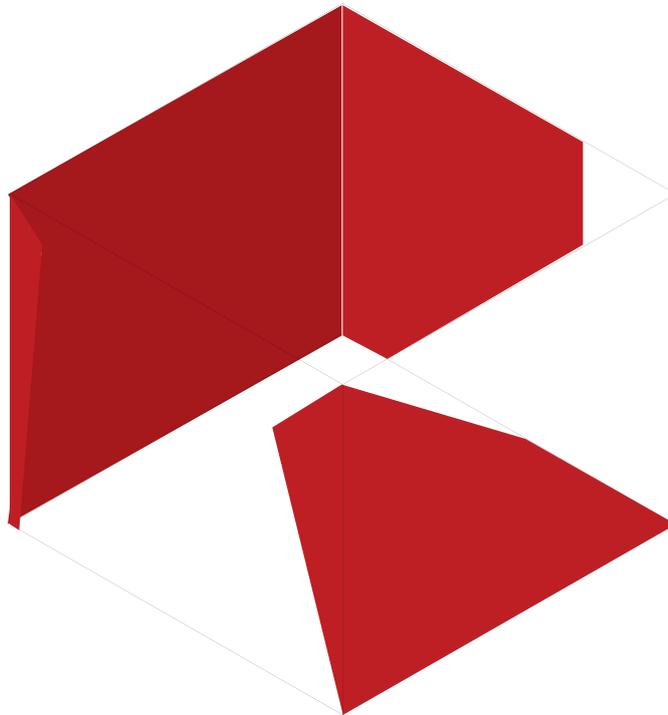


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The “Nature” of Design Education: teaching design fundamentals in an outdoor classroom

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Abstract: This article details the on-going research and development of an innovative, card based system for design curriculum named “Fundamentals in Nature.” This system is used to teach design fundamentals in an outdoor classroom guiding students on an analogue journey of discovery in the natural world. Through developing appreciation for the natural world, design students develop skills that are more conceptual, sustainable, well rounded and connected. The need for this approach is supported by research revealing the current generation of students are losing touch with their natural environment. By utilizing the outdoors as a classroom, students are able to experience first-hand relationships between design and the natural world. This unexpected relationship fosters expansive thought processes, and serves as a context for a consciousness of their use of materials in professional practice. The natural environment combined with the collaborative nature of the exercises, creates a strong foundation for sustainable design concerns in future designers.

Key Words: Design curriculum, design fundamentals, outdoor classroom, card system

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Introduction

Design educators have a well-established tradition of teaching the fundamental principles of form. The elements and principles of design are the basis of ubiquitous visual language. While many theorists approach the specifics of this language differently, they all acknowledge its importance as a foundation for the education of visual communicators. Early nineteenth-century Gestalt theorists such as Max Wertheimer, Wolfgang Kohler and Kurt Koffka have been lauded for their studies that inform the perceptual aspects of visual language. Their studies of perception brought understanding to unique physical and psychological aspects of sight. Through their research, they developed seven Gestalt Principles of Perception: figure ground, equilibrium, isomorphic correspondence, closure, proximity, continuation, and similarity. These principles form much of our understanding of visual perception and are the underpinnings of design education.

The Bauhaus (*Das Staatliches Bauhaus*) and Basel School (*Allgemeine Gewerbeschule*) are both recognized as cornerstones of graphic design education. Walter Gropius established the Bauhaus in 1919 at Weimar, Germany. Several Bauhaus instructors published books on design education that emphasized the premise of design elements and principles. Wassily Kandinsky published *Point and Line to Plane* in 1926. Kandinsky saw his book as a systemization of his theoretical ideas in which he sought to establish certain analytical methods while taking relational or compositional values into account. His goal was to illuminate how the basic elements are viewed. Johannes Itten wrote *The Art of Color, The Elements of Color and Design and Form*. In his writings he recognized the basic laws of color and form, proportions and texture, and rhythm as the foundation of his concept of art education.

