PERCEPTIONS OF ENVIRONMENTAL INFLUENCES ON CREATIVITY IN LANDSCAPE ARCHITECTURE DESIGN STUDENTS

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Dedication

For my family, both biological and "adopted", who have supported me throughout the years. It never came easy, but it was always worth the effort.

"The tree that never had to fight

For sun and sky and air and light,

But stood out in the open plain

And always got its share of rain,

Never became a forest king

But lived and died a scrubby thing...

Good timber does not grow with ease:

The stronger wind, the stronger trees;

The further sky, the greater length;

The more the storm, the more the strength.

By sun and cold, by rain and snow,

In trees and men good timbers grow."

-Douglas Malloch, excerpt from "Good Timber"

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Abstract

Ball State University landscape architecture students (*n* = 42) described their preferred types of environments for doing creative work as well as reported the environmental factors that hindered their creative work. Being alone and having quiet, ambient noise were the most common preferences for beneficial environmental characteristics. Bad lighting, uncomfortable temperatures, and loud, incongruous noises were most frequently reported as detrimental environmental characteristics. The presence of natural elements and/or access to views of natural elements were also common responses. The findings of the study largely support the current research on creativity and preferred working environments; however, there were some notable differences in the hierarchy of preferences within this subpopulation that should be further examined. Some discernable environmental preference profiles and patterns appeared in the survey responses. The results of this study are a starting point for further research on creative environment preferences of specific user subpopulations.

Chapter I: Introduction

INTRODUCTION + STATEMENT OF THE PROBLEM

The world and its issues are becoming increasingly complex, knowledge-intensive, and quick to change, resulting in a greater need for flexible, highly creative, and innovative-thinking problem solvers in academia and the workplace (S. Brown, 2008; Stehr, 1994). However, these qualities may be more fragile and susceptible to environmental influences than once thought. Inadequately designed environments may have a significant detrimental effect on individuals' creative thinking and work. "Creativity is undermined unintentionally every day in work environments that were established—for entirely good reasons—to maximize business imperatives" (Amabile, 1998,p. 77). Design students may be placed in these types of ineffective environments daily and are expected to intensively engage in the creative process for significant periods of time during which they are to perform high-quality creative thinking and work. Attempting this type of work in environments that are insufficient or incompatible with user needs may cause significant physical and psychological consequences such as difficulty concentrating (Kaplan, 1993; Schwartz & Kaplan, 2000; Singer & Baum, 1983; Toplyn, 1999), and/or elevated levels of stress, anxiety, fatigue, and burnout (Kaplan, 1995; Karasek, 1979; Smith, Michael, & Hocevar, 1990; Schwartz & Kaplan, 2000; Singer & Baum, 1983; Ulrich, 1993). However, students whose work takes place in well-designed environments that meets their needs may potentially benefit from several positive effects, such as reduced stress and frustration, improved overall performance, and more creative solutions (Amabile *et al.*, 1996; Burge *et al.*, 1987; Dorgan & Dorgan, 2000; Ekvall, 1996; Huang, Robertson, & Chang, 2004; Kaplan, 1993; Lorsch & Abdou, 1994a, 1994b; McCoy & Evans, 2002; Oldham & Cummings, 1996; Schwartz & Kaplan, 2000; Singer & Baum, 1983; Stokols, Clitherow, & Zmuidzinas, 2002; Ulrich, 1993; Woods, 1989; Wyon, 2000).

Earlier research involving creativity has typically covered the topic as a concept interrelated with personality traits (e.g. Barron & Harrington, 1981; Guilford, 1959; MacKinnon, 1970; Maslow, 1959), as the generation of a new artistic or intellectual product resulting from a series of defined mental process (e.g. Simonton, 2003; Rogers, 1959; Runco, 1990), or as a generative process that is highly involved with, and influenced by, the individual's social and cultural contexts (Amabile, 1983; Lasswell, 1959; Stein, 1963). However, despite identifying the physical environment as an important influence on creativity (Amabile, 1988; Hemlin, Allwood, & Martin, 2008; Huang, Robertson, & Chang, 2004; McCoy, 2002; McCoy & Evans, 2002; Stokols, Clitherow, & Zmuidzinas, 2002), little empirical research has been done to examine or test how these influences are specifically affecting an individual's perceptions or functioning of their creative processes, particularly for design students. This paper examines research from several different fields and professions in order to better understand the established and theoretical links between the physical environment and individuals' perceptions of how their surroundings support or inhibit their creative process. In addition, the findings from the existing literature provide the framework for understanding the outcomes from original survey data from landscape architecture design students in order to determine if gaps exist in the current field of knowledge. Identifying these gaps will help generate future research specifically targeted toward discovering more accurate design criteria for the development of effective spaces for students frequently engaged in creative work. For those involved I the design of colleges and professional firms, this knowledge can serve as a basis for optimizing conditions to enhance creativity in students and employees.

RESEARCH QUESTIONS

The primary goal of this research is to investigate how environmental conditions might affect the creative process in landscape architecture students and how to use that information to develop guidelines for evaluating and creating environments that facilitate the different stages of the creative process. From this general focus, several supplemental sub-questions were raised. These include:

1) What needs and preferences do landscape architecture students have that differ from those of the general public?
2) How do preferred conditions differ at different stages in the creative process?
3) What thematic patterns in student preferences can be developed into typologies of creative spaces?
4) How can these needs and preferences for creative spaces be addressed through design?
5) How do the spaces currently provided for students to work in help or harm their creativity?

The author's overall hypothesis was that the results from the survey would echo the same themes as those largely present in the current research literature, but would differ slightly according to each respondent's particular preference profile. The secondary hypothesis was that landscape architecture students would identify general shared preferences for restorative environments, as well as contemplative and playful environments, though to a lesser degree.

DELIMITATIONS

The delimitations to the study were:

1. Though they may influence creativity, and although studio spaces are sometimes used as classrooms, this study excludes teaching and learning environments because formal learning

involves specific mental processes and methods that differ from those utilized during the creative process.

2. The focus of this study is facilitating the creative process rather than emphasizing the final creative output or product.
3. This study focuses on the aspects of creativity that can be addressed, directly or indirectly, by environmental design. Therefore, issues such as intrinsic motivation, curriculum, and institutional policies may be briefly referenced for context but will not be covered in-depth or included in the final analysis end product of this study.
4. This study is designed to apply to landscape architecture students, programs, and studios that heavily emphasize design and creative solutions to complex problems.
5. The final survey was comprised of only 3 broad, open-ended questions instead of the much longer and more thorough original survey draft. This was done to reduce the amount of studio class time to administer the survey. Given the purely voluntary participation of respondents, the shorter survey was also meant to increase participation.
6. For convenience, this survey study was conducted with Ball State landscape architecture students only.
7. Other design disciplines in the College of Architecture and Planning were omitted from this study to preserve clarity in the data.
8. This study was designed as a pilot to identify gaps in knowledge between existing literature and the themes identified through this empirical research. Therefore, the emphasis was placed on identifying the most critical issues rather than accurately measuring and representing preference statistics.

9. This paper assumes the reader has at least some background knowledge and understanding of design principles and application.

ASSUMPTIONS

1. Landscape architecture students do much of their creative work in and around the College of Architecture and Planning.
2. The physical and social environment has an effect on the creative process of some individuals.
3. Students are able to identify environmental conditions that affect their creative process.
4. The administration of the survey was not time-sensitive relative to the phase of creativity the students were engaged in at the time of taking the survey.
5. Students will answer the survey questions openly and honestly.
6. Students will be able to recall and report influential environmental conditions without needing to be prompted.
7. Everyone has the potential to be creative.

DEFINITION OF TERMS

The following terms and definitions serve to clarify the meaning of the author with respect to the contents within this paper alone, and are by no means the official or complete definitions of said terms.

- Affect- an individual's psychological state; comparable to "emotion" but is distinct from "mood"
- Arousal- degrees of mental and/or physical stimulation
- CAP- the "College of Architecture and Planning" building on Ball State University's campus

- Creative environment- the space in which one does creative thinking or creative work
- Creative thinking- any thought process which aims to produce novel concepts, solutions, or methods, or seeks to produce some outcome that differs from traditional solutions
- Creative process- the creative process used here is based on Sawyer's (2012) 8-step process including identifying the problem, acquiring problem-related information, gathering a broad range of potentially relevant information, incubation, generating a large variety of ideas, combining and developing ideas in unexpected ways, selecting the best ideas and applying relevant criteria, and externalizing the final idea(s) using materials and representations
- Creative work- any work which engages the individual in their own creative process; most often with the goal of producing some individually novel or innovative outcome or product; (e.g. writing, designing, painting, drawing, etc.)
- Directed attention- the notion of voluntary attention one consciously focuses on an item or task that requires some element of effort; it inhibits distractions and is highly subject to fatigue by prolonged mental effort
- Directed attention fatigue- characterized by the degraded capacity to concentrate, focus, and perform tasks that require mental acuity
- Individually novel- an idea, process, product, or other outcome that is new or novel to the individual, though it may or may not be new or novel to society as a whole
- Landscape architecture students- undergraduate students majoring in landscape architecture that are at least in their second year of study; graduate students majoring in landscape architecture
- Remote association-making connections or combinations between unrelated items

- Restorative environment- a specific design typology that seeks to reduce stress and mental and emotional fatigue by adhering to a particular set of design guidelines
- Stress- any stimulus that causes physical, mental, or emotional tension in an individual
- Studio- the collective room where students are each given a desk and space to work on their projects with collective tables and wall space for conducting group discussions

Chapter II: Review of Literature

INTRODUCTION

Design students spend many years in college and much of that time is spent engaging in creative processes. Universities spend millions of dollars constructing and renovating spaces to be used by students for this type of work on their campuses. However, if these spaces are not being designed effectively in order to facilitate students' creative processes then both parties suffer negative consequences. Students can potentially experience greater levels of stress and anxiety and/or perform more poorly on creative tasks, and universities will have wasted money on constructing poorly performing spaces that may lead to poorer academic performance in its students, potentially affecting future student enrollment and access to government funding.

Many previous studies exist on improving the school and workplace environments; however, there is much less information on designing effective studio spaces and creative environments specifically for design students who often spend a significant portion of their time highly engaged in creative processes. Researchers in the field of creativity have developed a variety of environmental conditions that may facilitate, or at least not hinder, a general individual's efforts during different stages in the creative process. Many of these conditions are related to psychological concepts, such as control and affect, which can be indirectly manipulated or addressed through specific targeted design principles and interventions. The following chapters examine the existing literature in related fields of study to identify the individual and environmental conditions that may significantly affect the way a student engages in their creative process, and describe the potential design interventions that may be applied in order to facilitate these conditions.

CREATIVITY

Generally speaking, "the study of creativity has largely been the province of educational, social, and personality psychologists. The time is ripe for environmental design researchers to get into the act" (McCoy & Evans, 2002, p. 425). Indeed, there is great opportunity that lies in the combination of these fields of research and its applications. The following chapters sample research from creativity, educational psychology, cognitive neuroscience, environmental psychology, and environmental design disciplines in order to better understand how the qualities and design of an environment can potentially affect a person's creative processes.

In order to examine creativity, it must first be defined within the context of the study. However, due to the abstract nature of this phenomenon, this task can be rather difficult to accomplish. Who and what is considered creative varies historically and culturally. However, the two main contemporary schools of thought in creativity research that are the most applicable to this study include the cognitive approach and the sociocultural approach (Runco, 1990; Sawyer, 2012). The cognitive approach focuses on the singular individual. Those belonging to this school of thought define creativity as "a new mental combination that is expressed in the world" which "refers only to structures and processes that are associated with a single person" (Sawyer, 2012, p. 7). Many of the earlier modern studies in creativity done by traditional psychologists and experimental cognitive psychologists in the 1970s and 1980s were conceived under this construct which began to focus on the cognitive processes that take place during creative behavior (Houtz, 2003; Runco, 1990; Sawyer, 2012). Under this approach, creativity "is novel for the person, but it doesn't have to be the first time it's ever been done by a human being" (Sawyer, 2012, p. 35). For example, this could include figuring out a shortcut on the drive to work; improvising on an old recipe; or using a water bottle as a make-shift terrarium. This school of thought tends to be reductionist in nature whereby "they analyze creativity by decomposing it into smaller units of thoughts and

behavior" (Sawyer, 2012, p. 35). By breaking down the highly complex construct of creativity into a series or collections of distinct mental processes, researchers are better able to isolate, experiment, and analyze each piece as a fundamental component of the larger whole. Most of the empirical research reviewed in this chapter takes this approach as its framework is designed to facilitate scientific inquiry into complex phenomena.

During the 1980s and 1990s, a new interdisciplinary school of thought began to be used in conjunction with the cognitive approach. This movement in creativity research, the sociocultural approach, focuses on creative people as they work together within social and cultural contexts (Runco, 1990; Sawyer, 2012; Seitz, 2003). This approach defines creativity as "the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group" (Sawyer, 2012, p. 7). This definition maintains that in order for a person to be considered "creative", they must produce some socially valuable product. This concept is comparable to the term *innovation* within organizations.

While the constructs of the cognitive approach are mainly located within the human mind and are generally associated with psychology and neuroscience, "the sociocultural definition emphasizes, in contrast, that creativity doesn't only emerge from human minds; many natural and social processes can generate appropriate novelty" (Sawyer, 2012, p.30). This approach centers on the concept that creativity "is the result of processes of social transaction" (Stein, 1963, p. 218) by which "social factors can support, undermine, or neither support or undermine each other's creativity" (Runco, 1990, pp. 154-155). This takes into account and emphasizes the role and influences of the social and cultural contexts in which the creative behavior is occurring.

These two approaches are complementary. While one describes the creative process undertaken by the individual, the other explores the influences of the surrounding context in which

those processes take place. Thus it is necessary to explore and engage both approaches in order to better understand the many different factors of creativity. Since the design of an environment can affect conditions and reactions both within an individual and within a larger social/cultural context (which, in turn, subsequently elicits reactions and affects conditions within the individual), this paper must therefore also include aspects of both approaches.

Creative Product VS. Creative Process

Much of the research that exists on creativity focuses on identifying personal characteristics and attributes of the individual that have been associated with creative achievement (Barron & Harrington, 1981; Davis, 1989; Martindatale, 1989; Hemlin, Allwood, & Martin, 2008; Oldham & Cummings, 1996; Sawyer, 2012); however, it is important to remember that landscape architecture design students can be a very diverse group with widely varied backgrounds, skills, interests, motivations, and cognitive styles. Therefore, the research for this project must consider a broader approach in order to be more relevant and widely applicable within design studio environments and other creative spaces. In order to minimize the intricacies and inherent complexities of measuring and analyzing individual creative ability or capacity of each member of the chosen subpopulation, this paper assumes that everyone taking part in the research has the potential to be creative and focuses on how the individual engages in their own creative process. Simply put, the goal is not to measure creativity or creative potential within particular individuals or within a group. Rather, this paper focuses on facilitating the *creative process* in both highly creative and less creative individuals, and everyone in between; thereby addressing the goal of wider application in a diverse population. Also, this study does not attempt to identify or maximize the creativity of the individual's process itself. Instead, the research aims to facilitate the processes and stages students use to do creative work or thinking by providing beneficial qualities (e.g. access to

resource) and by removing obstacles in their environment that may hinder their progress (e.g. distractions).

The Creative Process

Creativity is a complex and dynamic concept. Therefore, it is often easier to break it down into a process with defined steps and activities/tasks. The simplest and oldest way of modeling the creative process is by dividing it into two modes of thinking: divergent and convergent. Divergent thinking modes are those where many ideas are generated and convergent thinking modes are those where many ideas are simplified or when one chooses a single solution from many ideas. It is important to understand the difference between these two ways of thinking as they often require very different environmental settings and mental conditions. This general two-part model is helpful to describe the basic fundamentals of the creative process, but various newer models proposed by philosophers and psychologists attempt to describe the process in a much more detailed manner.

For simplicity and brevity, this paper uses a model for the creative process adapted from Sawyer's (2012) integrated framework that combines several of the leading models in the field. This particular model was selected based on its completeness, relevance, and applicability to the design process of a typical design student's methodology.

Sawyer's Eight Stages of the Creative Process:

1. Identify the problem: involves redefining ill-defined problems that lend themselves to a creative solution
2. Acquire problem-related information: involves gathering domain-specific knowledge from which to draw in later stages of the process

3. Gather broad range of potentially relevant information: involves gathering general background knowledge that may or may not initially appear directly relevant to the problem
4. Incubation: involves taking time off and letting the unconscious mind process and associate the gathered information in unpredictable ways
5. Generate a large variety of ideas: involves ideation through conscious attention to the given problem
6. Combine and develop ideas in unexpected ways: involves making connections and associations and often includes developing and/or combining existing concepts in novel ways—the beginning of the convergent mode
7. Select the best ideas and applying relevant criteria: involves choosing the best solution to the given problem from the previous stages of ideation and development
8. Externalize the idea using materials and representations: involves the communication of ideas through creative production

   (Sawyer, 2012, p. 89)

These steps are covered more thoroughly throughout the following sections and chapters. It is important to note that creativity is not necessarily a linear process, as the common misconception generally suggests. Rather, creativity stems from a variety of cyclical mental processes that can be related to each of the eight stages listed above. Smaller cycles within the larger framework are common. For example, one may generate many ideas, then choose one and develop it, then find a new piece of information which then leads them to generate many more ideas from which they choose a new concept to develop. The following sections and chapters elaborate on these steps and the specific conditions that are beneficial to each phase.

