as tools accompanied by real-world case studies showcasing practical strategies and their applicability to localized contexts. In other words, a great focus should be placed on practicality and applicability of sustainability solutions and practices along with their significance to the local population. In this view, academic programs should offer varied opportunities for community participation and field inclusion which will give students a better idea of sustainability and how it can be potentially implemented in their careers.

In conclusion, sustainability is a way of thinking and is influenced by different factors, including family and cultural background, received education, and general situation awareness. As such, the formation of sustainable thinking at the national level is a complex task that requires consistent work over extended periods of time. Its achievement and success require a well-designed strategy and the collaborative effort of the government, initiative groups, and academic institutions. The recommendations described in this research will help to make academic programs more efficient and productive in their attempt to promote a sustainable worldview among the general population.

## BIBLIOGRAPHY

- Abu Aldahab, R. (2012). كويتي يتجه للإستثمار في البيئة، حسين السدرة: الأكياس البلاستيكية صديقة للبيئة. [A Kuwaiti invests in the environment, Hussain Alsidrah: Environmentally-friendly plastic bags]. *مجلة بيئتنا: الهيئة العامة للبيئة، الكويت*. [Beatona Magazine: Kuwait Environmental Protection Agency (EPA)], (155), 46–49. [In Arabic]. Retrieved from [http://www.beatona.net/CMS/index.php?option=com\\_content&view=article&id=1736&Itemid=84&catid=37%3Aarticles&lang=ar](http://www.beatona.net/CMS/index.php?option=com_content&view=article&id=1736&Itemid=84&catid=37%3Aarticles&lang=ar)
- Aburawa, A. (2012). Kuwait's Towering Trash Problem. *Green Prophet Newsletter: Sustainable News for the Middle East*. Retrieved from <http://www.greenprophet.com/2012/11/kuwait-towering-trash-problem/>
- Adams, T. E., & Jones, S. H. (2008). Autoethnography is queer. In Norman K. Denzin, Yvonna S. Lincoln & Linda T. Smith (Eds.), *Handbook of critical and indigenous methodologies* (pp.373–390). Thousand Oaks, CA: Sage.
- Adams, T. E., Jones, S.H., & Ellis, C. (2015). *Autoethnography: Understanding qualitative research*. New York: Oxford University Press. ISBN 978-0-19-997209-8.
- Adhikary, R. (2010). The Promise of green design. *Design Management Review*, 19(4), 22–29.

- Al Qallaf, Y., Al-Kandari, S., Yousef, K., Al Mutairi, S., & Fouzy, H. (2016). Analysis and improvement possibilities of waste management at Kuwait Oil Company (KOC). *WIT Transactions on Ecology and the Environment*, 202, 73–84.
- Al-Jassar, M. K. A. (2009). *Constancy and change in contemporary Kuwait city: The socio-cultural dimensions of the Kuwait courtyard and Diwaniyya*. (PhD thesis). The University of Wisconsin-Milwaukee. Retrieved from ProQuest.
- Albazzaz, A. A. (2014). Kuwait National Curriculum and Standards. Kuwait: Ministry of Education. Retrieved from <https://goo.gl/3pnxeF>
- Abellán, M. (2016). *Green packaging solutions* (1st ed.). Sant Adrià de Besòs: Monsa.
- Alhajri, K. M. (2004). مرادم النفايات: خطر محقق بالبيئة وصحة المجتمع [Landfill: Imminent danger to the environment and the health of the community]. *مجلة الخط الأخضر البيئية* [Green Line Environmental Magazine]. Retrieved from <http://www.greenline.com.kw/ArticleDetails.aspx?tp=219>
- Alhumoud, J. M., & Al-Kandari, F. A. (2008). Analysis and overview of industrial solid waste management in Kuwait. *Management of Environmental Quality: an International Journal*, 19(5), 520–532.
- Almudhaf, S. (2015). *Sustainable Packaging Design Visually Explained Guidebook Prototype* (Master's Thesis). 240–252. Rochester Institute of Technology, NY. Retrieved from ProQuest Digital Dissertations.
- Alsabih, A. (2014). 4 Thousand Tons of Household Waste Per Day. *Alqabas Newspaper*. Kuwait City.

- Alsarawi, M. A. (2004). مواقع ردم النفايات: جهود وطنية مثمرة لتأهيلها [Landfill sites: Productive national efforts for qualifying landfills]. *مجلة بيئتنا: الهيئة العامة للبيئة، الكويت* [Beatona Magazine: Kuwait Environmental Protection Agency (EPA)], (73), 8–21. [In Arabic]. Retrieved from [http://www.beatona.net/CMS/index.php?option=com\\_content&view=article&id=1563&Itemid=84&catid=37%3Aarticles&lang=ar](http://www.beatona.net/CMS/index.php?option=com_content&view=article&id=1563&Itemid=84&catid=37%3Aarticles&lang=ar)
- Aluminum Company of America [Alcoa]. (2013). Alcoa Foundation and Keep America Beautiful Help Students Recycle [Business]. Retrieved from [http://www.alcoa.com/global/en/news/news\\_detail.asp?newsYear=2013&pageID=20130307005764en](http://www.alcoa.com/global/en/news/news_detail.asp?newsYear=2013&pageID=20130307005764en)
- Andrews, C. J. (1999). Putting industrial ecology into place evolving roles for planners. *Journal of the American Planning Association*, 65(4), 364–375.
- Association for the Advancement of Sustainability in Higher Education [AASHE]. (2012). Sustainability-Focused Master's Degree Programs [Professional Higher Education Association]. Retrieved from <http://goo.gl/RJiEpq>
- Atwood, D. A. (2016). *Sustainable Inorganic Chemistry*. John Wiley & Sons.
- Bailey, L. H. (1911). Part I: Nature-Study Teaching. In *The nature-study idea: An interpretation of the new school-movement to put the young into relation and sympathy with nature* (Fourth Edition, pp. 3–112). New York: The Macmillan Company. Retrieved from <https://goo.gl/fMJxQ4>
- Ball, P. (2012). Nature's color tricks. *Scientific American*, 306(5), 74–79.

- Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.
- Benyus, J. (1997). *Biomimicry: Innovation Inspired by Nature*. New York: William Morrow and Company.
- Bergman, D. (2013). *Sustainable Design: A Critical Guide*. Princeton Architectural Press.
- Bertola, D. (2014). Pulp fiction: How many trees does it take to make paper? [Business Journal]. Retrieved from [http://www.bizjournals.com/buffalo/blog/morning\\_roundup/2014/05/pulp-fiction-how-many-trees-does-it-take-to-make.html](http://www.bizjournals.com/buffalo/blog/morning_roundup/2014/05/pulp-fiction-how-many-trees-does-it-take-to-make.html)
- Biomimicry 3.8. (2016). What is Biomimicry? [Bio Consultancy]. Retrieved from <https://biomimicry.net/biomimicry/>
- Black Dog Publishing (2006) *Recycle: A source book*. Westerville, Ohio: American Ceramic Society.
- Blair, T. (2009) *Vision Kuwait 2035: Final Report*. Kuwait.
- Bochner, A. P., & Ellis, C. (Eds.). (1996). *Composing ethnography: Alternative forms of qualitative writing*. Walnut Creek, CA: Alta Mira Press.
- Bochner, A. P. (2000). Criteria against ourselves. *Qualitative Inquiry* 6(2), 266–272.
- Bochner, A. P., & Ellis, C. S. (2006). Communication as autoethnography. In *Communication as--: Perspectives on theory*. G. J. Shepherd, J. St. John, & T. Striphas (Eds.). Sage Publications. ISBN 141290658X. Retrieved from <https://goo.gl/aGaQZb>

- Boyd, D. (2008). Autoethnography as a tool for transformative learning about white privilege. *Journal of Transformative Education*, 6(3), 212–225.
- Buckley, A. (2010). VCU Receives A– National Green Report Card. *Physical Plant Newsletter*, pp. 1–5. Richmond, VA. Retrieved from <http://www.fmd.vcu.edu/docs/ppdnewsletters/Winter%202010.pdf>
- BuYousef. (2011, September 13). Re: Recycling in Kuwait [Web log comment]. Retrieved from <http://248am.com/mark/kuwait/recycling-in-kuwait>
- Brundiers, K., & Wiek, A. (2011). Educating students in real-world sustainability research: vision and implementation. *Innovative Higher Education*, 36(2), 107-124.
- Brundtland, G. H. (1987). *Report of the World Commission on environment and development: Our common future* (p. 300). United Nations. Retrieved from <http://www.un-documents.net/our-common-future.pdf>
- Calaprice, A. (Ed.). (2000). *The Expanded Quotable Einstein* (p. 126). Princeton: Princeton University Press.
- Campaign for Environmental Literacy. (2007). Legislative History [Organization]. Retrieved from <http://www.fundee.org/facts/fedfund/leghistory.htm>
- Carr, K. E. (2017). Who invented paper? [Historical Review]. Retrieved from <http://quatr.us/literature/paper.htm>
- Casey, V. (2013). Phase 1 in Review: 2007-13 [Knowledge Distribution Network]. Retrieved from <http://www.designersaccord.org>

- Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*, 47, 118–163. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0142694X16300631>
- Caston, D. (2013). Curriculum designing with sustainability in mind: Reflections on a process. *Journal of Sustainability Education*, 5, 1–8. Retrieved from <http://www.jsedimensions.org/wordpress/wp-content/uploads/2013/06/Designing-Curriculum-for-Sustainability-final-PDFReady1.pdf>
- Chambers, N., Simmons, C., & Wackernagel, M. (2014). *Sharing nature's interest: Ecological footprints as an indicator of sustainability*. Routledge.
- Charmaz, K. (2014). *Constructing grounded theory*. Sage.
- Childress, D. (2008). *Johannes Gutenberg and the printing press*. Minneapolis, MN: Twenty-First Century Books.
- Christiaans, H. H. C. M., & Dorst, K. H. (1992). Cognitive models in industrial design engineering: A protocol study. *Design Theory and Methodology*, 42, 131–140.
- Clart, P. (2015). *Religious publishing and print culture in modern China, 1800-2012*. Boston: De Gruyter.
- Coad, J. (2012). *Green technology* (1st ed.). London: Raintree.
- Cohen, M. J. (Ed.). (2011). Academic Programs in Sustainability. *Sustainability: Science, Practice, & Policy [SSPP]*. Retrieved from <http://goo.gl/XkD6DJ>
- Cooper, T. (2005). Slower Consumption Reflections on Product Life Spans and the

- “Throwaway Society”. *Journal of Industrial Ecology*, 9(1–2), 51–67.
- Cortese, A. D. (2003). The Critical Role of Higher Education in Creating a Sustainable Future. *Planning for Higher Education*, 31(3), 15–22.
- Cross, N. (2004). Expertise in design: An overview. *Design Studies*, 25(5), 427–441.
- DaMatta, F. M., Ronchi, C. P., Maestri, M., & Barros, R. S. (2007). Ecophysiology of Coffee Growth and Production. *Brazilian Journal of Plant Physiology*, 19(4), 485–510.
- Day, D. V. (2000). Leadership development: A review in context. *Leadership Quarterly*, 11, 581–613.
- Davidson, G. (2011). *Waste management practices: Literature review* (pp. 1–59). Canada: Dalhousie University. Retrieved from <https://studylib.net/doc/18527000/waste-management-practices--literature-review>
- Designers Accord. (2011). *Integrating sustainability into design education: The toolkit* (pp. 1–23). Retrieved from <http://www.designersaccord.org/archive/wp-content/uploads/2009/08/DesignersAccord-EduToolkit.pdf>
- Dewey, J. (1933). *How we think*. Lexington, MA: D. C. Heath.
- Diaz, L. F., & De Bertoldi, M. (2007). History of composting. *Waste Management Series*, 8, 7–24.

- Disinger, J. F. (1983). Environmental Education's Definitional Problem. ERIC/SMEAC information Bulletin 2. Columbus, ERIC/SMEAC. *Environmental education for the 21 st century: International and interdisciplinary perspectives*, 3–11.
- Disinger, J. F., & Monroe, M. C. (1994). III. From the Classic to the Contemporary. In N. A. Osborn (Ed.), *EE Toolbox–Workshop Resource Manual: Defining Environmental Education* (pp. 10–11). Ann Arbor, MI: University of Michigan. Retrieved from <https://naaee.org/sites/default/files/eepr/resource/files/definingee.pdf>
- Disinger, J. F. (2005). Chapter 7 – The purpose of environmental education: Perspectives of teachers, governmental agencies, NGOs, professional societies, and advocacy groups. In *Environmental education and advocacy: Changing perspectives of ecology and education* (pp. 137–157). UK: Cambridge University Press.
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem–solution. *Design Studies*, 22(5), 425–437.
- Duiker, W. J., & Spielvogel, J. J. (2007). *World history*. Belmont, CA: Thomson/Wadsworth.
- Duncan, M. (2004). Autoethnography: Critical appreciation of an emerging art. *International Journal of Qualitative Methods*, 3(4), 28–39.
- Duranti, A. (1997). *Linguistic Anthropology*. Cambridge University Press. Retrieved from

<https://books.google.com/books?id=4FNa6B4bQh4C&printsec=frontcover#v=onepage&q&f=false>