The Basel School's graphic design program developed from the rich heritage of the Swiss graphic design scene of the 1950s and 1960s. Two revered instructors from this school also produced books that underscored the importance of foundational elements and principles of design. Armin Hofmann published *Graphic Design Manual Principles and Practice* in 1965. Hofmann believed line, plane, surface, color, material, space, and time should be presented to students as a coherent whole. His addition of this new dimensional view called for an extension of the principles of design.

In 1967, another instructor from the Basel School of Design, Emil Ruder, released *Typography—A Manual of Design*. In his book, Ruder illustrates the elements and principles of design through examples of his work, student work and historic reference. He illustrates through typography design elements and principles such as: point, line and surface, form and counter-form, proportions, contrast, color, unity, rhythm, spontaneity and fortuity, variations and kinetics.

Instructors from these established schools have not been the only ones to promote the elements and principles of design as the essential basis for design education. In 1972, Wucius Wong authored *Principles of Two-Dimensional Design*. He hoped to develop a visual logic by which students could be led to understand the elements of design, the possibilities of organizing them and the limitations. In 1973, the MIT press published *A Primer of Visual Literacy* by Donis A. Dondis. The goal of Dondis' book was to examine the basic visual elements and the psychological and physiological implications of creative composition. Dondis parallels visual literacy with verbal literacy, stating that visual literacy must operate within the same boundaries. One of the more recent editions to this list of foundational design books is Christian Leborg's 2006 release of *Visual Grammar*. Leborg pulls from the theorists



and authors before him such as Wong and Dondis and develops his own unique perspectives of syntax. Each of these books builds upon the premise of a visual language based on the elements and principles of design. This tradition of design education has stood the test of time and laid the foundation for contemporary design education.

Today the elements and principles of design continue to be the foundation used to help students learn how to express themselves visually, create compositional control and communicate most effectively. The elements of design, such as: dot, line, shape, color, tone, texture, scale, dimension, surface, volume, letter form and format, continue to be the basic building blocks we introduce to students for form creation. The principles of design (or compositional aspects) are the variables we introduce to help students shape the relationships between the elements most effectively. While they range dramatically according to educator and theorist, typical design principles include: direction, balance, rhythm, movement, contrast, emphasis, concentration, harmony, sequence, radiation, transparency, weight and positive/negative space. Many educational programs also extend design fundamentals to additionally introduce students to perceptual understanding with the Gestalt Principles of Perception (figure ground, equilibrium, similarity, isomorphic correspondence, closure, continuation and proximity). The Gestalt Principles of Perception help students consider how to utilize design elements and principles to communicate most effectively based on human cognition. The use of these design fundamentals as a foundation for design education unites designers throughout history and around the world.

However, a changing student demographic calls for further consideration of the ways in which visual language is taught. Do the traditional methods of teaching the elements and principles of design address the changing educational backgrounds of students and their learning styles? While contemporary graphic design students benefit equally from a solid understanding of the elements and principles of design, they are very different from the students of the 1920s—or even the 1970s. How might we take our understanding of the current generation into consideration when teaching design fundamentals?

One of the largest and most impactful advents in the field of graphic design has been the introduction of the computer. The computer and vast technology of the software which accompanies it has not only changed the way design is produced and practiced, it has had a large role in shaping the individuals that now fill the seats of classrooms. The design students of today are from the ‘Net’ generation (those born between 1977–1999) who have only known a life embedded with digital technology. The ‘Net’ generation has had access to super-realistic video games, the Internet, e-mail, instant messaging, online communities, videos, and music that can be downloaded at will. This level of interactive technology is shaping the ‘Net’ generation’s culture, values, and world outlook. In teaching, not only is it important to consider the information that needs to be delivered, but also the nature of the audience receiving it. What then might be a unique and valuable way of delivering information to such a ‘plugged-in’ generation? Is it possible to conceive educational formats that would reconnect our students with their very real surroundings?