These eight stages are highly generalized and were developed to be loosely applied across a broad canvas. This means that some subpopulations may vary within this larger conceptual framework, such as design students. Their creative processes and/or their needs and preferences for their creative environments may differ from those of the general population. If so, it is necessary to consider their specific needs in order to design an environment in which they can function more effectively. There is evidence to suggest that different disciplines have different cognitive and social styles (Becher, 1989; Delamonte, Atkinson, & Parry, 2000) in addition to the different cognitive and social styles and designer types within single disciplines (Sancar & Eyikan, 1998). This indicates that there may be a greater need for more discipline-specific studies to provide more accurate and applicable knowledge within the current research literature. “It is architects and architectural educators who must now step forward and, while benefiting studies on creativity in other fields, try to form their norms in this area. To be imaginative and creative architects, imagination and creativity must be present at many levels, some purely artistic, others scientific and professional” (Habib & Ebrahim Jafari, 2006, p. 361).

Creative Climate of Landscape Architecture Design Students

A landscape architecture instructor in Sancar and Eyikan’s study (1998) identified a common issue for the profession, “in some ways the variety of opportunities that landscape architects are able to respond to is one of the strengths, but it's also a weakness.... People see us doing a lot of everything and yet they don't know what we do” (p. 382). Indeed, landscape architecture is a very broad field. And as a design profession, problem solving is at its core. Often the types of problems that these designers are called upon to solve are” ill-defined” and commonly involve a wide variety of topics, concepts, disciplines, domains, and knowledge bases. “Creativity, by most accounts, involves a similar process of pulling together disparate, often opposing thoughts” (Houtz, 2003, p. 7). The following sections describe

the different stages of the creative process and how they may relate to a typical landscape architecture design problem.

Step 1: Finding the Problem

"Question: How many Imagineers does it take to change a light bulb?

Answer: Does it have to be a light bulb?" (Imagineers , 1996, p.11).

Finding the problem often involves redefining the given "ill-defined" problems or identifying a completely new problem altogether. Design students are typically trained to employ design-thinking tactics which involves looking at a problem from many viewpoints, redefining problems in response to various different factors, etc. Students are commonly given loosely-defined, open-ended problems with no clearly-defined solution, which often do not have just one right answer. These types of problems require much more divergent thinking skills and require creativity to come up with and select the best answer. Design problems are highly complex due to sophisticated relationships between various related systems. As a result of the dynamic interactions between these systems and the unique attributes of each site, no two design problems are exactly alike and no two design solutions will be exactly alike. The highly irregular natures of these types of problems do not lend themselves to formulaic solutions. As a result, the design process is largely an exercise in creative problem-solving where the students are expected to define the problem in their own terms and discover their own methods of solving the problem. This process in itself is a complex creative process and "complexity requires creativity" (Titchen & Horsfall, 2011, p. 35).

Steps 2 + 3: Information Gathering

These steps in the eight-stage model involve gathering information from various sources. This includes acquiring problem-related information and domain-specific knowledge from which to draw, as well as potentially relevant general background knowledge (Sawyer, 2012; Hemlin, Allwood, & Martin, 2008). In a study of architecture and landscape architecture professors, Sancar and Eyikan (1998) found that the most common sources of knowledge and creative inspiration used in their studios were: "reading (criticism, history, other) and learning about precedent studies; distantly followed by students' communication and contact with others and their motivation and intuition; and finally, instructors and lecturers, and making things" (Sancar & Eyikan, 1998, p. 387). These findings accentuate the importance of providing and facilitating access to wide variety of source material during these stages (Hemlin, Allwood, & Martin, 2008). Landscape architecture, in particular, is a diverse field that draws from many different disciplines and types of knowledge. The most common related disciplines include environmental fields, natural sciences, and other design-related fields (Sancar & Eyikan, 1998). Since many of these fields and design problems require at least a baseline knowledge of how many systems work and interact, this stage is critical for the student. However, landscape architecture is not just a science, it is also art. Therefore, this stage also includes finding sources of artistic inspiration, such as a site's cultural heritage and traditions.

Step 4: Incubation

During the incubation stage, one takes time off and lets the unconscious mind process and associate old and new information in unpredictable ways. This subconscious rumination often takes place when a person is walking, exercising, dreaming, daydreaming (Singer, 1975; Epstein, 1996), or playing (Runco, 2007). Incubation does not necessarily require one to be completely away on a tropical

vacation. Rather, creative insights can occur when thinking about a different problem or while thinking or working on a different project. Epstein (1996) suggests that "that individuals have their best ideas while in bed, the bath, or on the bus" and emphasizes the usefulness of daydreaming based from his previous research regarding the idea of *resurgence* (Epstein, 1990). Creative insights often occur "when individuals experience a state of calm, relaxed openness" (Runco, 2007, p. 348). This period of rest is important and has been shown to improve originality in at least one study (Houtz & Frankel, 1992).

Step 5: Idea Generation

The idea generation stage engages the divergent thinking mode while ideation takes place as a result of conscious attention to the given problem. This step is associated with moments of insight and the prolific genesis of numerous ideas and concepts. This is the stage where students often engage in sketching and other graphic representations. This sketching process is highly emphasized in design studios as a method of recording ideas, exploring ideas, testing ideas, and communicating ideas to oneself and others. A lot of the research and connotations associated with creativity focus on this divergent mode. However, "creativity may require a great divergence of thought, but it is also requires a perseverance and singleness of purpose sufficient to see a way through conflict, confusion, and insecurity" (Houtz, 2003, p. 7).

Step 6: Idea Combination and Development

This next stage involves making connections and associations and often includes developing and/or combining existing concepts in novel ways. This is beginning of the convergent thinking mode where instead of focusing on generating many ideas, many ideas are combined or filtered down to a few. Students take their best ideas and combine them into concepts that they explore and develop in

finer detail. As Ian Mount describes, “creativity is a function of knowledge, imagination, and evaluation. The greater our knowledge, the more ideas, patterns, or combinations we can achieve. But merely having the knowledge does not guarantee the formation of new patterns; the bits and pieces must be shaken up and interrelated in new ways. Then the embryonic ideas must be developed into usable ideas.”

Step 7: Idea Selection + Applying Constraints

Once the concepts have been developed and explored in finer detail, one must choose the best solution to the given problem. This involves applying the constraints of the original problem and conforming the solution to operate within those particular parameters. This important step is what makes the solution viable. This is where the background knowledge in multiple systems (e. g. hydrology, geology, seasonal and temporal change in plant material, zoning, transportation, nutrient cycles, ecological communities) and how they interact becomes important. Each interaction between systems is a new potential problem to solve for the designer.

Step 8: Communicating the Idea/Production

Selecting the best ideas involves evaluating the many previously generated ideas and converging upon a single solution. The externalization, or communication, of those ideas is often referred to as “creative production” and can often become a major creative process in and of itself for design students. There are many ways of communicating design ideas in landscape architecture, though graphic communication is heavily in the field as well as developing supplemental descriptive narratives.

CREATIVE ENVIRONMENT RESEARCH

This section outlines some of the most common research topics addressing some of the different physical, social, and individual aspects of creative environments. The first topics covered explore the possible links between stress, productivity, and one's immediate environment. Then the research is grouped into three categories: (1) those that address the physical microclimate, (2) those that address individual psychological and cognitive factors, and (3) those that address the social environment and conditions.

Health + Productivity

Performance depends on mental alertness (Clements-Croome, 2000). Fatigue, lethargy, and environmental conditions and stressors negatively affect mental alertness (Clements-Croome, 2000). Highly functioning physical and cognitive processes are easier for a body that is running more efficiently. Easing these processes reduces stress and strain on the individual. "Health is the outcome of a complex interaction between the physiological, personal, and organizational resources available to the individual and the stress placed upon them by their physical environment, work, and home life. A deficiency in any one of these factors increases the stress and decreases human performance" (Clements-Croome, 2000, p. 5). "The mind and body need to be in a state of health and well-being for work and concentration. This is a prime prerequisite for productivity" (Clements-Croome, 2000, p. 4). A body that is healthy and productive can be interpreted as efficient (Bedford, 1949). When a body is running efficiently, higher quality output is maximized while expenditure of resources is minimized without sacrificing performance. Efficiency and productivity also leads to the ability to "learn more effectively, and work more creatively, and hence sustain stress more effectively…and respond to work situations more positively" (Clements-Croome, 2000, p. 8; NEMA, 1989). The following sections describe the literature

findings on environmental influences that affect health, productivity, and preferences as they relate to either facilitating or inhibiting an individual's engagement in the creative process.

Physical/Climatic Conditions

A majority of the most empirical data reviewed for this paper comes from research done on workplace environments and productivity, particularly those studies regarding physical climatic conditions. Some of the most commonly reported highly influential indoor environmental factors include: temperature, humidity, room air motion/draughts, and air quality regarding contaminants/particulates (Dorgan & Dorgan, 2000); noise; harsh or inadequate lighting; agitation due to sunlight and/or glare; and crowded work spaces (Clements-Croome & Kaluarachchi, 2000; McCoy, 2002; McCoy & Evans, 2002). On average, poor indoor environmental quality can result in approximately a 10% decrease in office productivity (Clements-Croome & Kaluarachchi, 2000; Dorgan & Dorgan, 2000), but can range anywhere between 2 to 100% if it is severe enough to shut down the building (Dorgan & Dorgan, 2000; Hansen, 1991). Much of the research suggests that an individual performs better when they are not distracted by the physical climatic conditions of their environments such as poor lighting, poor air quality, uncomfortable furniture, and temperatures that are too hot or too cold (McCoy, 2002; Runco, 2003; Smith, Michael, & Hocevar, 1990; Singer & Baum, 1983; Veitch, 2000).

Some studies have presented curiously contradictory findings, though maintaining general agreement on key issues (Leaman & Bordass, 2000). For example, Pepler and Warner's (1968) findings reported that placing young people in uncomfortably cold conditions for short periods of time actually resulted in higher productivity. Another study by De Dear *et al.* (1993) found that 74.3^{o} F is generally the preferable office temperature according to office employee preferences; however, approximately thirty-five percent of office employees preferred warmer or cooler temperatures. This significant discrepancy

in comfort tolerances and individual preferences across populations sharing the same space further emphasizes the need for some amount of personal control over influential environmental conditions in an individual's immediate workspace (Wyon, 2000). In a study of over 4000 office workers, Burge *et al.* (1987) found that self-reports of productivity increased as the level of individual control over temperature, ventilation, and lighting increased. Throughout all the studies reviewed, providing more individual control of microclimate conditions is generally considered desirable and beneficial.

Many of these studies suggest that use of natural materials, moderate complexity of visual details in the environment, presence of windows (especially with views onto natural environments), and avoidance of cool colors and of manufactured or composite surface materials may stimulate creative performance (McCoy & Evans, 2002; Kaplan, 1995; Kaplan, 1993; Ulrich, 1993). Though these conditions are important to an individual's overall performance, this paper focuses more on cognitive and social conditions that are suggested as having more of an effect on an individual's creative performance.

Surroundings + Context

Plants in the Interior Landscape

Despite the multitude of studies on the effects of nature in the outdoor landscape, significantly less information has been generated about the beneficial effects of plants and nature in the interior landscape (Bringslimark, Hartig, & Patil, 2009; Goodwin, Pearson-Mims, & Lohr, 1994; Shibata & Suzuki, 2002). A majority of those studies that have been done seem to have generated a highly heterogeneous body of work regarding methodology and results that arise from the effects of numerous variables involved in studying this phenomenon (Bingslimark, Hartig, & Patil, 2009). However, some work has shown to be rigorous and more reliable by utilizing a more systemic approach such as Shibata and Suzuki's 2002 study that suggests "the presence of leafy plants might affect creative work positively" (p.

265). Exploring the applications for the interior landscape is critical for the study of workplace environments. A large part of daily life occur indoors, particularly the landscape architecture student who often works long hours and whose stacks of drawings and dim computer screens keep them from working outside. During the winter months when most of the outdoor vegetation has died back or lays dormant and the weather becomes increasingly inhospitable, the interior landscape becomes an even more predominant domain of daily life. However, much of the research, particularly regarding workplace environments, tends to focus mainly upon improvements in air quality and the availability and access to outdoor nature or views of nature. More information about the role of human-plant relationships is included in the section on restorative environments.

Individual Psychological + Cognitive Factors

Psychological and cognitive factors are those that relate to mental state and/or condition, thinking skills, intellectual processes, cognitive functioning, etc. These factors are more focused on the individual aspect of creativity but can be directly influenced by the individual's larger sociocultural context as well as their responses and interactions with their surrounding physical environment. There is a wide body of research on many of these individual factors. For brevity, the rest of this chapter identifies and covers only the most common themes found in the research literature that are also the most relevant to the project goals.

Control

One of the most common concepts suggested by researchers across disciplines is the level of control one has over their own physical environment and themselves. This can be applied at different scales and expressed in many ways. For example, at the organizational level, "Andrews and Farris (1967)

showed that teams of scientists produced the most creative outcomes when their supervisors provided substantial freedom at work and many opportunities to influence important decisions" (Oldham & Cummings, 1996, p. 612) such as the ability to choose when one takes a break from their work (Beeftink et al., 2008). More information about freedom is included in the section on play environments.

Though considerations at the organizational level may be important to creativity, this paper mainly focuses on the individual level of control as it generally consists of the relationship the user has with their immediate surroundings and interactions. A large portion of the most applicable research regarding control comes from studies done for workplace environments, and much of this research involves the connection between control, performance, and stress. One such study by Glass and colleagues (1977) found that when workers had control over an external stressor (such as noise), complex task performance and error rate were both improved. The ability to have local control over environmental (climatic) conditions has also shown to be a significant factor in maintaining and improving work performance, job satisfaction, and group productivity, while reducing distractions (Drake, 1990; Clements-Croome, 2000). Other studies by Cohen (1980) and Karasek (1979) suggest that the "degree of control a person has over the stressor… partly determines the severity of the stress reaction" (Huang, Robertson, & Chang, 2004, p. 620). Similarly, the "lack of control and lack of predictability over events have been linked to reports of stress in people" (Huang, Robertson, & Chang, 2004, p. 620; Singer & Baum, 1983).

Generally, these qualities are mainly products of having a flexible/dynamic environment in which one has a significant amount of control over themselves and their environments through access to variety and freedom of choice. The research suggests that the environment in which a person generally functions best is an environment in which:

- Individual autonomy is stimulated/encouraged/permitted (Beeftink et al., 2008; Crutchfield, 1962; Hemlin, Allwood, & Martin, 2008; Rogers, 1954; Unsworth & Parker, 2002)
- Feels secure to express ideas (Epstein, 1996; Ekvall, 1996; Hemlin, Allwood, & Martin, 2008); includes perceived privacy
- Individual control over microclimatic conditions (Clements-Croome, 2000; Drake, 1990; Huang, Robertson, & Chang, 2004)
- Flexible/moveable/adjustable dynamic environments versus a static environment (Csikszentmihalyi, 1996; Huang, Robertson, & Chang, 2004; McCoy & Evans, 2002)
- Enclosure can be used as a method of enhancing the sense of control one has over their environment (O'Neill, 1993, 1994)

Arousal and attention

> "Humans do not passively respond to the environment, nor do they absorb information in a blind, unselective fashion…Admittedly, some kinds of information may be nearly automatically processed. These require very little attention and effort…But most cognition is effortful and requires the active participation of the individual. It is effortful in a literal sense. Certain resources, particularly attention, must be devoted to it" (Runco, 2003, p. 27-28).

In this paper the term *arousal* refers to degrees of mental and physical stimulation (Landy, 1985). It is frequently studied in regard to its relationship to environmental complexity. For example, high arousal is when there are high levels of mental or physical stimulation, often resulting from sensory or psychological cues from the surrounding environment such as visual detail or ambient noise. Stress is the body's physiological response to an agent that the individual perceives as threatening or unpleasant, called stressors. Examples of environmental conditions as stressors include harsh lighting,

uncomfortable temperatures, direct glare, or aversive noise. “Stress is linked to arousal because the response to such events can include a heightened state of neurological activation. Thus,…the goal is to create conditions that would lead to optimal arousal, while avoiding conditions that might act as stressors” (Veitch, 2000, p. 211). Environmental stressors often cause anxiety and divide attention (Smith, Michael, & Hocevar, 1990; Singer & Baum, 1993). This is thought to inhibit creative thinking due to the individual’s reallocation of attention to the stressor rather than rather than the task at hand (Smith, Michael, & Hocevar, 1990; Singer & Baum, 1983).