- Dzeng, R. J. (2014). *2014 International Conference on Social Science and Environment Protection (SSEP2014)*. Lancaster, PA: DEStech Publications, Inc.
- Ecocell. (2015). Ecocell (Schweiz) AG [Disruptive Building Technology]. Retrieved from <https://www.ecocell.ch/index.php/en/en-m-company>
- Edwards, B. (2010). A Short History of Sustainable Development. *National Building Specification for the UK*. Retrieved from <https://www.thenbs.com/knowledge/a-short-history-of-sustainable-development>.
- Elder, J. L. (2003). *A field guide to environmental literacy: Making strategic investments in environmental education*. Washington, DC: Environmental Education Coalition.
- Ellis, C. (2004). *The ethnographic I: A methodological novel about autoethnography*. Rowman Altamira.
- Ellis, C., & Ellingson, L. (2008). Autoethnography as constructionist project. In Holstein, J. A., & Gubrium, J. F. (Eds.), *Handbook of constructionist research*. 445–466. New York: Guilford Press.
- Ellis, C., Adams, T. E., & Bochner, A. P. (2011). Autoethnography: an overview. *Historical Social Research/Historische Sozialforschung*, 273–290. Retrieved from <http://www.qualitative-research.net/index.php/fqs/article/view/1589/3095>

- Elmansy, R. (n.d.). Principles of Sustainable Design. Retrieved from <http://www.designorate.com/principles-of-sustainable-design/>
- Encyclopedia of Stone Age Art. (2017). Stone Age Cave Painting [Encyclopedia]. Retrieved from <http://www.visual-arts-cork.com/prehistoric/cave-painting.htm>
- Environment and Ecology. (2016). History of Ecology. Retrieved from <http://environment-ecology.com/history-of-ecology/132-history-of-ecology.html>
- Evolution News. (2011). How Butterfly Wings Display Brilliant Colors. Retrieved from [https://www.evolutionnews.org/2011/07/how\\_butterfly\\_wings\\_show\\_inten/](https://www.evolutionnews.org/2011/07/how_butterfly_wings_show_inten/)
- Eyring, G. (1992). *Green products by design: Choices for a cleaner environment*. Diane Publishing.
- Filho, W. L. (Ed.). (2015). *Transformative approaches to sustainable development at universities: Working across disciplines*. Switzerland: Springer.
- Findeli, A. (2001). Rethinking design education for the 21st century: Theoretical, methodological, and ethical discussion. *Design Issues*, 17(1), 5–17.
- Finnigan, L. (2014). Let's Do It World Meeting 2014. Retrieved from <http://zwia.org/lets-world-meeting-2014/>
- Fiorentino, C. (2010). Why taking Design for Sustainability at UofA? [Design Education & Research]. Retrieved from <https://carlosfiorentino.wordpress.com/2010/11/21/why-taking-dfs-at-uofa/>
- Fishman, B. J., & Krajcik, J. (2003). What does it mean to create sustainable science curriculum innovations? A commentary. *Science Education*, 87(4), 564–573.

- Fleming, R. (2013). *Design Education for a Sustainable Future*. New York, NY: Routledge.
- Funderburk, R. S. (1948). *The History of Conservation Education in the United States*. Nashville, TN: George Peabody College for Teachers.
- Füssel, S. (2005). *Gutenberg and the Impact of Printing*. Aldershot, Hampshire: Ashgate.
- García-Serna, J., Pérez-Barrigón, L., & Cocero, M. J. (2007). New trends for design towards sustainability in chemical engineering: Green engineering. *Chemical Engineering Journal*, 133(1), 7–30.
- Geertz, C. (1973). *The interpretation of cultures: Selected essays*. (Vol. 5019). Basic books.
- Gilson, R. D. et al. (1994). *Situational awareness in complex systems*. University of Central Florida Orlando.
- Glanz, K., Lewis, F. M., & Rimer, B. K. (Eds.). (1990). *Health behavior and health education: Theory, research, and practice*. San Francisco, CA: Jossey-Bass.
- Goodall Jr, H. L. (1998). Notes for the autoethnography and autobiography panel NCA. In *A paper presented at the National Communication Association (NCA) Convention in New York City*.
- Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your “house”. *Administrative Issues Journal*, 4(2), 4. Retrieved from [http://jolle.coe.uga.edu/wp-content/uploads/2015/02/89596\\_manuscript-file\\_2491](http://jolle.coe.uga.edu/wp-content/uploads/2015/02/89596_manuscript-file_2491)

04.pdf

- Gray, B., & Stites, J. P. (2013). *Sustainability through partnerships: Capitalizing on collaboration* (pp. 1–110). Network for Business Sustainability. Retrieved from <http://nbs.net/wp-content/uploads/NBS-Systematic-Review-Partnerships.pdf>
- Greyson, J. (2007). An economic instrument for zero waste, economic growth and sustainability. *Journal of Cleaner Production*, *15*(13), 1382–1390.
- Griswold, E. (2012). How ‘Silent Spring’ ignited the environmental movement. *The New York Times*, *21*.
- Hanasky, W. (2015). Protests in the 1960s [Educational]. Retrieved from <http://www.lessonsite.com/archivepages/historyoftheworld/lesson31/protests60s.htm>
- Handfield, R. B., Melnyk, S. A., Calantone, R. J., & Curkovic, S. (2001). Integrating environmental concerns into the design process: The gap between theory and practice. *IEEE transactions on Engineering Management*, *48*(2), 189–208.
- Hansen, E. G., Grosse-Dunker, F., & Reichwald, R. (2009). Sustainability innovation cube: A framework to evaluate sustainability-oriented innovations. *International Journal of Innovation Management*, *13*(04), 683–713.
- Hayano, D. (1979). Auto-ethnography: Paradigms, problems, and prospects. *Human organization*, *38*(1), 99–104.
- Henrickson, J., & Doering, A. (2013). Teaching Sustainability through Adventure. *The Journal of Sustainability Education*, *5*, 1–17. Retrieved from

[http://www.susted.com/wordpress/content/teaching-sustainability-through-adventure\\_2013\\_06/](http://www.susted.com/wordpress/content/teaching-sustainability-through-adventure_2013_06/)

Herek, G. M. (1986). The instrumentality of attitudes: Toward a neofunctional theory.

*Journal of Social Issues*, 42(2), 99–114.

Herman, W. E. (2005). Values acquisition and moral development: An integration of

Freudian, Eriksonian, Kohlbergian and Gilliganian Viewpoints. Online

Submission. Retrieved from <http://files.eric.ed.gov/fulltext/ED490607.pdf>

Herrnstein, R. J. (1990). Rational choice theory: Necessary but not sufficient. *The*

*American Psychologist*, 45(3), 356.

Holik, H. (Ed.). (2006). *Handbook of Paper and Board*. Germany: John Wiley & Sons.