Perhaps the natural world can provide the connection technology has severed for this generation. In *Last Child in the Woods*, author Richard Louv states today’s ‘Net’ generation “is aware of global threats to the environment, but their physical contact and their intimacy with nature is fading.” (Louv, 2005, p. 1) His book investigates the increasing divide between youth and the natural world and the environmental, social, psychological, and spiritual implications of that change. The evidence of a generational break from nature is growing in the United States. Louv cites several examples in his book:

In 1986, Robin Moore, a professor of landscape architecture at North Carolina State, chartered the shrinkage of natural play spaces in urban England, a transformation of the landscape of childhood that occurred within a space of fifteen years. In 2002, another British study discovered the average eight-year-old was better able to identify characters from the Japanese card trading game Pokéman than native species in the community where they lived: Pikachu, Metapod, and Wigglytuff were names more familiar to them



than otter, beetle and oak tree. Similarly, Japan’s landscape of childhood, already down-sized, grew smaller. For almost two decades the well-known Japanese photographer Keiki Haginoya photographed children playing in the cities of Japan. In recent years, “children have disappeared so rapidly from his viewfinder that he has had to bring this chapter of his work to an end,” Moore reports. “Either indoor spaces have become more attractive, or outdoor spaces have become less attractive—or both.” Moore, who is president of the International Association for the Child’s Right to Play and director of the Natural Learning Initiative, cites such causes as poorly designed outdoor spaces; the rapid growth of domestic air-conditioning since the 1950s; apprehensive parents who keep their children close to home; state-mandated school curricula that do not allow time for study outdoors; and the overly structured lifestyle of many families. (Louv, 2005, p. 33)

In *The Green Imperative* Victor Papanek theorizes that deeply embedded in our collective unconscious is an intuitive awareness of our relationship to the natural world. This awareness has gone through drastic pendulum swings throughout human history. However, mankind seems more distant now than ever. As Papanek points out:

During the last century two major changes have occurred that contribute to the human disconnect from the natural world. First, we have nearly all—at least in the northern half of the globe—moved indoors. There are still jobs that take us outdoors, but even a farmer plowing their field sits in an air-conditioned cab, and most of us spend our time in homes, cars, workplaces, or public buildings. The second change is that we have now attained the power to change the natural order of the earth and throw it out of harmony. (Papanek, 1995, p. 15)

The “pendulum swings” of the human relationship with nature is visualized in the use of nature in art. Primitive people made use of the natural elements to depict themes of their relationship with the natural world on the walls of caves. Baroque artists perceived a harmonious ideal in nature as represented in oil painted landscapes. In the eighteenth century the concept of the sublime as an aesthetic quality in nature distinct from beauty was brought forward. Nineteenth-century artists ushered in concerns with ideas of truth and beauty. It was also in the nineteenth century that a dramatic increase in industry caused an adverse impact on the environment that was immediately visible, which many nineteenth-century authors penned concern about. Later in the century, avid outdoorsmen and naturalists like John Muir, encouraged people to enjoy the beauty of the wilderness. In the twentieth and into the twenty-first century there were dramatic shifts in the attitudes towards nature. Over the past few decades there has been a transition from representation of nature to fashioning or utilizing it, as seen in the works of Robert Smithson and Andrew Goldsworthy. Their work represents both a new take on the picturesque, and a development towards a less framed way of depicting nature. Today many artists focus on nature in their work through the lens of urban issues and environmental investigations about sustainability. Artists today take into account both the crisis facing nature and the crisis in the definition of nature (King, 2010).