The leading theory regarding the nature of the arousal-environment relationship is what has come to be known as the Yerkes-Dodson Law (1908)(Broadhurst, 1959; Duffy, 1962; Anderson, 1988). This states that there is a positive, inverted U-shaped, relationship between performance and physiological or mental arousal. In other words, peak performance is related to moderate arousal. Further research has found that different types of tasks require different levels of arousal to facilitate optimal performance (Toplyn, 1999; McCoy & Evans, 2002; Kaufman & Vosburg, 2002; Landon & Suedfeld, 1972; Suedfeld, 1969). Cognitively demanding tasks needing higher levels of concentration require lower levels of arousal, and less-demanding tasks or those which take place over a longer period time may benefit from higher levels of arousal.

A more recent study by McCoy & Evans (2002) suggests that the relationship between arousal and cognitive functioning may be more complex and variable than the previous model might assume. Their findings concluded that higher spatial complexity and challenge within an environment can be more beneficial in the beginning stages of the creative process (McCoy & Evans, 2002). Additional research in cognitive neuroscience literature proposes that consistent spatio-temporal visual complexity in an environment is also important for optimal cognitive functioning (Albright, 2011). This theory is based on how the brain adapts to variation in environmental conditions. The process of adapting draws

resources from other parts of the brain. Consistent and "visually comfortable" environments cause less distraction, require less brain adaptation, and allow more of the brain's resources to be devoted to the task at hand (Albright, 2011). However, this is not to say that stark spaces are optimal for continuous creative engagement. Dubos (1971) believed that an individual restricted to a "featureless environment [would] suffer intellectually and emotionally" and that "the potentialities of human beings can become fully expressed only when the (physical) environment provides a wide variety of experiences" (p. 339). Other researchers such as Amabile (1983), Guilford (1967), Stein (1974), Kaplan (1993), Kaplan (1995), and Kaplan & Kaplan (1989) also suggested that visually interesting environments may be perceived as having higher creativity potential. Further information about stimulating and engaging environments is located in the Restorative Environments section.

Though not all of the research completely agrees, particularly with regard to optimal arousal conditions, a majority of the literature generally suggests that the optimal environmental conditions that facilitate attention, performance, and creativity include:

- Reduce stress for best performance (especially during divergent-Toplyn, 1999) (Runco, 2007; Ulrich, 1993; Krinke, 2005; Rogers, 1954)
- Reduce or remove environmental stressors (Smith, Michael, & Hocevar, 1990; Singer & Baum, 1983; Veitch, 2000)
- Moderate environmental arousal is best for optimal performance (Broadhurst, 1959; Duffy, 1962; Anderson, 1988; Toplyn, 1999)
- Different levels of arousal are optimal for different types of tasks (Toplyn, 1999; McCoy & Evans, 2002; Kaufman & Vosburg, 2002; Landon & Suedfeld, 1972; Suedfeld, 1969)
- Higher spatial complexity and challenge is best for the beginning stages of the creative process (McCoy & Evans, 2002; Unsworth & Parker, 2002)

- High levels of visual detail significantly enhanced perceived creativity potential of a setting (McCoy & Evans, 2002)
- Consistent spatio-temporal complexity reduces distraction and facilitates focus (Albright, 2011)
- Access to a wide variety of experiences and stimulation is optimal (Dubos, 1971)
- The absence of distraction is best for facilitating attention (Albright, 2011; Smith, Michael, & Hocevar, 1990; Singer & Baum, 1983; Stokols, Clitheroe, & Zmuidzinas, 2002; Veitch, 2000)
- Different levels of arousal for different tasks (low complexity for high concentration and vice versa) (Toplyn, 1999; Kaufman & Vosburg, 2002; Landon & Suedfeld, 1972; Suedfeld, 1969)
- Visually interesting environments are perceived as having higher creativity potential (Amabile, 1983; Guilford, 1967; Stein, 1974; Kaplan, 1993; Kaplan, 1995; Kaplan & Kaplan, 1989)

Complexity

Problem complexity has long been considered an essential contributor to an individual's intrinsic motivation, cognitive functioning, and creative performance (Amabile, 1988; Hackman & Oldham, 1980; Kanter, 1988; Oldham & Cummings, 1996; Suedfeld, Landon, & Ballard, 1983; West & Farr, 1989). "Specifically, complex, challenging jobs (i.e., those characterized by high levels of autonomy, skill variety, identity, significance, and feedback) are expected to support and encourage higher levels of motivation and creativity than are relatively simple, routine jobs (Deci, Connell, & Ryan, 1989; Hackman & Oldham, 1980)" (Oldham & Cummings, 1996, p. 610). "When jobs are complex and challenging, individuals are likely to be excited about their work activities and interested in completing these activities in the absence of external controls or constraints. The level of interest and excitement produced by a job's design is then expected to foster creative achievements at work. In addition, complex jobs may actually *demand* creative outcomes by encouraging employees to focus simultaneously on multiple dimensions

of their work, whereas highly simple or routine jobs may inhibit such a focus" (Oldham & Cummings, 1996, p. 610).

Affect

For the purposes of this paper, the term *affect* refers to an individual's psychological state. It is comparable to "emotion" but is distinct from "mood". For example, *positive affects* include states such as joy or excitement and *negative affects* include feelings such as anxiety and fear. Generally, positive affect is associated with enhanced access to memory, broadened attention, and overall enhanced well-being (Toplyn, 1999; Pannells & Claxton, 2008). Some studies suggest that "moderate intensity in affect, as with arousal, may enhance originality and divergent thinking" (Toplyn, 1999, p. 145) or "creative ideation" (Pannells & Claxton, 2008).

Research on the influence of affect suggests an important set of relationships that may greatly affect creativity. Toplyn's (1999) studies indicate that "positive affect enhances access to material in memory, a consequence of which is a broadening of attention. As ideas become simultaneously available, attention becomes less focused and a wider range of cue utilization emerges" (Toplyn, 1999, p. 145). Having access to a wide range of cue utilization generally results in more remote associations subsequently producing the potential for higher levels of originality which is a key component of creativity. Positive affect is also associated with risk-taking (Friedman *et al.*, 2003, Wallach & Kogan, 1965) and the benefits of social interaction and support networks on creativity; more of this is covered in later sections. However, having a consistently positive affect throughout the creative process is not necessarily optimal. In fact, some studies have shown that though having a slightly positive affect is optimal for divergent thinking tasks (Friedman *et al.,* 2003; Toplyn, 1999), having a slightly negative affect (and control) can be more beneficial during the later stages of idea production, or convergent

thinking tasks (Kaufmann & Vosburg, 2002; Kaufmann & Vosburg, 2003). Kaufmann and Vosburg's (2002) study findings "support the validity of the hypothesis that positive mood is most favorable under unconstrained solution requirements and most detrimental under constrained solution requirements" (Kaufmann & Vosburg, 2002, pp. 326).

Toplyn (1999) states that "it is possible to hypothesize that optimizing creativity includes an interaction of arousal and affect on attention. Arousal increases focus and discrimination in attention, while affect defocuses attention through increasing access to material in memory. Thus under moderately intense stimulation, the conditions may be present by which attention can be deployed to access a wide range of cues while at the same time retaining sufficient focus to discriminate among the quality of the available cues and discern those which mediate remote and original ideas. These conditions may be optimal for the kind of complex tasks, requiring diverse and original ideas, which lead to creative products" (Toplyn, 1999, p. 146). These complex relationships between arousal, affect, attention, and creativity is a provocative theory that could play a pivotal role in understanding the role of environmental conditions and their impacts on creativity.

Though affective states have been studied in psychological and sociological research literature, few of them focus on environmental design connections. One Based on Ulrich's findings (1993), he concludes that "because natural settings have been found to elicit positive emotional state, exposure to such environments may facilitate creative problem solving or high-order cognitive functioning via their ability to alter one's emotional state" (Ulrich, 1993, pp. 112). An individual's positive or negative emotional state can have a significant influence on performance and have shown to reliably influence memory recall and the process of creative problem solving (Ulrich, 1993, pp. 112), both of which are instrumental to the creative process. Additionally, positive emotional states are key in "cuing the retrieval of much larger amounts of better-connected information. Positive feelings in contrast to

negative feelings facilitate remote associations, integration, perception of related among different material, and creativity" (Ulrich, 1993, pp. 112). Therefore, by integrating environments that create and promote these positive emotional states into a work environment, students and faculty alike will be able to benefit from the positive effects on their emotional, physical, and mental health that have been linked with exposure to these types of environments.

The research on affect suggests that it is closely interrelated with other psychological and cognitive processes such as attention and memory (Toplyn, 1999; Friedman et al, 2003; Kaufmann & Vosburg, 2002; Wallach & Kogen, 1965; Ulrich, 1993). The reviewed literature generally agrees on how affective states can be used for facilitating creativity and producitivity:

- Positive affect (moderately intense) is optimal (Toplyn, 1999; Pannells & Claxton, 2008)
- Comedy or music (without words) facilitates positive affective states ((Hill, 2006)
- Positive affect is conducive to divergent (unconstrained) thinking tasks (wide associations and risk-taking), while slightly negative or neutral affect is optimal for later convergent (constrained) tasks (Friedman et al, 2003; Kaufmann & Vosburg, 2002; Wallach & Kogen, 1965)
- Natural settings elicit positive emotional states (Ulrich, 1993)
- Fill environment with diverse stimuli, and change them regularly (Epstein, 1996, p. 6)

The following section addresses social conditions and considerations. However, it is important to note that in certain cases "the distinction between social and cognitive aspects may be difficult to uphold because they are so closely intertwined (the cognitive tends to be shaped by the social processes which may, for example, affect motivation; the social is affected by understanding and skills)" (Hemlin, Allwood, & Martin, 2008, p. 201).

Social Climate

"Researchers still know surprisingly little about how the creative process works, especially within the context of complex social systems" (Woodman *et al.*, 1993, p. 316). This section is devoted to social climate and conditions that have been associated with the creative process. "The concept of *climate* relates to the subjective experience of various aspects of [a] psychological atmosphere" (e.g., Witt & Beorkrem, 1989) or to "behavior, attitudes and feelings common in the organization" (Ekvall & Ryhammar, 1999, p. 308) "and has been used to characterize the social microenvironment in the organization influencing creativity" (Hemlin, Allwood, & Martin, 2008, p. 198).

Social interaction is at its most useful during the early stages in the creative process, especially during divergent thinking modes, but it can easily become a distraction during the later convergent stages in the process. This illustrates one of the most critical aspects of a creative environment in that it not only needs to provide spaces for social interaction as well as spaces for solitude, but it also must clearly distinguish between the two uses (McCoy & Evans, 2002; Hemlin, Allwood, & Martin, 2008). People do their creative thinking and work in different ways. Some prefer to have a lot of social interaction and input from others, while others prefer and/or require solitude for some or a majority of their creative process. Those who prefer more privacy may agree with the statement that "the act of creation is a self-involvement and is usually not a public performance" (Hill, 2006, p. 328). This concept may be behind the growing trend in Japanese companies of "recognizing the importance of aloneness for creativity" (Hill, 2006, p. 328). One such company in Minolta provides all their research staff soundproof isolation rooms (Hill, 2006) in which to do their thinking and/or work. Perhaps access to these types of environments may be helpful for some students who prefer to be alone and remain undisturbed during a portion, or throughout the entirety of their creative process.

Some milder forms of distraction (permitted by access to windows and natural views, and through daydreaming (Singer, 1975; Epstein, 1996)) may have some benefits during divergent thinking tasks (Runco, 2007) and may foster "personal freedoms of autonomy, openness to experience, and engaging in unconventional thought processes" (McCoy & Evans, 2002, p. 424). However, unwanted distractions can have a significant detrimental impact on one's creative process and can lead to frustration, feelings of powerlessness, anger, anxiety, and stress. But despite these generalities, every person's creative process and preferences are different, meaning that some people may find that social interaction throughout their entire creative process is necessary for their best work while complete solitude is more beneficial to others. This underscores the need for creative environments where one has the ability to choose and have access to different types of environments to suit their individual needs throughout the different stages of the creative process (McCoy & Evans, 2002).

The other crucial aspect of the social environment is having opportunities for informal social interactions and impromptu "chance encounters" with people within their domain and with people who are knowledgeable in other fields. This fosters a certain attitude toward sharing ideas with others rather than protecting them as one's own "creative capital." Allowing others access to one's ideas provides many more opportunities for more remote associations which is associated with higher levels of creativity and innovation.

According to the literature reviewed, the social environment has a significant effect on one's ability to work and focus and has been suggested as one of the largest influences on innovation (S. Brown, 2008; Kasperson, 1978; Lechler, 2001; Sonnentag, 2000; Sparrow, Liden, Wayne, and Kraimer, 2001; Unsworth and Parker, 2002). Social interaction is crucial for the exchange of new ideas and gaining new insights and perspectives on existing ideas. Ultimately, the ideal social environment is one which includes:

- Communication flows easily with other individuals (sociopetal design) (flexibility or fluidity of a knowledge environment: (Amin & Cohendet, 2004; DeFillippi & Arthur, 1998; Grahber, 2002)
- Contact with others in neighboring research areas/interdisciplinary collaboration (Hollingsworth & Hollingsworth, 2000; Thagard, 2005; Turner, 2000; Kasperson, 1978)
- Facilities to ease communication with others AND offer areas of solitude (McCoy & Evans, 2002; Hemlin, Allwood, & Martin, 2008)
- Clear distinction between work and social spaces (McCoy & Evans, 2002; Hemlin, Allwood, & Martin, 2008)
- Places for informal social interactions and impromptu "chance encounters" (Simonton, 1999; Johnson, 2010)
- Openly sharing ideas and not protecting them as "creative capital" (Johnson, 2010)
- Regularly sharing ideas with others/Utilizing others as an information source (Johnson, 2010; Kasperson, 1978)
- Opportunity for collaboration (Johnson, 2010; Hemlin, Allwood, & Martin, 2008; Hollingsworth & Hollingsworth, 2000; Thagard, 2005; Turner, 2000; Kasperson, 1978)
- Different types of facilities for different stages in creative process and ability to choose (McCoy & Evans, 2002; Hemlin, Allwood, & Martin, 2008)
- Mild distractions/daydreaming (Singer, 1975; Epstein, 1996; Runco, 2007; McCoy & Evans, 2002
- Generally positive, supportive social environment with a low level of organizational impediments (Epstein, 1996; Stokols, Clitheroe, & Zmuidzinas, 2002)

SPECIFIC DESIGN TYPOLOGIES

This section provides examples of environmental typologies that are defined and created by adherence to specific design criteria in order to produce one or more specific desired outcomes. The first two design profiles seek to not only remedy current dysfunction and improve a user's immediate short-term cognitive, emotional, and spiritual states, but also to improve and sustain the user's long-term capabilities.

Removing Roadblocks + Sustaining Creativity

In order to achieve the goal of aiding the creative process, potential obstacles and creative roadblocks must be minimized or removed. One of the most common obstacles to creativity is stress. ***Stress*** is a very general term that refers to any stimulus that causes physical, mental, or emotional tension in an individual. Research has consistently shown that attending a college or university is frequently a common cause of chronic stress (Cushman & West, 2006, p. 24). A large part of college life is dedicated to studying and completing assignments. And depending upon their intensity and length, these activities require the student to sustain long periods of time engaged in directed attention. ***Directed attention*** refers to the notion of voluntary attention one consciously focuses on an item or task that requires some element of effort (Kaplan, 1995). It inhibits distractions and is highly subject to fatigue by prolonged mental effort that is common among students who experience intense, lengthy projects or other activities that require long or intense periods of focus, such as design students. This fatigue, called ***directed attention fatigue,*** is characterized by the degraded capacity to concentrate, focus, and perform tasks that require mental acuity (Kaplan, 1995). These prolonged periods of mental effort are considered to be another one of the most general and common source of stress. Directed attention fatigue is considered the main symptom of this stress that has a causal relationship with other

symptoms such as decreased vigor, exhaustion, and lower levels of creativity (Kaplan, 1995; Schaufeli et al., 2002, pp. 446). Problem solving skills that do not rely on automatic, habitual actions and require directed attention for mental selectivity and creativity can also be severely impacted from directed attention fatigue (Kaplan, 1995). Restorative and contemplative environments may prove to be the key to long-term sustainability of creative functioning/capabilities by reducing fatigue and burnout, thereby potentially improving one's stamina for longer periods of higher quality or more intense cognitive functioning.

