

UNIVERSITY STUDENTS' PERCEPTIONS OF LIGHTING AND PREFERENCES  
FOR THE SETTING AND SOCIAL ARRANGEMENTS IN CONTRASTING DINING  
FACILITIES

By

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This thesis is dedicated to Dad, Mom, Ross, and Phoebe.

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Abstract of Thesis Presented to the Graduate School  
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Holly Sutherin

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This exploratory study conducted within a holistic setting, investigated university students' perceptions of lighting, preferences for the setting, and preferences for the social arrangements in contrasting University of Florida dining facilities. Notable lighting researcher John Flynn focused on the psychological effects of lighting, and believed that there are shared impressions among users of a space, as well as shared changes in impression as the lighting level in the space is varied. Flynn also developed three categories of impressions upon which users define their space: 1) evaluative, or emotional, 2) perceptual clarity, or functional, and 3) spaciousness, or spatial design. In the current study, these three categories of impressions were used for the students to evaluate their perception of lighting in their space as well as variations in lighting levels as depicted in four computer-enhanced photographs.

One dining facility on the main campus of the University of Florida was chosen because of its design, lighting, and food selection, labeled as a residential restaurant. The

other dining facility on the main campus of the University of Florida was chosen because of its contrasting date of construction, lighting, design, and fast-food style selection. A questionnaire was distributed to one group of 50 willing participants from each dining facility after sunset because daylight and sunlight were not a factor in this research. The questionnaire included a semantic differential scale to test the students' perception of lighting levels, two open-ended questions for the students to respond to on both the positive and negative aspects of their dining facility, and a Likert scale to measure the student's preferences for dining in four types of social arrangements.

It was determined that the students' perceptions of lighting levels in their dining facility did have an affect on how they perceived their space. The participants from the Residential Dining facility had more consistent positive and negative responses than the students from the Fast Food dining facility. Additionally, the interaction of the dining facility and the lighting significantly influenced how students perceived the five adjectives dislike/like, unpleasant/pleasant, hazy/clear, blurry/focused, and confining/spacious. The two open-ended questions revealed that the Residential Dining facility received a majority of positive responses, while the Fast Food Dining facility received a majority of negative responses. Lastly, no connection was found between the students' preferences for dining in social arrangements; however, it was determined that neither setting was perceived as appropriate for a romantic dinner. Therefore, designers and architects should be aware that lighting systems influence students' perceptions of the space in terms of its emotional, functional, and spatial qualities. Also, students paid attention to the design, the lighting, and the space, and clearly expressed opinions about how well it suited their needs.

## CHAPTER ONE INTRODUCTION

"Sharing food with another human being is an intimate act that should not be indulged in lightly."—M F K Fisher

In the 1950s, US public university dining facilities were the “culinary equivalent of the industrial line” (Muecke, 2004, p.236) where students ate tasteless cafeteria food at tables with bench seating lit by harsh fluorescent lighting. By the mid 1990s, fast-food franchises replaced most cafeterias but still required students to wait in long lines to eat bland food prepared hours earlier in uninspiring interior settings (Kumar, 2003). By the turn of the 21<sup>st</sup> Century, the campus food service industry was a \$9.5 billion dollar business (Kumar, 2003) and the *residential restaurant* was at the center of the latest innovation in campus dining. Residential restaurants are an attempt to create a modern and comfortable physical setting as well as enhanced fresh food choices to incoming students, faculty members, administrators, and guests to the campus.

In spite of this trend and others, Horwitz and Singley (2005) argue that little is known about the perceptions and preferences of students who dine in these campus facilities. As college campus planners begin to move away from the standard delivery of food and to design alternative facilities, new efforts are required to explore students’ perceptions and preferences for campus dining experiences. This study aims to provide information to interior designers, architects, university decision makers, and facility planners about students’ perceptions of lighting levels, preferences for dining settings,

and preferences for types of social arrangements within contrasting campus dining facilities.

While research has been completed on the perceptions of lighting in many settings, this researcher found no information on how lighting levels are perceived by students in college dining environments. Most studies that test the subjective aspects of lighting focus on such spaces as offices, hospitals, and even manufactured lighting laboratories (Butler & Biner, 1987; Flynn & Subisak, 1978; Moore et. al., 2003; Ornstein, 1992). These studies have found that people's moods, emotions, productivity, and alertness are influenced by the lighting in their space.