In the space of a century, the American experience of nature has gone from direct utilitarianism to romantic attachment to electronic detachment. At a time when many are seeking emotional satisfaction from their computers while sitting indoors, exposure to the natural world provides a foundation essential for the human experience. As art historian, Elaine A. King asserts:

Nature—as with a painting, sculpture or building—only becomes significant when we make an active connection with it. Like a canvas in a gallery, a landscape or aspect of the natural comes to life in the eyes of the people who look at it. The act of observation in nature and not as a virtual experience brings about a very different experience that is capable of sometimes posing questions. In return, the observer confers meaning on the



works of nature, and, artists and the hybrid forms produced through human action on the environment, and transmit that meaning to others. (King, 2010)

Design educators have an opportunity to develop a rich connection through nature by bringing the design classroom outdoors. This gives students the chance to experience the natural world in a way many never have before. It removes students not only from the indoor classroom environment, but also the computer. Students in this outdoor experience are asked to turn off their cell phones, leave digital equipment behind, and use traditional hand skills such as drawing and sketching to express their experience and explore design fundamentals. Using the outdoors as both the content and context for the exercises reinforces design fundamentals and fosters a better understanding of the environment. This first-hand experience provides a relationship between design and the natural world, helping students expand their thought processes through an unexpected connection. As students learn how to observe and better understand nature, an inherent concern and respect develops. This reconnection with nature will create a design approach based on value and a deeper respect for the environment and audience, as well as establish a foundation for the tenants of sustainable design. At the core of our humanity is the fact that our survival and existence is inextricably tied to the natural world. This is a lesson students of all disciplines must learn. It is all too easy to forget, as we surround ourselves in a man-made existence that becomes our superficial reality.

Methods

Initial investigations for this project involved defining and understanding sustainability's relationship with graphic design, focusing specifically on environmental aspects. Interviews and discussions with students revealed a lack of understanding for sustainability's need for a design approach that balances societal, economic and environmental concerns for future generations. It was clear to most that design could have strong social and economic impact, but the environmental aspects and connections were less clear. While many felt environmental considerations in design such as recycling were a “good thing to consider”, there was an overall disconnect regarding their potential role as future designers and environmental stewards— potentially fuelled by this generation's growing disconnect with the natural world. Ultimately, it was determined the changes that needed to take place would not occur until individuals felt vested and connected. The focus became narrowed to reconnecting design students with the natural world. This connection establishes a sense of concern and responsibility as they develop into professional designers. Several avenues of this methodology were explored, distributed, and field-tested.

Beginning investigations evolved around the concept of guiding students to nature. The idea of creating a guidebook to the natural world was first explored. This guidebook had a series of documented methods that involved immersion in nature, which instructors could duplicate, modify, or enhance.

Development for the natural guidebooks began by creating a taxonomy of nature and travel guide materials. These materials were found to share key characteristics. One of the most important was allowing individuals to enter experiences or environments new to them with a degree of knowledge and certainty. Such a foundation establishes a base for exploration and discovery. Instructions on how to use the book or guide are often located in its introduction. Most guides contain history, maps, facts, and trivia. Their format is often small for ease of portability, and text and image are typically equally weighted.

Writing the instructions for these guidebook proved to have many challenging aspects. Initial approaches were inspired by the Situationists' *dérive* practice. In this practice, the Situationists aimlessly wander with no destination, soaking up a city's ambience. In field studies over the course of a week with undergraduate volunteers it was found that these methods encouraged experimentation and experience, however they lacked connection and meaning for participants. The next approach looked at methods that utilized childhood memories of a natural play area contrasted with a current visit to the same place. Continuing to strive toward immersive experiences, which created greater meaning and connection for the participant,



the next explorations focused on utilizing the human senses. While these methods better focused participants on the natural world, they did not provide learning opportunities to connect students with the natural world and their obligations to it as future designers.

The idea of a guidebook was re-evaluated. A guidebook alone would not get students outside. Instead, an opportunity for a wholistic or completely immersed experience was needed to help make a connection with the natural world. It was at this juncture the importance and relevance of Gestalt theory became apparent. Gestalt’s theoretical base is the belief that an approach to understanding and analysing all systems requires recognition that the system (or object or event) as a whole is made up of interacting parts. The parts can be isolated and viewed as completely independent and then reassembled into the whole, but no part of the system can be changed without modifying the whole.