Attention Restoration Theory

Frederick Law Olmsted believed in the restoration properties of 'natural scenery:' "it employs the mind without fatigue and yet exercises it; tranquilizes it and yet enlivens it; and thus, through the influence of mind over the body, gives the effect of refreshing rest and reinvigoration to the whole system" (Olmsted, 1968, pp. 22). This quote illustrates the main idea behind one of the current methods being explored by researchers who seek to reduce directed attention fatigue and its resulting symptoms by inducing the use of involuntary attention. Engaging one's *involuntary* or *non-directed attention* requires no mental effort and is thought to counter fatigue by allowing the parts of the brain engaged in directed attention to rest (Kaplan, 1995). "Research indicates that being in a natural setting, or viewing natural settings, can effectively induce non-directed attention" (Krinke, 2005, p. 133). In other words, experiencing natural environments causes the brain to switch to a different type of attention that requires less energy and allows the fatigued part of the brain to rest and rejuvenate. These places and settings that provide "measurable physical and/or psychological benefit to human health" (Krinke, 2005, p. 107) are referred to as *restorative environments*. Studies have shown that "contact with nature, especially vegetation, has measurable restorative effects (Krinke, 2005; Ulrich,

1993). Exposing an individual to certain natural settings that have the added benefit of providing opportunities for reflection can amplify the directed attention fatigue recovery benefits. These settings are referred to as *contemplative environments* (Kaplan, 1995).

Restorative Environments

Restorative environments seek to reduce stress and mental and emotional fatigue through eliciting outward focus onto the environment. It is generally thought that by negating stress and fatigue, these environments may restore the brain's cognitive and attentional capacity, and reduce the likelihood of fatigue-related side effects such as burnout (Kaplan& Kaplan, 1989). Stress and fatigue are associated with impaired cognitive functioning and overall performance, including creativity. Stress in particular has been shown to have other numerous negative effects, especially during tasks involving divergent thinking and originality (Toplyn, 1999). Reducing or eliminating these undesirable conditions in individuals removes potential obstacles to creativity, thereby creating the conditions that may have the potential to foster optimal creative functioning.

The Kaplans' well-known research in restorative environments within the field of environmental psychology delineates four attributes to a restorative experience: fascination (the ability to capture the user's attention), being away (or feeling removed), extent (involving the user's perception of being in a distinct place yet as part of a whole), and compatibility (refers to the synchronicity between the user's goals and the environment) (Kaplan, 1995, p. 172). These properties most directly address the interaction between the environment and the human user; however, these attributes can also be usefully applied to the characterization of environments.

First, a landscape that elicits the viewer's fascination is one that is intriguing and captures the attention in a way that encourages a reflective mood, also referred to as "soft fascination" (Kaplan,

1995, p. 172). “Fascination is critical to eliciting the state of involuntary or non-directed attention that is essential to restoring us from the mental fatigue of our overused directed attention” (Krinke, 2005, p. 132). Directed attention is what is used to manage one’s daily life and is highly susceptible to fatigue. It requires a significant amount of energy both to focus on immediate tasks and screen out the constant stream of stimuli and distractions that often vie for one’s attention (Krinke, 2005, p. 133). Though sleep aids in the restoration of mental fatigue, it is not sufficient alone (Kaplan, 1995; Krinke, 2005). “Engaging our non-directed attention during the day is necessary to avoid exhaustion” (Krinke, 2005, p. 133). Thus providing access to environments that provide restoration from fatigue or stress may, at least, prevent reductions in cognitive functioning and, at best, foster the conditions that allow for optimal cognitive and creative functioning (Ulrich, 1993; Rogers, 1954). Restorative environments may also be the key to long-term sustainability of creative functioning/capabilities by reducing fatigue and burnout, thereby potentially improving one’s stamina for longer periods of higher quality or more intense cognitive functioning.

Ulrich’s (1993) work suggests that “views of restorative environments may foster creativity”, even partial or obstructed views. “Perhaps this is due to the fascination produced by nature views that capture one’s attention, reduce mental fatigue, and restore cognitive capacity” (McCoy & Evans, 2002, p. 419; Kaplan & Kaplan, 1989). “The sense of freedom, complexity, openness, and coherence experienced in the natural environment that reduces cognitive fatigue could very well be the same sense of freedom, complexity, openness, and coherence that Rogers (1954) posited as conducive to creative performance” (McCoy & Evans, 2002, p. 419).

Designing for Restoration

The literature regarding design requirements for restorative environments is largely heterogeneous. The following examples of the predominant characteristics of restorative environments

are derived from a few of the seminal works in the field (R. Kaplan, 1993; S. Kaplan,1995; Kaplan & Kaplan, 1989; Ulrich, 1993; Korpela et al., 2001):

- Strong presence of vegetation
- Moderate to high spatial complexity/visually interesting
- Visually detailed/complex
- Views of natural environment
- Use of natural materials, shapes, textures, and forms
- Use of natural patterns and processes
- Presence of natural light sources
- Freedom, complexity, openness, coherence (Rogers, 1954)
- Visual interest and opportunity for discovery

Summary

Designs for the restorative settings are largely intended to elicit focus outward on the highly vegetated environment to induce non-directed attention by capturing the user's fascination with stimulating natural elements including a varied palette of colors, textures, structures, and patterns. These include the utilization and integration of: environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human relations to nature. A successful restorative environment emphasizes a connection with nature and one's surroundings. Exposure to these types of environments could be the key to the long-term sustainability of creativity.

Contemplative Environments

Contemplative environments ultimately seek to achieve similar end goals as restorative environments, such as the reduction of stress and fatigue, but through very different methods. These types of spaces seek to encourage inner focus for reflection, introspection, and contemplation (as opposed to the usual daily task-oriented thinking processes) by reducing environmental stimulation. This greatly differs from restorative environments which seek to elicit outward focus through *enhanced* environmental stimulation. The emphasis on inward focus is ideal for meditative, reflective, and contemplative uses.

Some contemplative environments employ walking as a meditative technique aid. Through contemplative walking, the user maintains a deliberate, steady walking pace which is directly tied to their breath rate. Walking has long been used as method to regulate cognitive rhythm associated with the body's physical tempo which responds to the conditions and changes in the surrounding environment (Krinke, 2005, 109). Walking has been shown to reduce stress (Jin, 1992; La Torre, 2004; Sitzman, 1999) and promote positive affects such as peace and clarity (Sitzman, 1999). Meditative walking in particular has been shown to regulate the heartbeat in both experienced and inexperienced meditators (Cysarz and Bussing 2005) and aid in the relaxation process (Sitzman, 1999). Meditative and/or contemplative walking are thought to enable a set of physical conditions, such as relaxation and reduced stress, that allow for the emergence of a particular set of psychological responses, such as inner peace (Rhodes, 2008; Bigard, 2009).

Despite their similar end goals, contemplative environments differ from restorative environments in their design needs. They are most often designed according to "overload" or "arousal" theory that proposes that "human perceptual systems can become overloaded and stressed in places that have a great deal of complexity or intensity" (Krinke, 2005, p. 133). This complexity or intensity

could refer to any stimulation sensation such as noise, movement, or visual cues. Thus, these settings are designed in a way to dampen outer stimulation or arousal in order to allow for a more complete focus on ones thoughts or purpose. Traditionally this has been accomplished through enclosure, reductive palettes, and sequencing of space (Krinke, 2005, p. 133).

Designing for Contemplation

Few sources were found for this review that describe the specific design requirements of contemplative environments. The literature is largely focused on describing the how reduction in environmental stimulation is less cognitively and attentionally demanding on the user which further fosters the inward focus of the mind. Krinke's (2005) work best describes the how design accomplishes these goals:

- Reduced palette of materials
- Simplified forms
- Reduced distraction (fascination) for inward focus
- Low arousal for inward focus
- Repetition in space, pattern, and pace
- Silence or white noise to reduce auditory distractions; occasionally rhythmic noises are used to aid "trance-like" uses
- Safe, often contained, environment that allows for complete immersion in one's thoughts and segregation from a larger context or the outside world

Historically, variations on the ancient form of the enclosed garden have been used to aid in the contemplative process and meditation as commonly seen in the cloister gardens of the Middle Ages and

the traditional Zen gardens of Japan. These spaces exhibited high levels of order and provided only partial access to the physical space or complete views. Some examples included garden spaces that were completely inaccessible "functioning not as a space to inhabit physically, but as a mental space and an aid to contemplation" (Krinke, 2005, p. 112). These design archetypes represent a historical model for developing a sense of security, solitude and silence in order to shut out outside distractions that could serve to inhibit the meditative process.

Preference for minimalism in design expression meant that "simplicity of form…supported by a few carefully selected materials" were most commonly applied to these specialized spaces (Krinke, 2005, pp. 129). This simplicity of form and material selection aided in the definition and separation of these contemplative environments from their contextual settings through a stark contrast between "static, orthogonal forms and vegetation that grows and changes" (Krinke , 2005, pp. 129). This contrast seeks to strike a balance between the allure of an unusual landscape that differs from those typically encountered in daily life and the enticement of one's attention against the desire for a minimalist, reductive design palette meant to dampen the effects of visual stimulation in order to aid in the process of disengaging from the daily mindset and moving toward a more relaxed, reflective focus inward (Krinke, 2005, pp. 130).

The layout and sequencing of the space also plays an important role in the development of a successful contemplative setting. Walking has historically been used as a method of shifting awareness and establishing a natural cognitive rhythm and physical tempo that can be modified by effective manipulation of the landscape (Krinke, 2005, pp. 109). For example, straight pathways generally encourage one to move more quickly through the space, while meandering pathways promote a more leisurely pace that also tend to encourage more interaction with the landscape elements (Krinke, 2005, pp. 108). Contemplative environment are meant to facilitate the slowing down from the often hectic

pace of everyday life in order to allow the mind to wander or to focus more clearly on one's thoughts; this can be further influenced as the placement of seating as a gestural form that implies how a space is to be used (Krinke, 2005, pp. 131). The amount and placement of seating elements determines the choreography and sequencing of a space by simply defining the places where people may stop and rest. Seating and other stopping or slowing points in the landscape can be considered punctuation marks within the environment that will require extra attention to views, materials, form and pattern, sense of enclosure, sense of isolation, and feelings of security.

Summary

Contemplative environments, as opposed to the traditional restorative environments, mainly serve to foster inward focus to aid in the process of disengaging from the everyday mindset to move toward one that encourages reflection and meditation. This is often done by reducing outer stimulation by enclosing areas, using a minimalistic design vernacular, and proper sequencing of spaces. These strategies to dampen outer stimuli to increase the inner focus result in highly simplified material and form palettes, low intensity and highly congruent massings of vegetation, geometric or gently curving lines, physically inaccessible spaces, and spaces designed to control the circulation and experience throughout the environment (Krinke, 2005). A successful contemplative environment emphasizes a connection with one's self and one's innermost thoughts.

Benefits of Restorative and Contemplative Environments

Historically, research on the restorative capabilities of environments has either emphasized the reduction of stress or the recovery of the ability to focus one's attention (Kaplan, 1995). Ulrich's studies in the role of restorative environments in the reduction of stress showed that contact with nature

produced faster and greater recovery from stress as evidenced by less muscle tension, lower blood pressure, and increased feelings of well-being in human test subjects (Ulrich, 1993). Berto's (2005) work showed that attentional capacity can be restored through exposure as well. Contemplative environments demonstrate many of the same benefits (Krinke, 2005). Several studies have shown that exposure to restorative environments improved performance on directed attention tasks after exposure to stress and fatigue (Hartig , 1991, p. 20; Ulrich, 1993). This could easily translate into improved student academic performance, which could also consequently have a positive effect on the individual's feelings of competency and engagement. By actively seeking to aid in the recovery of stress and direct attention fatigue, exposure to natural restorative and contemplative environments is not only useful in stress mitigation; it can also be used as a source of creative inspiration, spiritual renewal, innovative thinking, and a preventative measure against stress-related fatigue and its negative effects.

The benefits extend beyond those users who are experiencing fatigue. Ulrich's studies in Sweden found that exposure to everyday natural scenes produced more positive emotional states in *unstressed* university students. Research in cognitive science has shown that a subject's emotional state significantly affects "all aspects of thinking, including performance on both higher and lower-order tasks" (Ulrich, 1993, p. 112). Further connections can be made between creativity and brain health and activity. "Higher-order cognitive functioning involves integrating diverse material or associating in a flexible way previously unrelated information or concepts. Higher-order functioning is required for forming remote associations and for creative problem solving" (Ulrich, 1993, p. 110). One theory holds that "effective associational functioning is widely considered to have a central role in creativity" (Ulrich, 1993, p. 110), meaning that one essential element of creativity is combining seemingly disparate, unrelated elements in new and novel ways (Ulrich, 1993).

Therefore, based on Ulrich's findings, he concludes that "because natural settings have been found to elicit positive emotional state, exposure to such environments may facilitate creative problem solving or high-order cognitive functioning via their ability to alter one's emotional state" (Ulrich, 1993, p. 112). An individual's positive or negative emotional state can have a significant influence on performance and have shown to reliably influence memory recall and the process of creative problem solving (Ulrich, 1993, p. 112), both of which are instrumental in the academic success of university students. Additionally, positive emotional states are key in "cuing the retrieval of much larger amounts of better-connected information. Positive feelings in contrast to negative feelings facilitate remote associations, integration, perception of related among different material, and creativity" (Ulrich, 1993, p. 112). Therefore, by integrating environments that create and promote these positive emotional states into a campus design, university students and faculty will be able to benefit from the positive effects on their emotional, physical, and mental health that have been linked with exposure to these types of environments.

In addition to the physical and spatial characteristics of restorative or contemplative environments, the amount of time spent in these settings is crucial to their primary restorative function (Krinke, 2005). One theory posed by the Kaplans (1995) reveals four separate levels of restorative development, in increasing increments of time required: clearing the head, recovery of directed attention, recovery of cognitive quiet, reflections of one's life (Krinke, 2005, p. 136). Therefore, if the last level of restorative development is desired, the spaces must be designed in a way that either entices a user to stay and explore, moves the user through the site in a slower fashion, or is long enough to allow for the full amount of time and leads to a place that is desirable for a user to go.

Playful Environments

An effective method for inducing positive effects on creativity is to introduce the element of play in the environment. But one must be careful when using the term 'play' as it comes with its own specific set of preconceived connotations that could lead to misinterpretations of the concepts regarding its use in design. Here, *play* is both a physical and mental construct and refers to activities or behaviors which are "to some significant degree playful" (Dansky, 1999, p. 343). And *playfulness* is used to describe the quality of an element or activity that encourages actions or behaviors that are "intrinsically motivated and self-directed, that they are relatively free from externally imposed rules or constraints, and that the link between means and ends is loose and flexible. In addition to this relative sense of freedom from stimulus or task constraints, playful activity also tends to involve positive affective states such as pleasure, joy, excitement, or fun" (Dansky, 1999, p. 393).

"[Play] allows us to take creative risks that we need to take… Playfulness helps us to get better creative solutions. Helps us do our jobs better, and helps us feel better when we do them" (T. Brown, 2008). It helps people project into an experience without the risk of real-world consequences (T. Brown, 2008; Hendricks, 2001; L'Abate, 2009). Play is associated with higher levels of "flexibility and the ability to produce ideas and behavior sequences that are both novel and adaptive" (Dansky, 1999, p. 393). And often, "the kinds of behaviors and psychological processes that [are] described as playful are frequently creative in and of themselves" (Dansky, 1999, p. 393). Playfulness also promotes curiosity and an explorative attitude toward new ideas, scenarios, and possibilities. This willingness to explore new ideas is critical to the creative process, as adults tend to "self-edit", or prematurely evaluate (Dowd, 1989), their mental processes as a means of efficiency, often at the expense of considering novel or seeming - far-fetched solutions (T. Brown, 2008). However, these types of novel solutions are what lead to innovations that break through archetypal paradigmatic frameworks which are often considered the

height of creativity. It is for this reason that playfulness is considered to be most critical during the divergent modes and ideation (T. Brown, 2008), though it is also important throughout the entire process.

It is generally assumed that physical and psychological environmental conditions have a significant effect on the amount of playfulness an individual feels comfortable engaging in and expressing. Playful environments encourage playful behavior in its occupants in many ways. But the most important element of a playful space is to provide a permissive environment in which people feel free from judgment, paradigmatic conventions, rules, and societal norms (Wallach & Kogan, 1965; Runco, 2007; Dansky, 1999; T. Brown, 2008). Permissive environments are critical to the creative process, especially for tasks requiring divergent and original thinking (Wallach & Kogan, 1965; Runco, 2007; Dansky, 1999; T. Brown, 2008).

Designing for Play

Typical design for work and study spaces generally isolates the individual to improve focus by eliminating distractions. For example, the cubicle gives a person their own space, a defined territory, and a small sense of control, but provides little in the ways of creative stimulation or connection to others. It is mainly there to insulate the worker from outside interference and distractions from their work. This isolation can be good for some, but detrimental to others, especially after long periods of exposure to such conditions (Kaplan, 1993).