Holusha, J. (1990). Technology; Farewell to Those Old Printing Ink Blues, and a Few

Reds and Yellows [Newspaper]. Retrieved from

<http://www.nytimes.com/1990/05/13/business/technology-farewell-to-those-old-printing-ink-blues-and-a-few-reds-and-yellows.html>

Hook, S. V. (2010). *Johannes Gutenberg: Printing Press Innovator*. Edina, MN: ABDO.

Hungerford, H.R., Peyton, R.B., & Wilke, R. (1980). Goals for curriculum development

in environmental education. *The Journal of Environmental Education*, 11(3),

42–47.

Hungerford, H. R. et al. (1989). A Prototype Environmental Education Curriculum for

the Middle School. A Discussion Guide for UNESCO Training Seminars on

- Environmental Education. *Environmental Education Series 29*. Retrieved from [http://kpe-kardits.kar.sch.gr/Aiforia/Unesco/333\\_49.PDF](http://kpe-kardits.kar.sch.gr/Aiforia/Unesco/333_49.PDF)
- Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education*, 21(3), 8-21, DOI: 10.1080/00958964.1990.10753743. Retrieved from <http://dx.doi.org/10.1080/00958964.1990.10753743>
- Index Mundi. (2015). Kuwait Demographics Profile 2014. *Index Mundi*. Retrieved from [http://www.indexmundi.com/kuwait/demographics\\_profile.html](http://www.indexmundi.com/kuwait/demographics_profile.html)
- Jackman, W. S. (1892). *Nature Study for the Common Schools*. New York: H. Holt and company. Retrieved from <https://archive.org/details/naturestudyforc03jackgoog>
- Jacob, J. (2016). Kuwait profile–Timeline. *British Broadcasting Corporation News [BBC]*. United Kingdom. Retrieved from <http://www.bbc.com/news/world-middle-east-14647211>
- Jacobs, H. H. (1989). *Interdisciplinary curriculum: Design and implementation*. ERIC.
- Jassim, A. (2010). حرق الغازات ومعالجة مياه [Alqurain landfill site: Toxic gas burning and treating water]. *جريدة النهار [Annahar Newspaper]*, p. 20. [In Arabic]. Kuwait. Retrieved from <http://www.annaharkw.com/annahar/Resources/PdfPages/21-10-2010/P20.pdf>
- Kaminski, J. (2011). Diffusion of Innovation Theory. *Canadian Journal of Nursing Informatics*, 6(2), 1–6.
- Kelly, C. (2009). Origins of Sustainability. *Institute for Transport Studies, University of*

*Leeds.*

Kent, A. (1996). *Encyclopedia of Library and Information Science* (Vol. 58). New York: CRC Press LLC.

Khourey-Bowers, C. (2012). *Exploring sustainable development: A multiple-perspective approach* (pp. 1–35). United Nations Educational, Scientific and Cultural Organization [UNESCO]. Retrieved from <http://unesdoc.unesco.org/images/0021/002154/215431E.pdf>

Klewitz, J., & Hansen, E. G. (2011). Sustainability-oriented innovation in SMEs: A systematic literature review of existing practices and actors involved. 1–7.

Kliebard, H. M. (2004). *The Struggle for the American Curriculum, 1893-1958*. Psychology Press.

Kloosterman, K. (2014). Bahrain, Qatar, Kuwait and the UAE among world's top 10 wasters. *Green Prophet Newsletter: Sustainable News for the Middle East*. Retrieved from <http://www.greenprophet.com/2014/10/bahrain-qatar-kuwait-and-the-uae-among-worlds-top-10-wasters/>

Kolasa, J., & Pickett, S. T. A. (2005). Chapter 3 – Changing academic perspective of Ecology: A view from within. In *Environmental education and advocacy: Changing perspectives of ecology and education* (pp. 50–71). UK: Cambridge University Press.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally

and what are the barriers to pro-environmental behavior?. *Environmental education research*, 8(3), 239–260.

Krulwich, R. (2013). What Is It About Bees And Hexagons? Retrieved from <http://www.npr.org/blogs/krulwich/2013/05/13/183704091/what-is-it-about-bees-and-hexagons>

Kurlansky, M. A (2017). *Paper: A World History*. Place Of Publication Not Identified: W W Norton.

Kuwait Central Statistical Bureau. (2016). *Statistical Review* (No. 39) (pp. 1–36). Kuwait: Kuwait Central Statistical Bureau.

Kuwait Central Statistical Bureau. (2011). *Annual Statistical Abstract*. Kuwait: Kuwait Central Statistical Bureau.

Kyburz-Graber, R., Hofer, K., & Wolfensberger, B. (2006). Studies on a socio-ecological approach to environmental education: A contribution to a critical position in the education for sustainable development discourse. *Environmental Education Research*, 12(1), 101–114.

Lambrechts, W., Mulà, I., Ceulemans, K., Molderez, I., & Gaeremynck, V. (2013). The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. *Journal of Cleaner Production*, 48, 65–73.

Legrand. (n.d.). Sustainable development: Definition, background, issues and objectives [French Industrial Group]. Retrieved from

- [http://www.legrand.com/EN/sustainable-development-description\\_12847.html](http://www.legrand.com/EN/sustainable-development-description_12847.html)
- Lehtonen, M. (2004). The environmental–social interface of sustainable development: capabilities, social capital, institutions. *Ecological Economics*, 49(2), 199–214.
- Leonard, A. (2010). *The story of stuff: The impact of overconsumption on the planet, our communities, and our health—and how we can make it better* (1st ed.). New York: Free Press.
- Life Magazine. (1955). Throwaway Living. *Time Inc.*, 39(5), 43.
- Lim, C. (2014). History of Recycling [Public Awareness]. Retrieved from <http://www.all-recycling-facts.com/history-of-recycling.html#ixzz4axgnhcRO>
- Louisiana Department of Education [LDOE] (2016). Academic standards. *Dept. of Education*. Retrieved from <https://www.louisianabelieves.com/academics/academic-standards>.
- Lynch, J., & Hatcher, C. (2011). SFMOMA presents less and more: The design ethos of Dieter Rams [Museum Press Office]. Retrieved from <https://www.sfmoma.org/press/release/sfmoma-presents-less-and-more-the-design-ethos-of/>
- Manning, J., & Adams, T. E. (2015). Connecting the Personal and the Popular: Autoethnography and Popular Culture. *The Popular Culture Studies Journal*, 3, 187–222.