Gestalt psychologists have contributed valuable experimentation and research in the area of perception, collecting data and analysing the significance of visual patterns. They are also interested in how humans see and organize visual input and articulate visual output. The way in which elements come together creates the meaning and purpose of the visual statement and carries strong implications for what the viewer receives. Gestalt ideology not only takes into consideration the visual foundations upon which design is built, but also echoes one of the most valuable messages the natural world has to teach us: that everything is connected.

Gestalt theory, combined with the precedent “City Walks: Rome”, informed the final content and form of the project. “City Walks: Rome” was not a book, but a box of cards published by Chronicle books that created a non-traditional travel guide. Each card contained a description of a one-day, self-guided walking adventure with insider information about a Roman neighbourhood and a map on the reverse side. Another set of instructional cards encountered during the research development process was the IDEO Method. IDEO is an innovation and design firm that uses a human-centered, design-based approach to help organizations generate products, services, and capabilities. The IDEO cards offer discrete methods that can be used to keep people at the center of the design process. They are an example of a flexible card-based system that supports the design process and exploration of a range of design methods. The IDEO cards help structure design thinking, employ observation skills, encourage exploration and utilize methodological prompts. All of these are key features to a robust design investigation and important to include in the “Fundamentals in Nature” card system. Both the IDEO cards and “City Walks: Rome” provide a way of presenting information that is flexible, portable and engaging to the viewer—ideal for an outdoor classroom environment.

At this juncture, the potential form and content were realized for the “Fundamentals in Nature” card system. The form would be a deck of educational cards, and the content would address design fundamentals (elements, aspects of composition, and Gestalt Principles of

Perception). The next phase involved gathering specific content for the cards that related to nature. Then the system and methods structuring the use of the cards was developed. Initial trials had students go to a natural area with the cards, find an example of the visual grammar listed on the card and create a visual record of it. This route was rejected because of its didactic nature that introduced theory to students before they had an opportunity to discover and experience environmental conditions on their own. Josef Albers’ *Interaction of Color* (1963) was recognized as a pedagogical precedent. Albers’ teachings emphasize the importance of experimentation and discovery before the introduction of theory. A series of three task cards were developed which sent students to a specific natural area. This approach provided opportunity for individual discovery within a structured task. This left the understanding of foundational design grammar to occur after their task. After each student completed their individual task they reassemble as a class to be introduced to the theories of



design fundamentals and begin to apply them to their designs through a process of co-construction. In this manner a framework for the card system was developed which emphasizes intuition, experimentation, theory, and then the application of these ideas to create an artefact representative of their experience.



Figure 1: Still image of selected settings in the tool 'Sync' designed to chart full body movement capture and representation (Lise Hansen)

Project Realization

After developing the “Fundamentals in Nature”, it was determined additional components were necessary for its introduction to students. Therefore a companion booklet was developed to provide directions to the instructors (figure 1). The booklet addresses several topics: descriptions of card categories, suggested use of cards, suggestions for inclement weather, a complete supply list, bibliography, and discussion topics for possible outcomes.

The “Fundamentals in Nature” card set is comprised of four categories: Task cards, Element cards, Composition cards, and Gestalt Perception cards. The student begins with a task card. There are a range of tasks that focus on different activities in the outdoors (figure 2). Each task category has three task cards representing three steps in the process. The first step leads the student to an intuitive approach; next they apply a theoretical approach and, finally, develop a visual solution. The task cards guide the student through the steps of the experience; while the element, composition and Gestalt perception cards introduce the formal aspects of visual communication. Each task card describes a task on the front and provides a visual of design precedent on the back, along with interesting facts and details of the precedent’s designer. The front side of the element, composition and perception cards show a visual example and written definition of the element or principle they represent. The reverse side of these cards integrates aspects of the natural environment, providing natural facts and learning points.