The inherent issue related to the application of restorative play environments is the wide diversity within the genre of work and study environments. Each space is unique and presents its own challenges and opportunities while requiring its own unique design intervention. Additionally, there is a severe lack of literature available on the design of playscapes that specifically address the unique needs

of an adult user group. However, some general assumptions can be made through observations of successful precedents of other playful environments.

Light-heartedness or a joking/humorous spirit is another essential component of a successful design. It is important that the landscape gives the participant permission to take things less seriously. It creates a far less restrictive environment that promotes the freedom necessary for creative risk-taking. This concept is especially integral to the successful functioning of a playful creative environment. "Humor has been used by approaches to psychotherapy as a distancing technique—distancing from our problems and from our tendency to take ourselves too seriously. Humor can also foster creativity in that it can help us distance from an over-involvement in our rules of life, our ways of making sense of the world, and our automatic assumptions. Humor can help us to see the ambiguity in many situations and avoid a premature cognitive closure" (Dowd, 1989, p. 240).

One of the most essential elements of a successful design is openness. There needs to be room for personal interpretation of the space and personalization for a diversity of users. One way to accomplish this is through creating spaces that are flexible. The environment must also lend itself to a multitude of affordances, or uses (Hendricks, 2001). Another way to accomplish flexibility and openness is through the utilization of un-programmed space. Spaces that people can manipulate and recreate for themselves according to their imaginations are essential (Csikszentmihalyi, 1996). The space must be designed to respond to the unpredictable nature of play. "The conceptual structures of play, and by extension its physical structures, are continuously generating and degenerating and peculiar to the particular and perishable rules, circumstances and impulses of the participants (Claydon, 2003). It is therefore necessary for the site to maintain some element of neutrality and flexible since, inherently, "play will always undermine the imposition of a rigid and canonical order" (Claydon, 2003, p. 29). Additionally, spaces that look "un-designed" do not give specific clues as to a prescribed behavior or set

of rules to adhere to within the site, and are therefore helpful in creating an environment that encourages unstructured play (Hendricks, 2001). It abandons the airs of fussiness that can hinder explorative creativity.

Spaces that allow for chance encounters are also highly desirable for the exciting possibilities they bring to participants. They bring the prospect of meeting and interacting with people that one does not know or do not necessarily see during their typical day. These situations provide occasions for novel meetings with people from different backgrounds, interests, ideas, and specialties. "Cross-contamination" of ideas can occur during these meetings where ideas are spread around, free to influence, inform, and generate new concepts.

As adult play design is in its infancy, there is a noticeable vacancy of literature available on the subject of how they are best designed and successful precedent study (Hendricks, 2001). Therefore, it is up to the designer to balance the needs of the user with their best judgments in regard to the design aspects (Hendricks, 2001). Based on the literature available, playful environments and their characteristics are highly variable, but some common characteristics include:

- Freedom from judgment of ideas/ facilitating trust (Wallach & Kogan, 1965; Runco, 2007; Dansky, 1999; T. Brown, 2008)
- Symbols of playfulness and humor in the workplace as reminders of the permissive environment (Dowd, 1989; T. Brown, 2008)
- Flexibility (playfulness in divergent mode, attentive in convergent mode) and ability to move between the states or to be both (Csikszentmihalyi, 1996; Claydon, 2003; Hendricks, 2001)
- Freedom from complete isolation/connection with others (Kaplan, 1993)
- Formally and stylistically, organic, curving lines are often considered to be preferable over straighter, more regular geometric forms (Hendricks, 2001).

CONCLUSION: PUTTING IT ALL TOGETHER

The literature reviewed in this chapter presents research on many different concepts involved in the psychological and physiological processes that are involved in the creative process. However, what is missing in the literature is how all these concepts fit together to suggest specific environmental design criteria that would support the cognitive processes necessary for creativity throughout its various phases. This section correlates the findings of suggested beneficial creative environment conditions with each different stage in the creative process (as defined by Sawyer (2012) as mentioned in previous sections) as they relate to landscape architectural design.

Finding the Problem

There were no specific design criteria directly associated with this particular step in the process. However, as this stage involves divergent thinking techniques to explore and redefine problems, it would most likely benefit from the environmental conditions linked to divergent modes of thinking such as higher degrees of stimulation and interestingness/engagement, and access to peers and other social encounters.

Information Gathering

Having access to diverse and adequate resources is critical to this stage for obvious reasons. Since landscape architecture involves solving problems that are complex and require an understanding of how multiple systems work and interact, it is important that students have access to the various types of knowledge bases that can build their baseline knowledge of these systems and inform their later decisions and application of constraints as well as inspire their conceptual ideas and artistic vision.

Additionally, having access to a social environment could also be beneficial during this stage. A highly social, communicative, collaborative environment fosters the flow of ideas and information between people. The more interaction one has with others, the more opportunities for perspectives and feedback there are to enrich existing ideas or to inspire new ideas, especially if the interaction is between people of different disciplines and domains. During these divergent stages some degree of distraction is allowed or may even be beneficial. Ideally, this means that the space should provide some visual access to natural environments.

Incubation

The most central idea to this particular step is allowing the individual to step away from the given problem and allow their minds to rest and/or focus on something else. This could include being physically removed from their typical environment, experiencing a change in their environment, or even just allowing the mind to wander. Distraction could be quite beneficial during this stage. One particular example of helpful distraction given by Singer (1975) and Epstein (1996) is to have access to windows, particularly with views onto natural environments, to allow the mind to project outwardly and escape its immediate environment and the task at hand.

Creative insights often occur "when individuals experience a state of calm, relaxed openness" (Runco, 2007, p. 348). This indicates the importance of access to contemplative and/or restorative environments, or any other environment that allows and facilitates relaxation during this stage in the creative process. Both restorative and contemplative environments relate to restoring and rejuvenating cognitive functioning which may directly influence creative functioning in both the short and longer-term time frame. Social and playful environments can also be beneficial during this time for access to potentially "inspiring" ideas as well as for the positive affect that has been associated with social

interaction and playfulness.

Idea Generation

The most influential beneficial conditions during this stage are the presence of a permissive and/or playful environment with opportunities for sharing ideas and collaborating with others. Having a positive affect is also beneficial during this stage as it broadens attention to enhance wider cue utilization, resulting in making more remote associations and connections. Creative ideas often result from combining existing concepts in unexpected, novel ways. Positive affective states can be elicited and influenced by positive social interaction, playfulness, humor, and engaging in pleasurable activities among other methods. Having a supportive and/or permissive environment is critical at this stage to avoid premature restrictive editing of ideas.

Idea Selection and Development

This is beginning of the convergent thinking mode where optimal condition preferences may begin to vary more between individuals. Some find that having a regular opportunity to share ideas is helpful. Social interaction fosters the “cross-fertilization” of ideas and may add to wider range of remote associations through accessing others’ knowledge and perspectives. This is also the point where access to spaces for solitude as well as distinct areas for social interaction begins to gain in importance as well as strongly defining the separation between the two. Having a neutral or slightly negative) affect has been found to be beneficial during convergent modes. Environmental conditions that aid in focused attention states begin to be become important during this stage, such as reduced environmental stimulation, less social engagement (for some), consistent environmental complexity, and reduced level

of distraction.

Communicating the Idea/Production

During this stage the demand for higher levels of concentration is necessary. As a result, distractions can be more detrimental to creative functioning during this time. Lower degrees of environmental stimulation are better in order to reduce arousal to allow for more focused attention to the task at hand and better performance. As in the previous stage, a neutral or slightly negative affect is beneficial, such as stress or anxiety, perhaps serving as a motivator for students to complete the project. However, too much stress or anxiety can quickly get out of hand and can negatively affect a person's health, performance, and well-being. Therefore, access to restorative environments and social opportunities are necessary to reduce stress and improve affect if begins to become too negative (potentially leading to burnout and other more serious stress-related diseases and side-effects).

Multiple-Stage Shared Conditions

Despite the different environmental needs of the different stages, there are some conditions that are applicable and beneficial throughout all of the stages of the creative process. These include:

- Permissive (playful) environments that provide an atmosphere of security and trust
- Access to adequate resources (space, materials, etc.) and knowledge sources (disciplinary and non-disciplinary)
- Physical comfort (temperature, light levels, air quality, etc.)
- Opportunities for collaboration and chance encounters with others (especially with those in related domains and outside disciplines)

- Easy flow of information and communication with others
- Clear distinctions between work and social areas
- Control over one's environment (including flexible/adaptable, multifunctional environments)
- Variety of spaces and facilities for differing preferences and needs
- Consistent range of spatio-temporal complexity within discrete designed spaces to avoid distraction
- Access to restorative and/or contemplative environments to periodically restore attention, focus, and cognitive functioning/capacity

Chapter III: Methodology

INTRODUCTION

The methodology of this study was determined by previous research in similar studies and edited to meet time constraints. A large portion of the method for this thesis relies on responses to open-ended survey questions to which students provided feedback regarding their individual needs and preferences for specific environmental conditions with regard to their ability to think and/or work most creatively. In McCoy and Evans' 2002 study on the "Potential Role of the Physical Environment in Fostering Creativity", they found that "untrained college students can apparently assess what setting will appear to either facilitate or inhibit creativity" (p. 421) and that "settings perceived to affect creativity may, in fact, function as perceived (p. 424). This allows for the self-reported preference data to be generally presumed true and effective, and therefore lend itself to a more meaningful comparison to the empirical research findings in the literature review.

The initial methodology determined for this project differs from the final methodology carried out due to some surprising results during preliminary testing of the researcher's research question and hypothesis. These findings were contrary to the initial set of assumptions set by the researcher, mainly that students would largely describe locations within the CAP building as the places they do their creative work. The findings of this preliminary testing caused the researcher to go back and revise the assumptions, research question, survey questions, and overall methodology. The rest of this chapter

outlines the initial methodology attempted and the final procedures followed as a result of the change in thinking.

INITIAL PRELIMINARY METHOD

The planned method was to survey randomly selected landscape architecture students and ask "where do you do your best creative work in the CAP building?" The spaces identified by the students would be analyzed for significant/contributing environmental factors. The findings from this analysis would then be compared to the findings from the review of literature on the effects of the environment on creativity. From this comparison, design principles would be abstracted from the confirmatory results and explanations would be posited for the conflicting results. The design principles would then be applied to a prototype design for a productive creative space within the CAP building. Randomly selected landscape architecture students would be surveyed for preference to confirm adequate application of design principles in the prototype design. Before this method was carried out, the researcher/author carried out an informal preliminary testing of her hypothesis.

A convenience sample resulted in the selection of five landscape architecture students who were in their second or third year of the graduate program. They were surveyed between class times in their studio environment. One was an international student from China and other four were from Indiana. They were asked:

1. Where/when do you do your most creative thinking and/or work?

2. Where do you go in CAP to creatively think and/or work?
3. If not in CAP, why not? What are the beneficial and/or detrimental characteristics of the spaces?

The initial hypotheses for the survey findings were:

1. Students would largely report locations in or near the CAP building in order to have access to their materials/supplies and peers.
2. Students would also report some locations that are isolated and largely (psychologically and/or physically) removed from CAP, but mainly as a secondary preference after the studio environment.
3. Students would identify beneficial locations in or near the CAP building that: are removed from but have views onto active areas; allow quick access to own tools and materials; display prospect/refuge opportunities; provide nooks, or smaller discrete areas within larger contexts; provide a greater control of external environmental noise; has some element(s) of nature present or direct views onto natural environments.

The findings from this informal survey produced unexpected results. The participants' answers were not location-specific but consisted mainly of preferred and detrimental environmental features and conditions. These findings contrasted the researcher's initial ideas about how students perceive and select their environments and how they would report their preferences in the survey. The research question and survey were then altered to focus more on directly on the preferred and detrimental environmental characteristics and qualities rather than specific locations. The following sections describe the revised methodology from this slightly different perspective on the topic.

PARTICIPANTS AND REVISED PROCEDURES

Graduate and undergraduate landscape architecture students at Ball State University's College of Architecture and Planning (n = 42) were asked during studio class time to participate in a short online questionnaire. Permission had been obtained from the studio instructors. Studio class time was chosen for convenience and to ensure that students were not asked to participate in the questionnaire more than once. Participation was voluntary and there was no compensation or reward for participating and there was no penalty for not participating. Those students who chose not to participate were given the option to completely abstain from the process or could simply write anything in the spaces provided so as not to be singled out for not participating.

The survey was administered by the researcher in four studios: three undergraduate and one graduate. A small number of participants were international students, most from China. A vast majority of the non-international students were Caucasian and between the ages of 18 and 28 (this information was not collected, just an observation by the researcher).

Students were given 15-20 minutes in class to complete the online questionnaire. If students did not have access to a computer, hard copies were provided. Sixteen students completed the survey online, twenty-six responded via hard copy. The participants received a questionnaire that first asked the student to think back to a time, or times, when they did their most creative thinking and/or work. The instructions encouraged the participant to: "Take a moment and think about the place(s) where this creative thinking/working took place. Close your eyes if it helps, and envision the sights, smells, sounds, and activities that were going on around you." This set-up sequence was derived from the questionnaire in Korpela et. al's (2001) study of restorative experience and self regulation in favorite places.

The participants were then asked to keep the images and other qualities of that environment in mind while completing the rest of the questionnaire. The entirety of the questionnaire comprised of three open-ended questions:

1. Describe in as much detail as possible the environment(s) where you do your most creative thinking or work. (It does not have to be a set physical place. For example, it can be while you are engaging in some particular activity, or just during a certain time of day, etc.).
2. Describe in as much detail as possible the specific qualities of the environment(s) and any other conditions that you consider helpful or necessary for your creative process.
3. Describe in detail the environments, environmental qualities, and any other conditions that you consider to be harmful or that negatively affect your creative process.

For analytic purposes, each response was placed into a matrix and similar responses were grouped and counted by the researcher. The overall structure for categorizing groups of similar responses was developed on a post hoc basis, determined by the responses gathered. The responses and organizational categories were then compared to the existing body of research on creativity and workplace preferences. Each organizational category is described more in-depth in the following chapter on results and findings

Chapter IV: Results

PRELIMINARY SURVEY FINDINGS

This initial survey was informally administered for the sole purpose of checking the researcher's assumptions and research design. Out of all five students surveyed, none preferred to work within the CAP building, and furthermore, considered CAP to be harmful to their creative process and/or work. This was due to multiple reasons. The most common reasons cited were (1) other people socializing and being noisy in areas they considered dedicated to work, (2) too many general disruptions and distractions, and (3) people (professors and other students) can find them there and interrupt their work. Other reasons included uncomfortable furniture, bad smells at meal times, uncomfortable temperatures, poor lighting, insufficient working space," no pets", insufficient secure storage for expensive materials and books, "people wanting to borrow supplies", and being too crowded.

Beneficial locations identified were mainly residential environments, followed by library and coffee shops. Responses are largely non-location-specific, relying instead on describing environmental qualities. All respondents listed quiet, physical comfort, and being able to change their environment as beneficial qualities. Four of the five respondents reported being alone as beneficial. All participants listed having a large desk space and access to all their materials and supplies as beneficial. Four of the five students preferred having large windows and views out to natural environments.

The time of day that students prefer to work was interesting. Two respondents consider early mornings "before too many people are out" as their primary preferred time to work, followed by evenings as their secondary preference, while the rest preferred only evenings to late nights.