Additionally, numerous articles have been written on newly renovated and newly constructed college dining facilities across the nation (Harlow, 2004; Koschmann & Wesp, 2001; Kumar, 2003; Lee, 2005; Mattus, 2004; Tejera, 2004, and Yonan, 2004). However, these normative articles focus on new trends in college dining facilities, and lack any empirical research on students' subjective responses to lighting. For the purpose of this study, the term subjective is defined as something particular to an individual, or a reality that is perceived rather than factual knowledge ([www.m-w.com](http://www.m-w.com)). To rectify the existing gap in knowledge, the current study focuses on college dining facilities because a critical empirical analysis is required to provide guidelines for designers and architects seeking to create a healthy and successful campus dining facility.

### **Statement of Purpose**

The purpose of this exploratory study was to investigate within a natural holistic setting, college students' perceptions of lighting levels, environmental preferences for dining, and preferences for dining in different social arrangements in two contrasting University of Florida campus dining facilities. Two separate groups of students, one

from a fast food dining facility and the other from a residential dining facility were solicited to take part in this study.

Three research questions were formulated as the focus of this study and are listed as follows:

1. Do students who dine in the Residential Dining facility—lit with a combination of functional and subjective lighting—express a more positive perception for lighting in this setting than those students who dine in the Fast Food Dining facility—lit predominantly with functional lighting?
2. Do students who dine in the Residential Dining facility—with an open kitchen and enhanced food choices—express a higher preference score for their overall dining experience than students in the Fast Food Dining facility—with a closed kitchen and limited food choices?
3. Do students in these two contrasting dining facilities differ significantly in their preferences for dining with a friend, a romantic partner, a group of friends, or alone?

Multiple methods were used to conduct this research and included a survey instrument with both closed and open-ended questions. A closed-ended semantic differential scale was used to understand the students' perceptions of the lighting in their space, as well as computer-enhanced photographs of each facility with four variations in lighting levels. Students' perceptions were measured in response to the four photographs of both the Fast Food Dining facility containing predominantly fast food franchises, and the Residential Dining facility that utilizes the trend of residential dining. Two open-ended questions collected students' positive and negative reactions towards these dining spaces, as well as open-ended responses about their preferences. Finally, a closed-ended

Likert scale assessed the students' preferences for the type of social arrangement they preferred in the dining facility. The choices included dining with a friend, a romantic partner, a group of friends, and alone within each dining facility.

### **Significance**

Dining Halls are being constructed nationwide to meet the heightened culinary expectations and social experiences of college students today. Bill Kolb, the Admissions Director at the University of Florida says, "It's all about wooing the student," with high academic scores and scholarships (Kumar, 2003 p.3). John Barnhill, the Admissions Director at Florida State University adds, "Anything can be the trigger...you never want to overlook anything that can make the school more attractive" (p.3). New residential restaurants on campus attempt to provide one of these triggers. They offer many advantages such as food being made to order in front of the student, all-you-can-eat buffets, and a wide selection of quality food. Kumar adds that with these trends developing, the university designers and planners also realize that other factors, such as lighting, finishes, colors, and convenience need to be addressed in order to provide a complete, successful dining environment. For example, Kumar notes that booths are installed and wall murals are painted in these new residential dining facilities, out-dated fluorescent lighting fixtures are being removed and replaced with a mix of modern fixtures or even streetlights.

The customary use of specific types of lighting can reveal to users what type of restaurant they are eating in (Wright, 1985). Wright states that college dining facilities can be classified as "fast-food," or "cafeteria," where design goals are to keep people moving and discourage lingering. A quick turnover, or the amount of business done in a cycle, is important when designing a college dining facility to afford for optimal

business. Light can have an effect on a restaurants' turnover. Wright adds that cool, bright fluorescent lighting systems have been found to decrease patrons' stay in a restaurant and are utilized in order to promote high turnover. By contrast, warm, dim lighting, as often seen in high-end restaurants, increases a patron's stay and thus decreases turnover. The current research builds on this foundation to test students' perceptions and four variations in lighting levels in two campus dining facilities with different interior design, food service, and lighting installations. The Residential Dining facility and the Fast Food Dining facility use both subjective and functional lighting systems, however, the installations in fixtures used in both facilities contrast one another.