CATEGORIES + CARD SUBJECTS (each circle below represents a card):

TASK CARDS	ELEMENT CARDS	COMPOSITION CARDS	GESTALT PERCEPTION CARDS
SOUNDSCAPE <ul style="list-style-type: none"> intuitive theoretical applied 	<ul style="list-style-type: none"> Dot Line Shape 	<ul style="list-style-type: none"> Direction Balance Rhythm 	<ul style="list-style-type: none"> Figure ground Equilibrium Similarity
NATURAL COLLECTION <ul style="list-style-type: none"> intuitive theoretical applied 	<ul style="list-style-type: none"> Color Tone Texture 	<ul style="list-style-type: none"> Movement Contrast Emphasis 	<ul style="list-style-type: none"> Isomorphic correspondence Closure Continuation
MICRO-MACRO <ul style="list-style-type: none"> intuitive theoretical applied 	<ul style="list-style-type: none"> Scale Dimension Surface 	<ul style="list-style-type: none"> Concentration harmony sequence 	<ul style="list-style-type: none"> Proximity
OBSERVATION <ul style="list-style-type: none"> intuitive theoretical applied 	<ul style="list-style-type: none"> Volume Letter form Format 	<ul style="list-style-type: none"> radiation transparency weight positive/negative 	

Figure 2. The four categories of the “Fundamentals in Nature” card set : Task cards, Element cards, Composition cards, and Gestalt Perception cards.

For example, if the student starts with the “Soundscape” task category they are instructed to go out into the natural environment and visualize sound with the first task card. A precedent is given on the back of the card to help get them started. On the “Soundscape” task card the precedent provided is the work of Kandinsky. After the student has completed the assignment on the first task card, they return with their classmates and view one another’s sketches. At this point the student receives the other card categories (the element, composition and Gestalt Perception cards). The rest of the cards depict elements and principles of design, which the students can use to discuss possible improvements for their work. Through co-construction the entire class begins to understand the theories and formal aspects at work within their compositions. The second task card instructs them to apply what they have learned from the element, composition and perception cards by adding to, or recreating, their initial composition. In the final step, the third task card (of the “Soundscape” task) asks the student to create a poster representing and communicating their experience of the “Soundscape”. This final step encourages students to consider their relationship to their natural surroundings while exploring the challenging task of visualizing abstract thoughts and design concepts.

The card series is structured for use in an outdoor classroom. Ideally this means an area that allows students to easily immerse themselves in the natural world, where man-made sounds, structures and objects are at a distance. However, a natural classroom does not always entail travelling to a dedicated nature area. It may be as simple as exploring one’s own backyard.

Field trials show potential for the use of the “Fundamentals in Nature” card system to generate in students an interest and respect for the natural world, as they learn about the elements and principles of design and Gestalt perception. This approach adds value and conceptual connection to the teaching of graphic design.





Figure 3. The first field trial of the card set done with high school campers was taken to the third level “Soundscape” task card for which they created a computer-generated representation of their experience.

Field Trials

Field-testing “Fundamentals in Nature” has been implemented through a series of over-night art and design camps held at the University for high school students (ages 15-17). Both trials explored the “Soundscape” task with students of the same age. The trial showed not only potential improvements for the system, but also the possible scalability for their use over a range of ages and populations.

To enhance the learning opportunities and reinforce the environmental aspect of the experience, a professional naturalist was enlisted. The naturalist led a nature hike that ended in an open area where the “Soundscape” task series performed. The beginning of the nature hike escorted students through a native prairie. This provided an opportunity to educate them regarding the loss of 99% of the native prairie landscape of their home state. Most of the students were unaware of this important environmental fact and its repercussions.