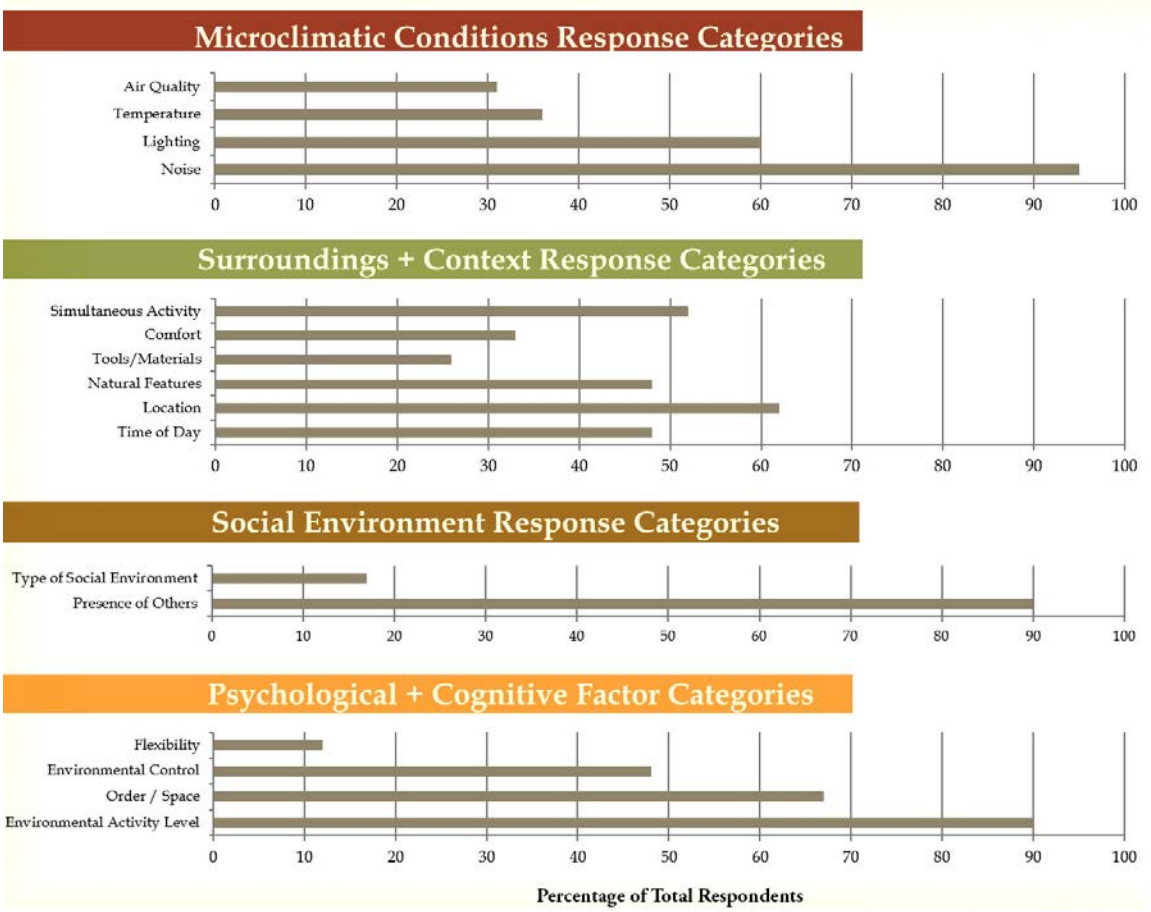
MAIN SURVEY FINDINGS

The rest of the results reported in this chapter are comprised of only the responses to the formal survey given, and *do not include* any of the informally gathered data from the preliminary survey test.

Major Response Categories

During the analysis portion of the study, the researcher grouped similar responses. The responses mainly fell within four large conceptual groups: environmental surroundings + contextual conditions, microclimatic conditions, social environment, and individual psychological + cognitive factors. Within these larger categories, several smaller subcategories were determined for analysis purposes. Figure 1 shows the overall distribution of responses throughout all the major categories and subcategories. This displays the hierarchy of shared responses with regard to influential factors, both positive and negative, to students' creative process.

Figure 1. Comparison of number of participants who responded within each subcategory.

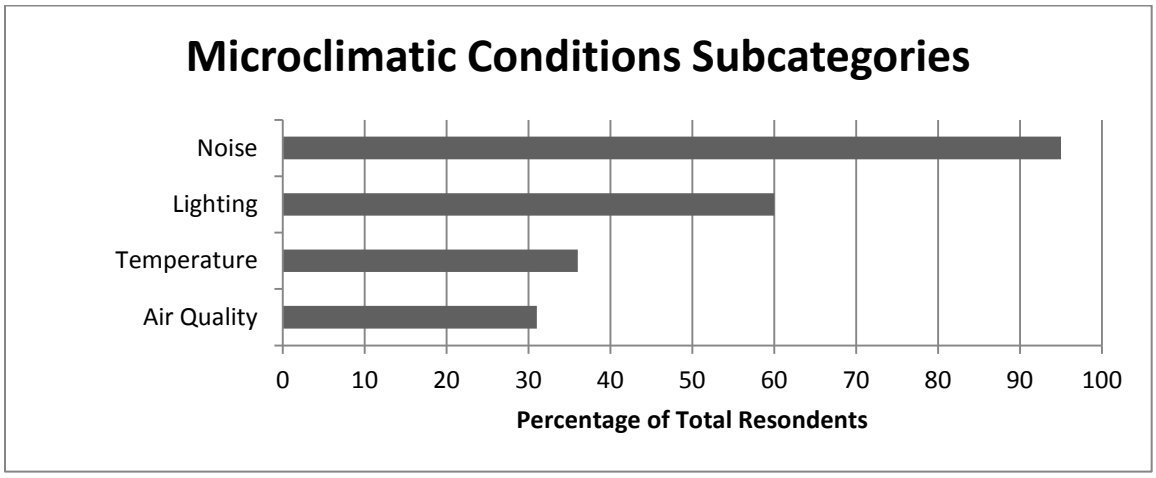


Note: This graph measures how many unique participants responded within each category, where 100% is equal to 42 students.

PHYSICAL MICROCLIMATIC CONDITIONS

The majority of survey responses were comprised of microclimatic site conditions as the main determinants of whether a space was preferred or disliked. Overall, ninety-five percent of people surveyed were impacted by noise, sixty percent were impacted by light, thirty-six percent by temperature, and thirty-one percent by air quality.

Figure 2. Main response subcategories within the larger category of Physical Microclimatic Conditions



Noise

Noise, in general, was the single most commonly mentioned factor in determining environmental preference. Ninety-three percent of respondents mentioned some element of noise level or noise type as important to their preferred and/or disliked conditions.

Of the forty-two survey respondents, twenty-nine reported either needing silence or being alone, compared to the twenty-one who listed soft music in the background as helpful. Of those reporting soft background music, six were unique responses. These three conditions were the most commonly reported upon, with only six respondents who did not mention any of these in their preferences/responses. With relatively quiet conditions clearly dominating the preference spectrum (and response rate); it comes as no surprise that noisy environments were the most commonly reported detrimental condition.

The types of preferred music were generally not specified. However, one respondent stated that "sometimes I throw on some music, usually Tchaikovsky if I need to concentrate. If it is purely creative process (art rather than writing an essay) then I will listen to all sorts of music. My favorite is Irish bar songs." And another listed "mellow music such as jazz or mellow hip hop" as their preferred type. Other

types of preferred noises were “undisturbing” or “muffled” background noise, such as a quiet television with “no sudden noises”, “white noise”, and “relaxing” sounds such as “moving water.”

One of the most commonly reported unfavorable conditions were environments that were noisy or those with loud talking or chatter (*n*=27). Of those, thirteen were unique responses for loud/noisy environments and seven were unique responses for loud talking or chatter. Two respondents specified that others talking about anything unrelated to the topic or work at hand was particularly disruptive. Surprisingly the only other type of disruptive noise listed were “repeating noise”, “someone else’s music”, and “sudden noises”.

Since the majority of participants reported preference for silence and/or being alone, and consider loud talking and chatter as a major contributing source of disruptive noise, it would seem that quiet working environments separated from other people would be generally preferred. However, seventeen individuals also listed the presence of other people as beneficial to their processes.

Table 1. Noise conditions (n=40)

Noise Conditions	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Soft and/or background noises	28	
Loud/noisy (including talking/chatting)		27
Alone	22	
Quiet and/or silence	17	
Other (Repeating noise; someone else’s music; sudden noise; traffic sounds)		4

Light

Adequate or “suitable” light was also considered important to many students. The responses reported a general preference for bright, “comfortable” lighting, and a general dislike for extremes of

lighting such as environments that were too bright or too dark. One respondent explained, “Good lighting livens up my mind, makes me happier, especially in winter.”

Table 2. Lighting preferences (n=25)

Lighting Conditions	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Natural light	7	
Bright	6	
Harsh or too bright		4
Inadequate / poor lighting		4
Sometimes dim / dark	2	

Temperature

Many responses referenced a preference for “comfortable” temperatures, and a dislike for any temperatures outside their perceived comfort range (e.g. too hot or too cold). However, some participants added that they preferred slightly cooler environments when given a choice between slightly too warm and slightly too cold temperatures. Interestingly, 3 respondents listed “cold hardscapes” as a detrimental characteristic, conceptually linking temperature and type of environment. This perceptual association may mean that the design of hardscapes should be extra careful to avoid appearing “cold” and instead promote an atmosphere of warmth in order to be perceived as a more beneficial and desirable for creative uses.

Table 3. Temperature condition preferences (n=15)

Temperature Conditions	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Comfortable or moderate temperature	15	
Cold temperatures		4
Hot temperatures		2

Air Quality + Smells

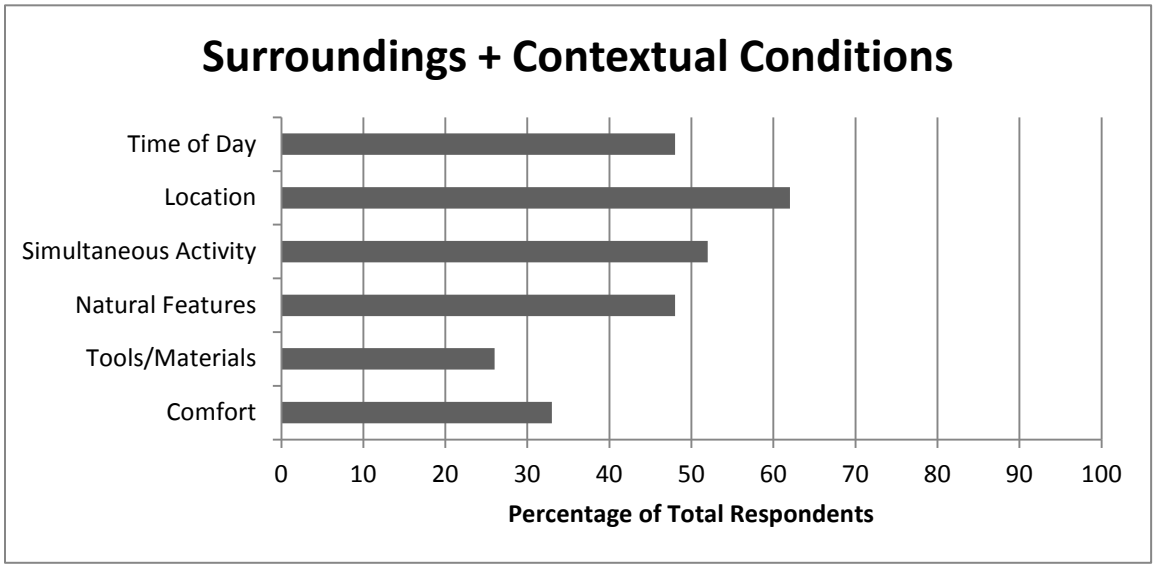
Though only five respondents listed smells as important variables, each one was a unique value. A smell was classified as natural if the response referenced being outdoors or if natural features (e.g. "fresh air", "natural breezes") were referenced. This category also includes all those who were also counted in the "fresh air/breezes" category in the air quality section of Table 9. The responses identifying pleasant smells were described as "good", and "incense or eucalyptus scented candle". Unpleasant smells were described as "bad", "weird", and "strange".

Table 4. Air quality preferences (n=13)

Air Quality Conditions	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Fresh air/breezes	8	
Pleasant smells	3	
Unpleasant smells		2

ENVIRONMENTAL SURROUNDINGS + CONTEXTUAL CONDITIONS

Figure 3. Main response subcategories within the larger category of Environmental Surroundings + Contextual Conditions



Time of Day

Only four responses in this category were not unique. However, all four of them chose sequential time slots. This could mean that every respondent who listed time of day as an important factor may prefer a single, continuous, and consistent time of day for carrying out their creative processes. A typical response for this category was “Most of my creative thinking is done in late night/early morning hours typically when no one else is around and it is very quiet."

Table 5. Time of day response subcategory (n= 20)

Time of Day Preference	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Nighttime hours	19	
Daylight hours	7	
Other (when inspired)	1	

Location

As in Korpela et. al's (2001) survey analysis, a given favorite or detrimental place was classified as natural if the response referenced a natural environment (e.g. a forest) or natural features were integral or central to the identification of the place (e.g. "soft grass" or "surrounded by trees"). Table 6 shows the general preference for interior spaces compared to those preferred areas that were described as "outdoors" or a "natural environment'". Generally, respondents listed far more specific interior locations (Table 7) and conditions (both preferred and detrimental) compared to the vague and sparse descriptions of the exterior environments.

Table 6. General location preference response subcategory (n= 26)

Location Preference: General	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Outdoors/natural environment	8	
Indoors	16	

Table 7. Types of indoor location preferences

Location Preference: Specific	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Studio	8	5
Bed/bedroom	8	2
Bathroom/shower	5	
Home/apartment	2	
Coffee shop	2	
Indoors (in general)	3	
Other (CAP atrium during class; library)	2	

When looking at types of locations preferred (Tables 6 and 7), residential locations were listed most frequently (*n*=15), followed by academic locations (*n*=10), outdoor/natural environments (*n*=8),

indoors in general (*n*=3), and coffee shops (*n*=2). When the residential locations are broken down, there appears to be an interesting distribution of specific areas preferred: bed (*n*=4), bedroom (*n*=4), bathroom/shower (*n*=5), and home/apartment in general (*n*=2).

Those who listed "bed" as a preferable environment only listed it as preferable during creative thinking activities. Nearly all of them also included the phrase "when I am about to fall asleep" as an additional descriptor. Those who listed "bed" or "bedroom" as detrimental locations cited uncomfortable furniture and being too comfortable as the reason why.

All those who listed the shower (*n*=4) and bathroom (*n*=1) as preferable, specifically listed them as beneficial environments for creative thinking. One respondent explains the reason as "it is usually one time in the day when you are completely relaxed and it gives your brain a chance to float and that is when the ideas flow is when you are not trying too hard. So any creative space needs to make you feel comfortable and secure, so your mind can float." Similarly, another respondent notes that "during these times my mind wanders off and I think about crazy things."

Of the academic locations, studio spaces were the most frequently mentioned type of environment, both positively and negatively. Studio spaces were considered detrimental mainly due to noise, activity and others using the space to socialize instead of work. Other reasons included uncomfortable furniture, spending too much time in the same space, bland colors and materials (concrete), clutter, being distracted and interrupted by others (students, professors, etc.), and being distracted by others' technology and ideas. However, studio spaces were also considered preferable environments when there are few people there/little going on, and/or when the student wants to collaborate, share ideas, or receive input.

When describing the studio environment as preferable or detrimental, temporality became a clear distinguishing factor. Of those listing studio as a preferable environment, thirty-seven percent

listed it as preferable all of the time, thirty-seven percent listed it as preferable only some of the time, and twenty-six did not specify either way. Those who preferred to work in studio some of the time choose not to work there if they have "spent too much time there", are "working out design problems and solutions", or when they are in the initial ideation phase of their creative process. Only one respondent provided an elaboration on why they prefer to always work in studio: "I find I am most creative when I am in studio. I think this is because once I get to my desk I know it's time to work." This is an example of psychological conditioning and place-based attachment of meaning and connotations that will be important to consider in future studies.

Simultaneous Activities

When describing their environments and circumstances surrounding their best creative thinking and work, over half of the respondents (*n*=22) listed being engaged in some other type of simultaneous activity (Table 8). There are over twice as many activities reported that are solitary or do not include social exchange than those activities reported that do include social exchange. This suggests that respondents have the potential to participate in a wider diversity of solitary activities when attempting creative thinking or work.

Table 8. Simultaneous activity preferences (n=22)

Simultaneous Activity Preferences	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Talking with others/discussion	12	
Let mind wander (think aloud/contemplate)	8	
Exercise (run, hike, etc.)	5	
Walking	4	
Other (draw; garden; surf internet; sunset)	3	
Driving	2	
People-watching	2	
Relaxing	2	

Natural Elements/Features

Nearly half of all respondents (*n*=20) mentioned some natural element as preferable in their responses as shown in Table 9. The "breezes and/or fresh air" category is also represented on Table 4 and the "natural light" category is also represented on Table 2.

Not all natural elements were considered tied to the exterior landscape (Table 10). In fact, more respondents referred to beneficial natural elements within an interior environment than those that described them only as part of an exterior environment or a combination of both interior and exterior contexts. These results suggest the importance of interior landscapes for developing creative work environments. These types of landscapes and the combination of interior and exterior natural features context often describe similar environmental qualities and conditions. One response that addresses these contexts describes "an indoor working environment with natural light and vegetation or an outdoor space where I can feel enclosed but yet apart of the space with everyone else."

Table 9. Natural elements preferences (n=20)

Natural Elements	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Presence of "green", "vegetation", or "nature"	10	
Immersion in an outdoor environment	7	
Breezes and/or fresh air	6	
Natural light	6	
Windows with views to outside/nature	5	1

Table 10. Context of preferred natural elements

Natural Elements Context	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Interiors	9	
Outdoors	6	
Both interior and exterior context	5	

Additional analysis of responses revealed very little overlap between individuals who reported a preference for the presence of others and those who preferred natural environments. These results may suggest that people who prefer to be outdoors prefer to be alone. The design implications of this potential finding is that the design of outdoor environments should perhaps offer more private, flexible spaces where people can be alone. Only one individual reported both conditions as beneficial, but they also specified in their other responses the need for different types of environments for different stages in their creative process, so this individual response is not seen as a contradiction to the general trend in the data.