Subjective lighting involves a symbolic, compositional design element that goes beyond the recommended lighting codes and standards (Tiller & Veitch, 1995). Subjective lighting is also significant in how users perceive their lit environment. Gifford (1988) found that people seated in well-lit areas perceived their environment more positively than participants seated where there is inadequate or un-interesting lighting. Jay (2002) explains two types of lighting; functional and subjective. Subjective lighting can be found in such environments as churches, hotel foyers, high-class retail, restaurants, clubs, and so on, to achieve an intimate setting, while the main purpose of functional lighting is ease of seeing, as in office spaces. In the current study, both the Residential Dining facility and the Fast Food Dining facility have a combination of subjective and functional lighting systems. However, the Residential Dining facility uses modern updated lighting installations, wall sconces, and track lighting, while the Fast Food Dining facility primarily uses functional lighting, soffits lighting, and minimal track

lighting. For the purpose of this study, the names of both dining facilities have been changed.

Jay (2002) identified four main differences between functional and subjective lighting installations. First, uniform lighting that is used to light a whole space is termed functional while subjective installations rarely use uniform lighting. Rather, they use beams of concentrated light on particular areas of interest, such as the top of a dining table or on a piece of artwork. Second, functional lighting has plain and simple fixtures that do not attract attention or attempt to create a focal point, while subjective lighting installations are ornamental, made of expensive materials, and contribute to the mood and ambience of the room.

Third, functional lighting is installed at specific points for uniform illumination; while subjective lighting is directed at significant places so the eye is led easily from one area to another without any breaks, such as from entrance to table to table to bar. Finally, functional lighting is required to illuminate a space for a specific task, while subjective installations are typically arranged in settings of low reflectance and therefore only require a small proportion of the space to be illuminated well enough for accurate perception. Subjective lighting will be discussed further in chapter two.

### **Research Design**

The independent variables for the current study included the Residential Dining facility and the Fast Food Dining facility, as well as the students' demographics (age, gender, frequency of visits per week, whether or not the subject was on a meal plan, cost for one meal, length on time spent per visit, and what activities were completed). The dependent variables were 1) the students' perception of lighting as recorded by a semantic differential seven bi-polar adjective list, applied to the five different lighting

levels measured (including the space itself), 2) the open-ended responses, and 3) the students' preferences for the type of social arrangements in the setting – with a friend, a romantic partner, a group of friends, or alone.

### **Assumptions**

Several assumptions underlie this study. First, the researcher assumes that all students recruited were a representative sample of University of Florida students who regularly attend or have attended the dining facilities. Second, any student can purchase a meal plan system to use in either dining facility. Thus, the “meals per week” is limiting because the Fast Food Dining facility is not included in this plan. Third, it is assumed that all lighting levels measured with a light meter were accurate and free of mechanical error. Fourth, it is assumed that the light levels measured initially remain at a consistent footcandle.

The delimitations set in this research are few. The restaurant selection was delimited to two dining halls with contrasting designs, lighting, and food selections located on the main campus at the University of Florida located in Gainesville, Florida. Also, this study was delimited to a public land-grant institution. Additionally, the time period in which the questionnaires were distributed was delimited to after sunset. Thus, sunlight and daylight were not a factor in this research. Lastly, the researcher notes that the size of the Fast Food Dining facility (18,683 sq. ft.) was two and a half times larger than the size of the Residential Dining facility (7,481 sq. ft.).

## CHAPTER TWO REVIEW OF LITERATURE

### **History: Subjective Lighting Design Research**

The current study focused primarily on students' perceptions of lighting levels in two contrasting dining facilities. In the 1960s and 1970s researchers in lighting design (Boyce, 1973; Gibson, 1979; Jay, 1967; Marsden, 1969) such as John Flynn (1973, 1977, 1978, 1979) sought to understand the effects of lighting and how it influences peoples' feelings and perceptions of an interior space. According Murdoch and Caughey (2004), Flynn was a twentieth century lighting pioneer and researcher who focused on the psychological effects of lighting. Flynn hypothesized that there are consistent and shared patterns of impressions among users of a space, as well as consistent *changes* in impression as the lighting in the space is varied. He proposed that there is more to perception than physiological processes,

“ . . . visual consciousness does not seem to be completely explainable with the simple notion of an optical image imposed on the retina of the eye and photographically interpreted by the brain . . . instead, we find indications that there is considerable selectivity in the process of visual experience” (87).