The first field trial using the “Soundscape” task with the high school campers took the students through to the final phase of the task in which a computer-generated poster of their experience was created (figure 3). It was found with this age demographic the emphasis of executing the final artefact on the computer diluted the initial environmental experience. With the introduction of computer technology, these young students were less vested in initial theoretical investigations and the reiterative design process. As soon as the computers were introduced, their desire was to focus on the technological tool—not the design process. Also important for this demographic was limiting the number of element, composition and perception cards. The concepts introduced on the cards were new, so it was better to introduce them in a small quantity. This approach was less overwhelming and students were more easily able to digest and understand the content of each card. Post project write-ups from these students focused almost solely on the computer techniques learned and little of the design fundamentals and environmental experience. This reinforces the research and understanding of this generation, who are digital natives, focused on technology. Careful consideration of the structure of the experience to move beyond technology must be taken when something as intriguing and comfortable as the computer is introduced to these students.

In the second field trial of the same age demographic (15-17 years old) the final iteration was limited to a final composition in colored pencils (figure 4). This differed from the first field trial by eliminating the distraction and learning curve of the computer to generate the final piece, thus allowing the students to focus and invest in the reiterative design process through hand renditions. Final compositions from this process were stronger: more expressive and compositionally complex. At the end of the exercise, students seemed to recall a more thorough balance of design fundamentals tied with their natural experience. These observations were compared through the students’ post-project write-ups.





Figure 4. In the second field trial of the same age demographic the final iteration was limited to a final composition in colored pencils.

Conclusions and Future Directions

In both field trials, students cited spending a period of quiet time while they sketched natural sounds to be both unusual and enjoyable. Several students said it was not typical for them to take time in silence to contemplate and reflect. While it may seem banal to some, this is an important part of the design process that many of the current “plugged-in” generation do not benefit from due to existing socio-cultural constructs. The age groups in the initial field studies were young for an advanced approach to form and concept; however, the card system proved effective as a framework for discovery and exploration. It is worthwhile to consider how these experiences might become a strategic part of design curriculum.

Initial trials of “Fundamentals in Nature” reinforced that the importance of this project lies not in a polished artefact, but rather the process and path that led to its creation. This is an important difference between design education and the professional practice of design. Focusing on solid process ensures design students are prepared with solid methodology to address the varied challenges they will face as professionals. In order to best prepare students for the future, design curriculum must invest in a thorough understanding of design basics. Equally important for future designers is emphasizing the reiterative process and engaging them in environmental and societal discussions. The need for students to have a thorough understanding of technology cannot be ignored; however the focus must be on balance. Once a strong understanding of the environmental and societal consequences of design and the value of a reiterative design process are firmly in place, technology may then be added.

Young designers must be taught the importance of balancing the needs of the environment, society and economy for future generations. Students who rely on technology to develop highly polished artefacts with a less robust design process and focus on the expressive and emotional qualities communicated in a design will not be suited to meet this challenge. We are wise to no longer blindly embrace technology as the answer, but understand and consider its advantages and disadvantages. Research is now uncovering the detrimental effects of technology on the environment and children who have grown up enmeshed in a plugged-in era. This project demonstrates innovation in design education, and how concerns for the environment and society may be included in curriculum development. It is not a specialization, but an opportunity to make considerations of sustainability a part of the educational process and discussion—thereby adding value and experience to design education by focusing the students on their relationship to the natural world. This approach illustrates how design can be taught in a meaningful manner by focusing on experience, process, and conceptual connection.

“Fundamentals in Nature” has significant opportunities for expansion. Many of the directions could be encapsulated in an accompanying Website. A Website would create an opportunity to provide the design instructor with more examples, discussion points, and references. While each task card presents an art or design precedent relating to the nature of the task, a Website could create the opportunity to provide a greater range and depth of visual precedent as well as discussion points. The Website could be an area to present



examples of designs that balance the needs of economy, environment and society.

Through the development and initial field-testing of “Fundamentals in Nature”, the potential value of its contributions to design education and its scalability has been established. Future directions will entail further development through field trials with a range of demographics. It is hoped a publisher may be found to make “Fundamentals in Nature” available for design education purposes and public use.



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