- Maréchal, G. (2010). Autoethnography. In Mills, A. J., Durepos, G., & Wiebe, E. (Eds.), *Encyclopedia of case study research 2*, 43–45. Thousand Oaks, CA: Sage Publications.
- Marion, N. E. (2011). *Making environmental law: The politics of protecting the Earth*. Santa Barbara, Calif: Praeger.
- Mark. (2011). Recycling in Kuwait. Retrieved from <http://248am.com/mark/kuwait/recycling-in-kuwait>
- Martin, M. (1974). Understanding and Participant Observation in Cultural and Social Anthropology. In *Verstehen: Subjective Understanding in the Social Sciences*, M. Truzzi, ed. Reading, Massachusetts: Addison-Wesley.
- Martin, S. (2011). Paper Chase [Global Network]. Retrieved from <http://www.ecology.com/2011/09/10/paper-chase/>
- McCrea, E. J. (2006). The roots of environmental education: How the past supports the future. *Education Resources Information Center (ERIC)*, 1–12. Retrieved from <http://files.eric.ed.gov/fulltext/ED491084.pdf>
- McDonough, W., & Braungart, M. (Eds.) (2002) *Cradle to Cradle: Remaking the Way We Make Things*. 1st ed. New York: North Point Press.
- McKeown, R., Hopkins, C. A., Rizi, R., & Chrystalbridge, M. (2002). *Education for sustainable development toolkit*. Knoxville: Energy, Environment and Resources Center, University of Tennessee.

- McLellan, R., Iyengar, L., Jeffries, B., & Oerlemans, N. (Eds.). (2014). *Living Planet Report 2014: species and spaces, people and places*. World Wide Fund (WWF) for Nature.
- McLennan, J. F. (2004). *The philosophy of sustainable design: The future of architecture*. Ecotone publishing.
- Meadows, D. (1997). Places to intervene in a system: In increasing order of effectiveness. *Whole Earth, 91*(1), 78-84.
- Medrick, R. (2013). A Pedagogy for Sustainability Education. *The Journal of Sustainability Education, 5*, 1–3. Retrieved from <http://www.jsedimensions.org/wordpress/wp-content/uploads/2013/06/rickMedrickAPedagogy-ForExperientialEducationPDFReady.pdf>
- Meggs, P. B., & Purvis, A. W. (2005). *Meggs' history of graphic design*. New York: John Wiley & Sons.
- Mele, C., Pels, J., & Polese, F. (2010). A Brief Review of Systems Theories and Their Managerial Applications. *Service Science, 2*(1–2), 126–135.
- Metal & Recycling Company [MRC]. (2016). Who We Are. Retrieved from [http://www.mrckw.com/page.aspx?page\\_key=who\\_we\\_are&lang=en](http://www.mrckw.com/page.aspx?page_key=who_we_are&lang=en)
- Miller, T. R., Wiek, A., Sarewitz, D., Robinson, J., Olsson, L., Kriebel, D., & Loorbach, D. (2014). The future of sustainability science: A solutions-oriented research agenda. *Sustainability science, 9*(2), 239–246.
- Milošević, R., Nedeljković, U., Banjanin, B., Novaković, D., & Kašiković, N. (2016).

- The Analysis of Ink Jet Printed Eco-Font Efficiency. *Journal of Graphic Engineering and Design*, 7(1), 13.
- Moore-Colyer, R. J. (1990). Blacksmiths, Farriers and Horses in Wales: An Historical Note. *Folk Life*, 29(1), 76–79.
- Morris, J. (2014). The History of Ink. *The Week*. Retrieved from <http://www.theweek.co.uk/>
- Mykhalovskiy, E. (1996). Reconsidering table talk: Critical thoughts on the relationship between sociology, autobiography and self-indulgence. *Qualitative Sociology*, 19(1), 131–151.
- Needham, J., & Tsuen-Hsui, T. (1985). *Science and Civilisation in China: Volume 5, Chemistry and Chemical Technology, Part 1, Paper and Printing, Volume 5, Part 1*. New York, NY: Cambridge University Press.
- National Association of Schools of Art and Design [NASAD]. (2016). NASAD Handbook 2016–17. Reston, VA: NASAD. Retrieved from [https://nasad.arts-accredit.org/wp-content/uploads/sites/3/2015/11/NASAD\\_HANDBOOK\\_2016-17.pdf](https://nasad.arts-accredit.org/wp-content/uploads/sites/3/2015/11/NASAD_HANDBOOK_2016-17.pdf)
- National Oceanic and Atmospheric Administration [NOAA]. (2009). 20th Century Drought. Retrieved February 8, 2017, from [https://www.ncdc.noaa.gov/paleo/drought/drght\\_history.html](https://www.ncdc.noaa.gov/paleo/drought/drght_history.html)
- Neiva de Figueiredo, J. & Guillen, M. (2016). *Green products* (1st ed.). Portland: CRC Press.

- O'Brien, S. R. M. (2007). *Indications of environmental literacy: Using a new survey instrument to measure awareness, knowledge, and attitudes of university-aged students* (Thesis). Iowa State University, IA. Retrieved from <http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=16054&context=rtd>
- O'Hare, R. (2016). Earliest handwritten “notepad” unearthed in London: Discovery of 410 wooden tablets gives glimpse into life of city’s first Romans [Newspaper]. Retrieved from <http://www.dailymail.co.uk/sciencetech/article-3619586/Earliest-handwritten-note-pads-unearthed-London-Discovery-410-wooden-tablets-provides-glimpse-life-city-s-earliest-Romans.html>
- Office of Civic & Community Engagement. (2017). Community-Based Projects [University of Miami]. Retrieved from [http://www.miami.edu/index.php/civic\\_community\\_engagement/projects/](http://www.miami.edu/index.php/civic_community_engagement/projects/)
- Oppenheim, L. (2008). Lessons in Biomimicry – Part 2 Natural Systems [Sustainability Media Outlet]. Retrieved from <https://www.treehugger.com/sustainable-product-design/lessons-in-biomimicry-part-2-natural-systems.html>
- Oswalt, W. H. (1986). *Life cycles and lifeways: An introduction to cultural anthropology*. Mayfield Publishing Company.

- Oxford English Dictionary. (1999a). Artisan. *The Oxford Dictionary and Thesaurus*.  
Oxford: Oxford University Press. Retrieved from  
<https://en.oxforddictionaries.com/definition/artisan>
- Oxford English Dictionary. (1999b). Craftsman. *The Oxford Dictionary and Thesaurus*.  
Oxford: Oxford University Press. Retrieved from  
<https://en.oxforddictionaries.com/definition/artisan>
- Partnerships Technical Bureau of Kuwait [PTB]. (2015). Municipal Solid Waste  
Treatment Facility—Kabd Location. Retrieved from  
<http://www.ptb.gov.kw/en/Municipal-Solid-Waste-Treatment-Facility-%E2%80%9393-Kabd-Location>
- Pawlyn, M. (2013). Biomimicry in Architectural Design. 5th VELUX Daylight  
Symposium, The Royal Danish Academy of Fine Arts, Copenhagen. Retrieved  
from [www.youtube.com/watch?v=wdoriWPaaDI](http://www.youtube.com/watch?v=wdoriWPaaDI).
- Prabaharan, M. (2012). Green Design Framework for New Product  
Development. *International Journal of Modeling and Optimization*, 245–249.
- Pro Natura. (2016). Pro Natura—Switzerland’s Number One in Conservation [Non-profit  
Organization]. Retrieved from <http://www.pronatura.ch/79>
- Prochaska, J., Johnson, S., & Lee, P. (1998). The transtheoretical model of behavior  
change. In S. Schumaker, E. Schron, J. Ockene, & W. McBee, (Eds.), *The  
Handbook of Health Behavior Change*, 2nd ed. New York, NY: Springer.