Access to Tools + Materials

For designers who often use several different types of supplies and methods during their different creative stages, it is important to have easy access to these tools and materials throughout the

entire creative process. Approximately a quarter of respondents (*n*=11) reported having access to a particular item as an influential factor in determining preferable creative environments (Table 11). Though some respondents require access to certain materials, such as computers and design software, in order to facilitate their methods; some respondents also consider having access to certain technological items (television, computer, cell phone) as distractions and detrimental to their creative process.

Table 11. Preferences regarding access to tools and materials (n=11)

Access to Tools + Materials	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Food/caffeinated beverages	5	
Large open table/desk space	4	
Technology	4	4
Materials/supplies (general)	4	
Books	1	

Comfort

"Comfortable" was a common adjective used to describe preferred environments. The words "comfort", "comfortable", and "comfy" were used twenty-six times in the responses by fourteen individuals (Table 12). Having comfortable furniture was also considered important to several respondents. Other adjectives used to describe their ideas of an ideal comfortable environment were: cozy (listed twice), inviting, serene, and relaxing. "My most creative work happens when I'm comfortable—mentally and physically." Though only a third of respondents directly referenced "comfort" as an influential factor, many additional respondents indirectly addressed comfort in their responses.

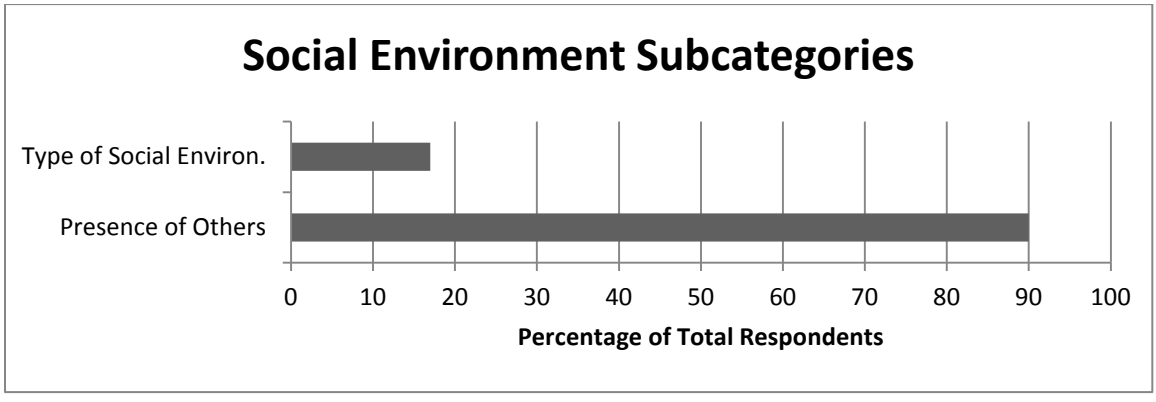
Several students offered a rationale behind the emphasis on comfort. “If I am not comfortable it is hard to design … Since it seems for me that the creative process can take a long period of time which includes sitting and/or standing, my creative process can also be negatively affected by uncomfortable seating and work spaces that do not allow for flexibility.” “The environment should always be very comfortable with chairs and tables that you can move around and sit in a variety of positions, because when you work long hours it is hard to sit still and you start to go numb if you sit one way to long.”

Table 12. Comfort factors and preferences (n=14)

Comfort Factors	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
"Comfort/comfortable/comfy"	26	
Comfortable furniture	9	1
Comfortable environment (in general)	8	
Comfortable temperature	7	
Other (lighting; textures; space)	3	

SOCIAL ENVIRONMENT + CONDITIONS

Figure 4. Main response subcategories within the larger category of Social Conditions



Presence of Others

While about half of the respondents preferred to be alone (22), fifteen preferred to be in the presence of others in some capacity (five respondents listed both) (Table 13). Seven respondents preferred the presence of others in small groups for the specified purpose of collaboration. An additional seven individuals reported that talking with others was helpful to their creative process, necessitating access to other individuals. "I like to be able to talk things through with others and make connections. Making connections is often what leads me to move forward with my design." However, preferences of how many and what type of people make up an environment may change as one moves through the different stages of their creative process. One participant noted that "I think it is necessary to be alone for a stage of the creative process. You should think of an idea initially on your own and then a studio setting is beneficial to collaborate the ideas of others to elaborate on your initial idea."

Those listed as considering the presence of others in general as detrimental also includes the responses of those who listed "crowded" (*n*=5) and "too much activity" (*n*=4) as detrimental environmental characteristics.

Table 13. Preferences regarding presence of others within an optimal environment (n=38)

Presence of Others	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
None (alone)	22	
Others in general	15	16
People for discussion and/or collaboration	14	1
Few people	8	
Many people/active environment	2	13

Table 14. Types of social environments (n=7)

Social Environment	***Preferred Condition Frequency***	***Detrimental Condition Frequency***
Carefree environment	4	
Competitive environments	2	1
Negative people / negative mood		3

Several respondents noted the qualities of people they preferred to be around or have in their environment. These include:

- Those with different backgrounds (for inspiration)
- Hard working and cooperative
- Those with similar interests who can provide meaningful feedback
- Those familiar with the project topics
- Passionate co-workers
- Teammates and/or friends (for input and inspiration)
- People for discussions

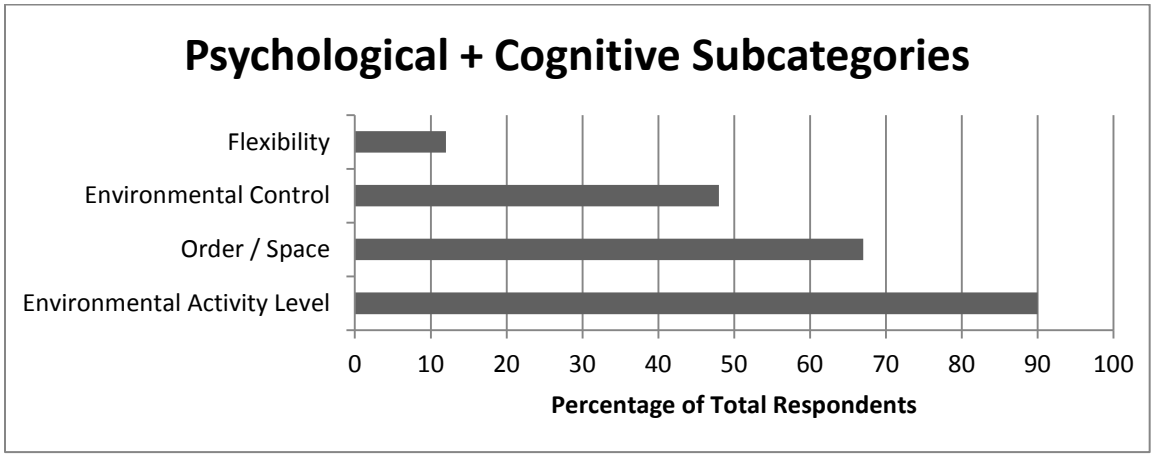
Types of Social Environments

This category can also be interpreted as "social atmosphere" (Table 14). Examples of the responses comprising the "carefree environment" category include "a casual place with some close friends where I don't need to worry about saying stupid things" and "an environment that lets me feel free of judgment from classmates or my instructors… when I am alone or in a care free environment." The other two categories are more straight-forward. While respondents had differing opinions on whether competitive environments were either beneficial or detrimental, those that reported on

negative atmospheres or being around people with a negative attitude or mood were in complete agreement. "I love being surrounded by people, but not negative people. They bring a negative vibe and bring everybody's mood down. When a negative person is there I can feel it and they irritate me and stop my creative thinking."

INDIVIDUAL PSYCHOLOGICAL AND COGNITIVE CONDITIONS

Figure 5. Main response subcategories of Individual Psychological and Cognitive Conditions



Flexibility

Though only five respondents directly referenced "flexibility" or "flexible workspaces" (Table 15), a few additional respondents did address the topic indirectly through other terms such as "personalizable" or "customizable" (Table 16). Examples of the responses in the "flexible workspace" category include: "[I need] chairs and tables that you can move around and sit in a variety of positions," and "work spaces that…allow for flexibility - tilting tables or ability to move up and down whether you choose to sit or stand." Respondents defined the static environment as "[conditions] that don't allow for

imagination," and as "nothing, or a lack of different qualities in a space. If there is nothing to inspire you or bring about some kind of response then it is difficult to be creative."

Table 15. Flexibility factors (n=5)

Flexibility	***Preferred Places Frequency***	***Detrimental Places Frequency***
Flexible workspace	3	
Static/inflexible environments		2

Control

"Control" refers to the ability to physically manipulate or change one's surroundings as well as the ability to exercise authority, dominion, or influence over matters and conditions, especially those that affect the individual (Table 16). The categories corresponding to higher degrees of individual control (personal space and carefree environment) are almost exclusively rated as preferable, while the categories corresponding to the lower degrees of individual control are exclusively rated as detrimental.

Carefree environments are described by respondents as a place that "lets me feel free of judgment from classmates or my instructors" and where "I don't need to worry about saying stupid things." The respondent who listed carefree environments as detrimental did so because "people have too much fun" in working environments and are distracting. Several additional participants indirectly alluded to elements of carefree environments in their responses that are included in the "personalized space that feels comfortable and secure" category. This category includes responses that describe environments that can be altered or customized by the individual and/or where they are able to feel completely at ease and uninhibited. Four of the responses in this category are also counted in the "Own/Personal space" category in Table 17.

Time constraints were reported as particularly stressful and counterproductive. "[It] makes it very hard to focus on one thing for very long, or to relax the mind enough where creativity does not feel like it is being forced." "I can't concentrate when I have to be done by a certain time. I get frustrated with the time constraint and refuse to use all the time I have, instead quitting halfway through." Other assignments and obligations are regarded in the same way since they serve as similar forces that require the individual to conform and restrict their behavior to meet external demands. Both respondents in this category mentioned that this was detrimental because it interrupted their creative processes.

Table 16. Environmental control preferences (n=20)

Level of Control	***Preferred Places Frequency***	***Detrimental Places Frequency***
Personalized space that feels comfortable and secure	7	
Carefree environment	4	1
Deadlines/time constraints		4
Too many other assignments or obligations		2
Being closely monitored or watched		2

Enclosure / Open Space

With regard to open versus enclosed environments (Table 17), respondents in this category preferred one or the other. No one reported preferences for both. Those who preferred open spaces listed several reasons for their choice. These respondents favor open space because they can spread out their materials, physically move around, have adequate space for all their supplies and materials, and/or have enough mental space to not feel overly confined. The combination of freedom of physical movement and psychological escape was reported as beneficial by a majority of the respondents in this category (*n*=5). "[I prefer] open space with areas to move around in. Some sort of view to not feel contained or trapped… I like to be able to move around, which helps me think." Having windows and

views outside of their immediate area was identified as essential as part of the psychological space. For several respondents, having enough space was one of the most critical conditions necessary for environments conducive to their creative process. “The key is in the space. Room to think, breathe and space to spread out. Sort of physical and psychological removal of the boundaries and constraints.”

Those who preferred enclosed areas were less descriptive of their preferences and reasoning. However, one respondent in this category did note the importance of needing to feel connected to a larger whole (“[being] a part of the space with everyone else”) despite the inherent isolating effect of working in intimate enclosed spaces.

Of the six respondents who reported needing their “own”/“personal” space, five did not report preference for either open or enclosed areas, and one reported a preference for enclosed space. Based on analysis of their comments, respondents defined “own”/”personal” space as an environment that one has control over to change and customize as they see fit, with some degree of implied ownership. “If I want to create a space which is completely my own i need personal space. I am very good at changing things.”

Table 17. Open space and enclosure preferences (n=14)

Enclosure / Open Space	***Preferred Places Frequency***	***Detrimental Places Frequency***
Open area (with space to move around)	6	2
"Own"/"Personal" space	6	
Closed/enclosed environment	2	2

Order and Interest

Two thirds of all total respondents consider interestingness and organization as influential environmental factors (Table 18). By and large, respondents reported that “visually interesting” and “engaging” environments were helpful to their creative process. Likewise, they consider “dull”, “boring”, and “unimaginative” environments as inhibitory to their creativity. “The environment itself needs to be engaging and creative. If the environment can provide or spark creative thoughts it helps the creative process.” Other beneficial qualities of engaging environments include “richness of the different textures, sounds, sights, and other things.” Descriptions of undesirable “static” environments include “dull” or “bland” colors, “constant material,” “harsh hardscape”, “monochromatic”, “concrete”, “flat landscape”, “boring”, “unimaginative”, and “unchanging”.

Order and organization were also reported as an issue for some respondents. A small number of students described their preference for “messy” procedures and environments. For example, “I just want to be able to spread out my things and make a mess. Piles of examples, sketches, and concepts everywhere!” Additionally, a desirable location displays “inspiring and creative sayings and pictures all around for you to look at when you get stuck and can't think of a design.” On the opposite end of the preference spectrum were those who preferred “neat” and “clean” environments that are devoid of “clutter”. Some descriptions of these types of working and thinking environments include “Spartan and well organized”, “tidy”, and “open and clear”. All those that favored “neat” and “tidy” methods and environments also listed “messy”, “unorganized”, and “cluttered” environments as undesirable, unattractive, distracting, and detrimental to their creative process.

Table 18. Order and interest preferences (n=28)

Order / Interest Variables	***Preferred Places Frequency***	***Detrimental Places Frequency***
"Interesting"/"engaging" environment	10	1
"Dull"/"static"/"unimaginative" environment		5
"Messy"/"unorganized"/"cluttered" environment	2	4
"Neat"/"tidy"/"clean" environment	3	

Environmental Activity

Those reporting on environmental activity levels (Table 19) were largely in agreement with one another. In general, most respondents view higher levels of activity as distracting and inhibitory to their creative process. However, respondents also note that environments that are too static and dull are also undesirable for creative thinking and work. Therefore, it appears that respondents may desire an environment that has low levels of background activity—just enough to keep the space interesting, but not enough to be distracting. The few respondents who favored highly active areas consider them to be stimulating and a source for new ideas. For example, "I tend to do my most creative thinking in places that are busy (lots of noise, people, things happening) or places that have a lot of visual interest. This is because it allows me to take in all of the different qualities and then process and combine certain things into something new."

Table 19. Environmental activity level preferences (n=38)

Environmental Activity Level	***Preferred Places Frequency***	***Detrimental Places Frequency***
"Busy" / "crowded" / "active"	2	12
Distractions (in general)		6
"Dull"/"monotonous"/ "static" environment		5
Relaxed / calm	4	
Views onto active areas		2
"Changing lights"/"moving things"/"sudden noises"		1

Distractions

The most commonly reported unwanted distraction was noise, by a wide margin (Table 20). A majority of those who consider noise a problem identified "loud talking" and "chatter" as the one of the main cause of irritation, frustration, and distraction (Table 1), particularly in studio environments. Just the mere presence of other people can serve as a distraction to some respondents. Those that reported preferring to work alone and away from others (Table 13) were not counted in this category. The most prominently discussed issues respondents have with the presence of people is the opportunity for being "interrupted or disturbed by others" and being influenced by other people's ideas. "I can't create where someone else is creating. I tend to bounce ideas off of other people and when I see an idea I tend to manipulate that idea to my own." Another example of this is described by a different respondent, "other's ideas [are detrimental] because I tend to emulate them and sometimes base my ideas around the collective others."

Technology, both belonging to the respondent and that which belongs to other people in the surrounding environment, was considered distracting to a certain degree. Mainly the issues with technological devices stem from the noises they make (both continual and sudden) and the temptation to use them for purposes other than the task at hand. However, computers are a common tool used in

the landscape architecture studios that some students consider it an essential tool for their creative process (see Table 11).

Table 20. Types of distractions

Types of Distractions	***Preferred Places Frequency***	***Detrimental Places Frequency***
Noise		27
Presence of other people		9
Being interrupted or disturbed by others		4
Technology (computers, cell phones, television)		4
Views onto active areas		2

SUMMARY

The results from the survey were largely congruent with the findings established by existing research (see discussion section for detailed comparisons). Based on the analysis of the survey findings, the most influential environmental conditions for areas used as creative spaces include noise, presence of others, adequate space/room, comfort, and environmental activity. Focusing on these key conditions may serve as a potential starting point for future research.

Chapter V: Discussion

INTRODUCTION

The overall goal of this thesis project was to examine how the design of a landscape architecture student's environment potentially impacts the student's creative processes. The original intent of data collection was to compare the results with existing data in the field in order to determine if any gaps were present in the existing field of knowledge. After the results of the study were compiled and organized, they were then compared to the leading theories proposed by creativity researchers as described in the literature review. The primary intent behind this process was to discover: (1) if the data supports current theories in the field, then specific design guidelines for effective studio environments could be developed and added to the body of creative research literature; OR (2) if the data collected opposes current theories in the field, then new hypotheses can be made based upon the unique nature of the subpopulation of landscape architecture design students and will create evidence upon which to base further research. However, as a result of the loose structure and qualitative nature of the open-ended survey questions, the responses were less specific and did not necessarily compare neatly within the more quantitative frameworks of the existing literature findings. Therefore, additional categories of preferences and/or a restructuring of the organizational categories of preferences were determined based on grouping and comparing similar concepts. Thus, there could not be complete and accurate comparison with existing theories due to the differences between the levels of specificity and lack of equally comparable items. Therefore, rather than attempting to directly compare the survey results and the research literature, this final chapter explores the survey results through a more qualitative lens, informed by the literature findings.