- Reed-Danahay, D. E. (1997). Introduction. In Reed-Danahay, D. (Ed.), *Auto/Ethnography: Rewriting the Self and the Social*. 1–17. Oxford: Berg.
- Rhodes, B. J., & Streeter, W. W. (1999). *Before Photocopying: The Art & History of Mechanical Copying, 1780-1938*. Oak Knoll, CA: Oak Knoll Publishing.
- Richardson, L. (2000). Evaluating ethnography. *Qualitative Inquiry*, 6(2), 253–255.
- Richardson, L., & St. Pierre, A. E. (2005). Writing: A method of inquiry. *The Sage handbook of qualitative research*, 959–978.
- Rogers, E. M. & Shoemaker, F. F. (1971). *Communication of Innovation*. New York: The Free Press.
- Ronai, C. R. (1992). The reflexive self through narrative: A night in the life of an erotic dancer/researcher. In Carolyn Ellis & Michael G. Flaherty (Eds.), *Investigating subjectivity: Research on lived experience* (pp.102–124). Newbury Park, CA: Sage.
- Ronai, C. R. (1996). My mother is mentally retarded. In Carolyn Ellis & Arthur P. Bochner (Eds.), *Composing ethnography: Alternative forms of qualitative writing* (pp.109–131). Walnut Creek, CA: AltaMira.
- Rosen, M., & Kishawy, H. (2012). Sustainable manufacturing and design: Concepts, practices and needs. *Sustainability*, 4(2), 154–174. doi:10.3390/su4020154.
- Ross, P. (2013). Evidence of Prehistoric Recycling Suggests our Ancient Ancestors Were “Green,” Too [Newspaper]. Retrieved from

<http://www.ibtimes.com/evidence-prehistoric-recycling-suggests-our-ancient-ancestors-were-green-too-1423688>.

Ryan, J. C., & Price, A. T. D. O. (1997). *Stuff: The secret lives of everyday things* (New Report, No 4). Seattle, Washington, DC: Northwest Environment Watch.

Sachs, J. et al. (2016). *SDG Index and Dashboards—Global Report* (p. 427). New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). Retrieved from [https://issuu.com/unsdsn/docs/sdg\\_index\\_dashboard\\_full](https://issuu.com/unsdsn/docs/sdg_index_dashboard_full)

Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-Design*, 4(1), 5–18.

Sanera, M. (1998). Environmental education: Promise and performance. *Canadian Journal of Environmental Education*, 3, 9–26. Retrieved from <http://files.eric.ed.gov/fulltext/EJ569289.pdf>

Sarton, G. (1967). *Introduction to the history of science ...: From Homer to Omar Khayyam*. Washington, DC: Carnegie Institution of Washington.

Schmitz, C. L., Stinson, C. H., & James, C. D. (2010). Community and environmental sustainability: Collaboration and interdisciplinary education. *Critical Social Work*, 11(3), 83–100. Retrieved from <http://www1.uwindsor.ca/criticalsocialwork/community-and-environmental-sustainability-collaboration-and-interdisciplinary-education>

Schwartz, M., & Hollander, D. (2000). Annealing, distilling, reheating and recycling: bitumen processing in the Ancient Near East. *Paléorient*, 83–91.

- Shenoy, P. (2016). A Study on History of Paper and possible Paper Free World. *International Journal of Management, IT and Engineering*, 6(1), 337–355.
- Sikdar, S. K. (2003). Sustainable development and sustainability metrics. *AIChE journal*, 49(8), 1928–1932.
- Sinek, S. (2009). *How Great Leaders Inspire Action*. Retrieved from [https://www.ted.com/talks/simon\\_sinek\\_how\\_great\\_leaders\\_inspire\\_action?language=en#t-674011](https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action?language=en#t-674011)
- Sparkes, A. C. (1996). The fatal flaw: A narrative of the fragile body-self. *Qualitative inquiry*, 2(4), 463–494.
- Spilsbury, L. (2016). *Johannes Gutenberg and the printing press*. New York, NY: Rosen Publishing Group, Incorporated.
- Spry, T. (2001). Performing autoethnography: An embodied methodological praxis. *Qualitative inquiry*, 7(6), 706–732.
- Stokes, J., & Gorman, A. (2010). Encyclopedia of the Peoples of Africa and the Middle East. *Online Edition, The Safavid and Qajar dynasties, rulers in Iran from, 1501, 707*.
- Strange, T., & Bayley, A. (2008). *Sustainable Development: Linking economy, society, environment*. OECD Publishing. Retrieved from <https://www.oecd.org/insights/sustainabledevelopmentlinkingeconomysocietyenvironment.htm>
- Suib, S. (2013). *New and future developments in catalysis* (1st ed.). Amsterdam: Elsevier

Ltd.

Suwa, M., Gero, J., & Purcell, T. (2000). Unexpected discoveries and S-invention of design requirements: important vehicles for a design process. *Design studies*, 21(6), 539–567.

Svanström, M., Lozano-García, F. J., & Rowe, D. (2008). Learning outcomes for sustainable development in higher education. *International Journal of Sustainability in Higher Education*, 9(3), 339–351.

Sykes, B. E. (2014). Transformative Autoethnography An Examination of Cultural Identity and its Implications for Learners. *Adult Learning*, 25(1), 3–10.

Tanzifco. (2014). Municipal Waste [Business Profile]. Retrieved from <http://www.tanzifco.com/en/services/municipal-waste/>

Tierney, W., & Lincoln, Y. (Eds.). (1997). *Representation and the text: Re-framing the narrative voice*. Albany: State University of New York Press.

The Economist. (2007). The truth about recycling [Newspaper]. Retrieved from <http://www.economist.com/node/9249262>

The Media Line. (2009). The Middle East Is Drowning In Waste. *Green Prophet Newsletter: Sustainable News for the Middle East*. Retrieved from <http://www.greenprophet.com/2009/11/middle-east-garbage/>

The Swiss Confederation. (2009). *National Reporting to CSD 18/19 by Switzerland – Waste Management* (p. 11). New York: United Nations (UN). Retrieved from

[http://www.un.org/esa/dsd/dsd\\_aofw\\_ni/ni\\_pdfs/NationalReports/switzerland/waste.pdf](http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/switzerland/waste.pdf)

Thomas, V. M. (1997). Industrial ecology: towards closing the materials cycle. *Journal of Industrial Ecology*, 1(2), 149–151.

Trimingham, R., Lofthouse, V., Norman, E., Bhamra, T., & Zanker, N. (2008). An Integrated Approach to Sustainable Design Education. In *DS 46: Proceedings of E&PDE 2008, the 10th International Conference on Engineering and Product Design Education, Barcelona, Spain, 04–05/09/2008*.

Trochim, W. (2000). *The Research Methods Knowledge Base* (2nd Edition). Cincinnati, OH: Atomic Dog Publishing. Retrieved from <http://www.socialresearchmethods.net/kb/sampron.php>

Umair, S., Anderberg, S., & Potting, J. (2016). Informal Electronic Waste Recycling in Pakistan. *The Journal of Solid Waste Technology and Management*, 42(3), 222–235.

UNDP. (2016). About Kuwait. *United Nations Development Programme [UNDP]*. Retrieved from <http://www.kw.undp.org/content/kuwait/en/home/countryinfo>

UNESCO. (1977). *International Strategy for Action in the field of Environmental Education and Training for the 1990s*. Tbilisi, United Nations Educational, Scientific and Cultural Organization [UNESCO] with United Nations Environment Programme [UNEP].

UNESCO, & UNEP. (1992). UNCED The Earth Summit. *Connect*, XVII(2), 1–8.

Retrieved from <http://unesdoc.unesco.org/images/0015/001535/153549eo.pdf>

UNESCO. (2005). UN Decade of Education for Sustainable Development 2005–2014.

United Nations Educational, Scientific and Cultural Organization. Retrieved from

<http://www.wwf.se/source.php/1312773/DESD%20at%20a%20glance.pdf>

UNESCO. (2016). Education for Sustainable Development (ESD) [International

Organization]. United Nations Educational, Scientific and Cultural Organization.

Retrieved from

<http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/>

United Nations. (2015a). Consensus Reached on New Sustainable Development Agenda

to be adopted by World Leaders in September [Intergovernmental Organization].

Retrieved from

<http://www.un.org/sustainabledevelopment/blog/2015/08/transforming-our-world-document-adoption/>

United Nations. (2015b). Sustainable Development Goals [Intergovernmental

Organization]. Retrieved from <https://sustainabledevelopment.un.org/sdgs>

United Nations. (2015c). Goal 3: Ensure healthy lives and promote well-being for all at

all ages [Intergovernmental Organization]. Retrieved from

<http://www.un.org/sustainabledevelopment/health/>

- United Nations. (2015d). Goal 6: Ensure access to water and sanitation for all [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/water-and-sanitation/>
- United Nations. (2015e). Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/energy/>
- United Nations. (2015f). Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/economic-growth/>
- United Nations. (2015g). Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/infrastructure-industrialization/>
- United Nations. (2015h). Goal 11: Make cities inclusive, safe, resilient and sustainable [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/cities/>
- United Nations. (2015i). Goal 12: Ensure sustainable consumption and production patterns [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/sustainable-consumption-production/>

- United Nations. (2015j). Goal 13: Take urgent action to combat climate change and its impacts [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/climate-change-2/>
- United Nations. (2015k). Goal 14: Conserve and sustainably use the oceans, seas and marine resources [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/oceans/>
- United Nations. (2015l). Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss [Intergovernmental Organization]. Retrieved from <http://www.un.org/sustainabledevelopment/biodiversity/>
- United Nations. (2016). Transforming our world: The 2030 agenda for sustainable development [Intergovernmental Organization]. Retrieved from <https://www.un.org/development/desa/socialperspectiveondevelopment/issues/sustainable-development.html>
- United Nations General Assembly. (2005). *Resolution adopted by the General Assembly* (World Summit Outcome No. 60/1.) (pp. 1–38). United Nations. Retrieved from <http://goo.gl/Qbh0zL>.
- United Nations Statistics Division [UN Statistics Division]. (2011). Environmental indicators: Municipal waste treatment. Retrieved from <http://unstats.un.org/unsd/environment/wastetreatment.htm>

- United States Central Intelligence Agency [CIA]. (2014). Kuwait. *The World Factbook*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/ku.html>
- United States Environmental Protection Agency [U.S. EPA]. (2013, December 13). *What is sustainability?* EPA.gov
- United States Forest Service [U.S. Forest Service]. (2013). About Conservation Education. Retrieved from <http://www.fs.usda.gov/main/conservationeducation/about>
- University of Southern Indiana. (2017). Paper Recycling Facts [Academic Institution]. Retrieved from <https://www.usi.edu/recycle/paper-recycling-facts/>
- Vanderbilt, T. (2012). How Biomimicry is Inspiring Human Innovation. *Smithsonian Magazine*. Retrieved from <http://www.smithsonianmag.com/science-nature/how-biomimicry-is-inspiring-human-innovation-17924040/>
- Vezzoli, C. (2003). A new generation of designers: Perspectives for education and training in the field of sustainable design. Experiences and projects at the Politecnico di Milano University. *Journal of Cleaner Production*, 11(1), 1–9.
- Vocabulary.com. (n.d.). Collectivism. *Vocabulary.com*. Retrieved from <https://www.vocabulary.com/dictionary/collectivism>
- Von Mises, L. (2012). Chapter 5: On some popular errors concerning the scope and method of economics. In *The Ultimate Foundation of Economic Science* (pp.

- 66–93). Indiana: Liberty Fund. Retrieved from  
<https://mises.org/library/ultimate-foundation-economic-science/html/p/201>
- Waas, T., Hugé, J., Block, T., Wright, T., Benitez-Capistros, F., & Verbruggen, A. (2014). Sustainability assessment and indicators: Tools in a decision-making strategy for sustainable development. *Sustainability*, *6*(9), 5512–5534.
- Wang, Y. (2014). On green packaging design in packaging design. *Advanced Materials Research*, *971–973*, 2251–2254.
- Ward, G. W. R. (2008). *The Grove Encyclopedia of Materials and Techniques in Art*. Oxford University Press.
- Watt, M. (2010). Has green news reporting gone green? An analysis of geographically diverse newspapers' online and print coverage of climate change. *First Monday*, *15*(10).
- Waxman, O. B. (2016). The History of Recycling in America Is More Complicated Than You May Think. *Time*. Retrieved from:  
<http://time.com/4568234/history-origins-recycling/>
- Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability science*, *6*(2), 203–218.
- Wolff, L. A., Sjöblom, P., Hofman-Bergholm, M., & Palmberg, I. (2017). High performance education fails in sustainability? — A reflection on finnish primary