THE CREATIVE PROCESS

The survey did not specifically ask for the students to identify or describe their creative processes clearly. So, in general, respondents did not report this type of information. Only a few individuals implied the separation between more open, collaborative stages and more private, focused stages. However, this does not necessarily mean that these students do not engage in a multi-staged creative process, only that they did not report them. Of those who discriminated between their divergent and convergent stages, the descriptions of their preferred environmental conditions differed between the two modes. Typically, a more active, social, engaging environment is preferred for the divergent modes and a quiet, still, flexible, more controllable environment is preferred during the convergent modes. Feedback from peers was considered important to many, though most did not specify during which stages of their creative process when this feedback would be most helpful.

Several respondents identified needing to "get away" from the problem, or "working it out" while doing or thinking of something else. In fact, over half of the respondents reported that engaging in some activity other than working on the problem was helpful to them during creative thinking and/or work. This seems to reinforce the importance of the incubation period to some students' creative processes. Their responses identified some additional concepts linking incubation and recreation not explored in the literature review. Some researchers posit that creativity may be enhanced by engaging in appropriate leisure activities (Dowd, 1984; Iso-Ahola, 1984; McDowell, 1984). Dowd argues that leisure activities "can provide one of the few opportunities for people to engage in exploratory, divergent, and creative activities, rather than problem-solving, goal-directed, and convergent activities" (Dowd, 1989, p. 240). Perhaps this modal switching of thinking pattern, particularly during the incubation phase of the creative process, is what the respondents were noticing and reacting to in their survey responses.

PHYSICAL/MICROCLIMATIC CONDITIONS

The results from the survey in this category closely mirrored those predicted by the literature review in that students preferred comfortable temperatures, manageable noise levels, adequately bright or natural lighting, and fresh air. These preferences were universal across taste profiles, excluding noise level. This may suggest that this category has more universal application across subpopulations.

ENVIRONMENTAL SURROUNDINGS + CONTEXT

Students overwhelmingly prefer to work in consecutive blocks of time, particularly during nighttime hours. Due to these longer periods of time, uncomfortable furniture was often cited as an influential distraction and hindrance to an individual's creative process. Several respondents reported preferring environments where they have access to a place to lie down (i.e. sofa, bed). This preference may be a result of working long, late hours where time is at a premium and short naps are the primary sleep delivery method. Perhaps having quick access to a variety of resources and environments (such as kitchen, bedroom, living room) is one reason why the majority of respondents reported residential locations as ideal for their creative process.

SOCIAL ENVIRONMENT + ORGANIZATIONAL CLIMATE

Landscape architecture students often spend a majority of their days and many long nights together in their studios. Because of this time spent with each other, the social relationships between students in a studio can be a complex mix between professional respect among colleagues, close friendships, and love/hate familial relationships. These complicated relationships result in a complicated social

environment that may potentially have a significant effect on how an individual perceives, interacts, and behaves within their environment. One reason why current studio environments may not be functioning as desired could be because they do not take into account these complex social factors into the designed environment.

One commonly shared social environment preference was for isolation, quiet/silence, and/or being alone. A majority of respondents reported needing silence or being alone at some point in their creative process. According to Hill, "aloneness is usually required for the student not trained in the art of 'flow' which is why many students are more creatively fluid working nights when they have more opportunity for uninterrupted 'flow'" (2006, p. 328). While the survey study for this paper did not specifically ask whether the student was trained in 'flow', the results do support Hill's observation of students preferring to work at night. Other contributing factors to night preferences may include: less chance of being interrupted or disturbed by others, less demanding schedule allowing for longer continual periods of time to work, less distraction due to lower external activity and/or limited visibility to potentially distracting external views, etc.

"No one can be close to others, without also having frequent opportunities to be alone" (Alexander, Ishikawa, & Silverstein, 1977, p.669). This quote from *A Pattern Language* describes the need for individuals within a household to have a place to themselves where they have more control, more privacy, and can set themselves apart from the collective social areas and environment. Other environmental typologies described in this book present the need for a variety of flexible spaces within a larger context, such as one typically experiences within a house. The residential typologies described in this seminal piece of design literature had direct relevance to how some individuals interact in a studio environment, perhaps due to the more intimate relationships forged between classmates through spending so much time together. This appears to be the primary missing piece to how creative

environments should designed for landscape architecture students. The current design of these environments seek to optimize space and resources and meet the student's most basic needs; but at the expense of considering how a student *lives* within the space, both as an individual as well as within their social environment and context. In other words, houses are designed to facilitate living; offices and classrooms are designed to optimize university resources. However, studio spaces are both places of work and living. Since landscape architecture students need both conditions to aid their creative processes, having to choose between working at home or working in a studio setting requires compromises on both ends. Therefore, optimal creative environments should be designed to facilitate both living and working conditions for the student in order to meet their needs.

INDIVIDUAL PSYCHOLOGICAL AND COGNITIVE CONDITIONS

Psychological and cognitive factors are those that relate to an individual's mental state and/or condition, thinking skills, intellectual processes, cognitive functioning, etc. These factors are more focused on the individual aspect of creativity but can be directly influenced by the individual's larger sociocultural context. For example, a highly competitive social environment may cause some students to feel stress and anxiety, which may cause a myriad of negative reactions such as increased sensitivity to environmental stressors, negative feelings and outlook, negative health side effects, and changes in their perception of their surroundings such as viewing the presence of other people as a threat rather than as a resource.

Stress + Relaxation

In order to facilitate the creative process at one of the most basic levels, stress, tension, and conflict should be minimized. This mainly pertains to tension within an individual rather than conflict between an individual and their contextual ideological domain as this has been cited as a potential source of creativity in some individuals (Runco, 2007; Hemlin, Allwood, & Martin, 2008). "Tension inhibits creativity (tension and creativity overlap in the brain and tension blocks the act of creation)…Relaxation is one of the prerequisites of the physiological state needed to access and maintain a 'flow' state" (Hill, 2006, p. 326-327). Several respondents mentioned relaxation or calming environments in their descriptions of their preferred and/or necessary conditions for creative thinking and work. Stress has a significant effect on many other psychological and physiological processes, as described in chapter two.

Open Space + Enclosure

With regard to open space and enclosure, "people cannot work effectively if their workspace is too enclosed or too exposed. A good workspace strikes the balance" (Alexander, Ishikawa, & Silverstein, 1977, p. 847). While a few respondents identified needing an extreme of one or the other, a balance of both may be the best route for designing creative environments, while giving the individual some degree of control over adjusting their space to fit their preferred scale. One factor in determining how open or intimate a space feels is the presence of windows. "Rooms without a view are prisons for the people who have to stay in them…When people are in a place for any length of time they need to be able to refresh themselves looking at a world different from the one they are in, and with enough variety and life to provide refreshment" (Alexander, Ishikawa, & Silverstein, 1977, p. 890). Windows provide individuals with perceived, or mental, space that may help compensate for an otherwise cramped space.

Several respondents reported a preference for staring out of windows to let their minds wander and/or daydream, serving as an element of distraction. In a study by Wells (1965), eighty-one percent of office workers chose a position next to a window. Another study of office workers found that they prefer windows with "meaningful"/interesting views (e.g. city life, nature) over less meaningful and uninteresting views (Markus, 1967). The survey responses also mirrored this preference for windows, particularly with views to "outside" or "nature". The principles of attention restoration theory propose that views onto natural elements helps to restore cognitive functioning after experiencing stress or fatigue, thereby sustaining an individual's capacity to be productive for a longer period of time with fewer side effects (Ulrich, 1993; Kaplan, 1995; Kaplan & Kaplan, 1989; Hartig, Mang, & Evans, 1991; Heerwagon & Orians, 1986; Heerwagon, 1990).

CONFLICTING PREFERENCES

When analyzing the preference data, the author found several instances of reported preferences that appeared to be contradictory. However, upon further analysis, patterns emerged in the data that suggested at the presence of a few different preference profiles. Some examples include groups of respondents that want conditions where they are:

- Completely alone with no noise (high levels of environmental control, low levels of distraction) versus those who prefer to be alone but also want presence of other people (typically for feedback and occasional discussion)
- Surrounded by an enclosed environment (typically also prefer very "neat" and "tidy" environments) versus those who need to larger open spaces to spread out both physically and mentally (who typically also prefer to spread out their materials in front of them and generally prefer working/thinking in less orderly environments)

- Surrounded by higher levels of environmental activity and stimulation (who prefer higher levels of visual interest and engagement) versus those who prefer environments which are more "serene" and "relaxing" with much less environmental activity, noise, and stimulation
- Located solely within indoor environments versus those who prefer to be outdoors (who typically were more likely to report engaging in repetitive, "mindless" simultaneous activities such as walking, running, or driving; and who also typically prefer to be alone)

"There are numerous ways to achieve 'flow' and each student must realize what is effective for him/her" (Hill, 2006, p. 328). This may begin to explain the variety of preferences and taste profiles received in the survey. Further research in psychological and cognitive studies may also help to elucidate additional predictive factors in how these taste profiles are formed and how they relate to an individual's functioning, perceptions, and behaviors.

After accounting for taste profiles, there were still some conflicts in the preference data that appeared significant. However, these conflicts represented the main issues/reasons as to why students reported not liking to work in studio or other similar environments. These conflicts include:

- wanting natural light, but preferring to work at night
- preferring outdoor environment, but natural light caused too much glare on screens
- wanting to be alone or have silence, but also wanting access to other people for discussion
- wanting access to their own tools and materials wherever they chose to work, but currently can't easily move them from place to place
- wanting access to fresh air and breezes, but also want to have papers and projects strewn out on their desks
- wanting to talk and converse with others, but not wanting to listen to others talking

SPECIFIC DESIGN TYPOLOGIES

Preferences generally appear to align with the qualities typical of the three design typologies in both the literature and in the survey results. However, due to the specificity of some of the parameters of these typologies and the generality of the survey responses, only a general comparison can be made.

Restorative Environments

The survey results correlated well with this collection of environmental conditions. Respondents reported preference for the following qualities of this particular design typology:

- Visually interesting/ engaging environment
- Aspect of "being-away"-providing an escape from the stressful/typical environment
- Synchronicity between the user's goals and the environment
- Perception of being in a distinct place yet also feeling as belonging to a larger whole
- Presence of vegetation
- Moderate to high spatial complexity/visual detail
- Views of natural environment
- Use of natural materials, shapes, textures, and/or forms
- Presence of natural light sources

The aligned preferences were consistent across most taste profiles (mainly excluding those who preferred the most amount of enclosure and highest degree of order). The few remaining design guidelines for this typology that were not mentioned in the survey responses may have been too specific for survey respondents to address without being prompted.

Contemplative Environments

This design typology was also successful in predicting preferred environmental qualities for a large portion of respondents. The specific conditions supported by the survey results include:

- Reduced distraction (fascination) for inward focus
- Low arousal for inward focus and concentration
- Higher degree of order/lower environmental complexity
- Repetition in pace (repetitive simultaneous activities such as running, walking, swinging, etc.)
- Silence or white noise to reduce auditory distractions; occasionally rhythmic noises
- Safe, enclosed environment that allows for complete immersion in one's thoughts and segregation from a larger context or the outside world/enhanced sense of isolation

This typology was slightly more well-represented in the survey responses largely due to preferred noise conditions, sense of isolation, and reduced level of distraction to allow greater focus. These categories had some of the highest response rate throughout the survey findings.

Playful Environments

Of the three design typologies, this is the least represented in the survey data. However, this does not necessarily mean that students do not prefer those particular conditions, only that they were not reported in the absence of a specific prompt. The conditions that were supported by the survey results include:

- Freedom from judgment of ideas/ trusting atmosphere
- Flexibility and openness
- Freedom from complete isolation/access to connection with others
- Opportunities for spontaneous social interaction with others outside one's usual circle

Specific Design Typologies Summary

The three chosen design typologies were generally very well supported by the survey results, thus suggesting that restorative environments, contemplative environments, and playful environments may typically be considered beneficial to a landscape architecture student's creative process. However, these typologies need further review as to their effectiveness for this purpose, particularly regarding contemplative and playful environments.

LIMITATIONS

Limitations based on the participants:

- Limited number of respondents resulted in low sampling number which could skew the results.
- Both graduate and undergraduate students were surveyed. Only a very small number of graduate students had a background in landscape architecture which, if profession turns out to be a dependent variable in preference, could skew the results.
- Several participants were international or non-local students whose responses may reflect certain cultural preferences and norms as their own preference profiles which cannot be ascertained from the current data.
- Since no reward was given for taking the survey, the number of survey questions was greatly reduced in hopes of procuring a larger response rate for this stage in the research. Unfortunately, this means that no demographic information was collected which could have potentially a significant effect on the analysis of the survey results.
- No follow-up interviews were possible with the anonymous survey method. This restricted the ability to dig deeper and discover the meta-data behind the superficial responses provided.

Context and further detail was greatly needed to improve clarity of many of the answers and the meanings behind them.

- Since none of the participants were tested for degree of inherent creative capability, which could skew the data if level of creative ability is a factor.

Limitations based on the survey questions:

- The questions in the survey were quite broad and therefore produced broad/very general results. In order to uncover more meaningful data, the next steps of this research should take the categories suggested by this survey's results and test to what extent each consideration/element/topic is to each individual's creative process. In addition, each topic should be rated for importance during the different stages in the individual's creative process. For example:
    - *To what extent is being alone helpful to your creative process? (1: not important at all – 10: crucial to my process)*
    - *During which stages in your creative process is being alone important? (open-ended)*
    - *To what extent is being alone helpful during this particular phase in your creative process? (1-10)*
- The questions did not specifically ask for preferences and needs for different stages in the creative process. This could have led to some confusion for the respondent. However, the researcher intentionally kept the questions vague in order to avoid biasing and leading the responses toward the conclusion that there should be different conditions for different stages in the creative process.

Additional limitations:

- *First* understanding the creative processes of the individuals in detail, *then* establishing how they use their environment during the different stages in their processes could be a better way to arrange the study questions. Arranging the questioning in this way could lead to more insightful connections between the two variables and would certainly be more beneficial in developing preference and taste profiles.
- For future studies and analysis, baselines need to be established from which to measure the results. The same population should be tested more than once during different stages in their creative process. However, as most of the students were engaged in multiple creative projects, many at different stages, it was not possible to completely isolate and eliminate this as a factor that may have skewed the data. But, since this study was originally only intended as a preliminary investigation into the more broad critical issues, in a very general sense, establishing baselines and measuring differences in needs/preferences throughout the creative process will be more applicable to the next stage of this research where a more rigorous and empirical methodology shall be applied.
- The author's previous research and experience in restorative, contemplative, play, and biophilic environments could have affected the interpretation and analysis of the open-ended survey responses. However, every attempt was made at maintaining an objective point of view during these phases in the project.

CONCLUSIONS

One of the inherent problems with the analysis of studio environments is that they are not just one type of space. It is a place where students work, learn, and live. Therefore, when comparing

research and design based on workplace environments, learning environments, or living environments will always fall short. Rather, designers and researchers may discover that optimization of environmental creative potential lies in the intersection of the three genres. This approach could be enriched by placing particular focus on how the unique social relationships and environment within each subpopulation affect perception and behavior within the individual as well as further developing the knowledge of specific preference profile patterns.

The author's initial overall hypothesis for this study was that the results from the survey would echo the same themes as those largely present in the current research literature, but would differ slightly according to each respondent's particular preference profile. This hypothesis is supported by the findings of this study. Much of the research was supported by the survey results, and a large portion of the research not supported may have been too specific for the respondents to address without being prompted. The secondary hypothesis was that landscape architecture students would identify general shared preferences for restorative environments, as well as contemplative and playful environments, though to a lesser degree. However, the survey results supported both restorative and contemplative environments in nearly equal proportion, and playful environments were least-represented in the response data. Nevertheless, environments designed for facilitating the creative processes of landscape architecture students may still potentially benefit from these types of environments despite the lack of support in the general survey data.

Ultimately, facilitating the creative process is a highly individualized notion that requires in-depth knowledge of how each individual works on their own, in a group, and how they react to certain environmental conditions and stimuli. "In one sense, creativity cannot be fostered at all. Because creativity is, by definition, unplanned, spontaneous, and divergent, then any planned activity to foster it

will render impossible that which is desired… Similarly, we cannot create creativity; we can only set up the conditions for it [and hope for] its spontaneous occurrence" (Dowd, 1989, p. 241).

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