- teacher education. *Education Sciences*, 7(1), 1–22. Retrieved from <http://www.mdpi.com/2227-7102/7/1/32/htm>
- Worldmark Encyclopedia of Nations. (2007). Kuwait. Retrieved from <http://www.encyclopedia.com/doc/1G2-2586700210.html>
- World Bank. (2010). *Theories of behavior change*. Communication for Governance and Accountability Program (CommGAP). Washington, DC: World Bank. Retrieved from <http://documents.worldbank.org/curated/en/456261468164982535/Theories-of-behavior-change>.
- Woschnack, U. (2000). *Environmental education in Switzerland: ESSENCE report*. ETH Zürich, Professur für Mensch-Umwelt-Beziehungen (pp. 1–21). Retrieved from <http://dx.doi.org/10.3929/ethz-a-004105566>
- Yeni. (2011, September 14). Re: Recycling in Kuwait [Web log comment]. Retrieved from <http://248am.com/mark/kuwait/recycling-in-kuwait>
- Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). California: Sage publications, Inc.
- Younkins, E. W. (2005). Rousseau's General Will and Well-ordered Society. Retrieved from <http://www.quebecoislibre.org/05/050715-16.htm>
- Zafar, S. (2016). The Menace of Landfills in Kuwait. *EcoMENA*. Retrieved from <http://www.ecomena.org/landfills-kuwait/a>
- Zahedieh, N. (2010). *The Capital and the Colonies: London and the Atlantic Economy*

1660-1700. Cambridge University Press.

Zajkowska, M. (2015). Development and implementation of sustainability-oriented innovation in polish small and medium-sized enterprises. DOI: 10.17626

Zsóka, Á., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, 48, 126–138.

## APPENDIX

Official invitation letter sent via email to participate in this doctoral research.

### UNIVERSITY OF MINNESOTA

---

*Twin Cities Campus*

*Department of Curriculum and Instruction  
College of Education and Human  
Development*

*125 Peik Hall  
159 Pillsbury Drive SE  
Minneapolis, MN 55455  
Office: 612-625-4006  
Fax: 612-624-8277*

**Subject:** Invitation to Participate in Sustainable Design Interview – Study No. 1611E00242

Dear [First Name],

Since Sustainable Design is an emerging academic field worldwide, literature on educational standards, criteria, and evaluations are limited. As a Ph.D. candidate researching this field at the University of Minnesota, my concern is that academic programs, which focus solely on theory, may inhibit practical applications for sustainable design students in the real-world.

Through conducting interviews with designers implementing sustainability in their profession, I intend to identify a set of practical skills necessary for sustainable design students to acquire during their academic matriculation. Data from the interview will be important to further improve sustainable design education practices and curricula. The culmination of this research will be used to write the dissertation for my Ph.D. degree.

You were selected to participate in this important phone interview to share your experiences as a Designer for Sustainability. **Interviews will be approximately 30–40 minutes in length and each participant will receive a \$25 Amazon e-gift card within 24 hours of completion.** Participants will have the option to engage in a follow-up interview for which they will receive an additional \$25 Amazon e-gift card. Participation in this interview is completely voluntary and you may opt out at any time.

**If you are interested in participating, please email me at [almud003@umn.edu](mailto:almud003@umn.edu) by Wednesday February 22, 2017.** Interviews will be scheduled during February and March of 2017. By agreeing to participate, you will be giving your consent for me to audio-record your interview and publish your responses. However, your identity will be ethically protected and remain confidential. If you have any questions about this research, feel free to contact me or my research advisor Dr. James Bequette at [bequette@umn.edu](mailto:bequette@umn.edu). If you have any questions about the rights of research subjects, please contact the University of Minnesota IRB's Research Subjects' Advocate Line at (612)625-1650.

Thank you for your time. I hope you will be a part in this important research!

Sincerely,  
Sara Almudhaf  
Ph.D. Candidate / Principal Investigator  
Curriculum & Instruction—Arts in Education Program  
College of Education & Human Development  
University of Minnesota—Twin Cities

Interview consent form based on the International Review Board guidelines.

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Curriculum and Instruction  
College of Education and Human  
Development

125 Peik Hall  
159 Pillsbury Drive SE  
Minneapolis, MN 55455  
Office: 612-625-4006  
Fax: 612-624-8277

**INTERVIEW CONSENT FORM**

Participation in Sustainable Design Interview  
Study No. 1611E0024

You are invited to participate in a research about sustainable design. You were selected as a possible participant because you have a graduate-level degree in Design for Sustainability and professional experience in design. We are seeking to understand your experiences in order to help us identify a set of practical skills necessary for sustainable design students to acquire during their academic matriculation to ultimately improve sustainable design education and curricula.

**Purpose**

The purpose of this interview is to describe the practical experiences of sustainable designers during their education and professional career.

**Procedures**

If you agree to participate, we will conduct a 30 to 40-minute semi-structured interview asking for your opinions, learning outcomes, and experiences. You will have the option to participate in a follow-up interview of a similar length.

**Risks of Participation**

This research poses very minimal risks to human subjects, based on the Institutional Review Board (IRB) at University of Minnesota (UMN). You may refuse to answer any question that may make you feel uncomfortable.

**Compensation**

You will receive a \$25 Amazon e-gift card within 24 hours of interview completion. If you decide to engage in a follow-up interview, you will get an additional \$25 Amazon e-gift card.

**Confidentiality**

Your interview responses and researcher field notes will be kept confidential in a secure, safe location at the UMN and only the researcher will have access to those materials. The participant will be assigned a pseudonym along with published excerpts. Your identity will be ethically protected and remain confidential. At the completion of this research, all soft and hardcopy data will be securely destroyed.

**Voluntary Nature of the Study**

Participation in this interview is completely voluntary and you may opt out at any time. Your decision of whether or not to participate in this research will not affect your relationship with the UMN.

**Contacts and Questions**

Any questions or comments you may have now or later about this research, interview, final report, or presentation may be directed to me at [almud003@umn.edu](mailto:almud003@umn.edu) or my research advisor Dr. James Bequette at [bequette@umn.edu](mailto:bequette@umn.edu). For questions about the rights of human subjects, you are encouraged to contact the University of Minnesota IRB's Research Subjects' Advocate Line at (612)625-1650.

\_\_\_\_\_ **Initial** to give your permission to record audio.

\_\_\_\_\_ **Initial** to give your permission to publish de-identified excerpts from your interview.

\_\_\_\_\_  
Participant Date

\_\_\_\_\_  
Principal Investigator Date

\_\_\_\_\_  
Research Advisor Date