Through experimentation, Flynn recorded the subjective perceptions of users in terms of both the lighting arrangement and illumination levels. In the 1970s, the concept of providing a satisfying illuminance level, a pleasant atmosphere, and clear visual cues were reasonably new and untested. Because his work was completed nearly 40 years ago, there have been several empirical follow-up studies that use Flynn's methods of analysis as a guide for measuring subjective reactions to lighting (Bernecker & Mier,

1985; Biner & Butler, 1989; Boyce, 1973; Houser & Tiller, 2003; Jay, 2002; Ozturk, 2003; Tiller & Veitch, 1995). While these criteria are evident and relevant today, progress was made in the field of subjective lighting and how it influences peoples' perceptions and feelings due to Flynn and his followers' dedication to providing updated research in the field of lighting.

Students' perceptions of lighting levels concerning the three main categories of impressions that Flynn (1973) defined and isolated were: evaluative impressions, perceptual clarity, and spaciousness. "Evaluative Impressions" (EI) describe the emotional aspects that people use to judge a space. Designers can reinforce how people emotionally judge their space by incorporating low-level overhead diffuse and down-lighting as well as peripheral wall lighting. EI can also be defined by bi-polar adjectives such as pleasant/unpleasant, dislike/like, and visually cool/visually warm. "Perceptual Clarity" (PC) are functional ways in which people evaluate a space. Designers can strengthen these evaluations by featuring horizontal luminance from high intensity overhead diffuse lighting, as well as a combination of overhead down-lighting, diffused lighting, and peripheral lighting. Bi-polar adjectives that describe PC include clear/hazy, bright/dim, and focused/unfocused. Lastly, "spaciousness" (S) is used to evaluate a space on its spatial interior architecture. Designers can emphasize spaciousness with peripheral lighting as well as a combination of overhead down-lighting, diffused lighting, and peripheral lighting. Bi-polar adjectives that describe S are spacious/cramped. These categories of impressions were used in the current study to understand how students perceived emotionally, functionally, and spatially, the lighting in their setting based upon the seven bi-polar adjectives developed by Flynn. Additionally, the researcher wanted to

determine if these categories were relevant in lighting research as accurate measures on which to judge lighting in contextual settings, as opposed to the a-contextual laboratory settings in which Flynn conducted his research.

### **Lighting in College Dining Facilities**

Lighting fixtures and placement help to create the ambience in active and profitable restaurants. The following information provides empirical research that contributes to the importance of lighting in dining facilities. Mahnke and Mahnke (1987) observed that in order to provide good lighting to all customers, the space should not be too dim or too bright. They add that while bright lights create arousing, stimulating environments, dim lights create cozy, intimate surroundings. It is also essential to establish a sense of personal space for patrons. Personal space comes from the placement of tables, as well as the lighting over a tables' surface to illuminate, but not exceed the social boundary of the patron. In high-end dining, bright overhead lighting can damage the feeling of personal space, however it may be necessary in large spaces for encouraging social interaction, such as in cafeterias and college dining facilities. Also, to promote privacy, Mahnke and Mahnke (1987) add that in cafeterias and college dining facilities, the serving line should be located away from the seating area so there is a physical separation between serving and dining. Birren (1988) notes, in the food service industry, warm light is essentially imperative. Warm, soft lighting has many functions, such as providing a pleasant complexion to customers, creating a comfortable atmosphere, and enhancing the feeling of physical warmth, thus promoting relaxation. Birren adds that successful restaurants have been using bright floodlights during the noon hour rush, and a soft diffused light to add warmth for evening diners. Bright fluorescent lights on one hand attract customers into the establishment, and then out in a hurry; while incandescent soft

lighting creates a homelike atmosphere and invites relaxation, and thus encourages spending from the patron.

### **Lighting**

Light and the perception of light is not only a biological phenomenon, it also relies heavily on the psychological. The amount of light an object reflects is said to be its luminosity, while illuminance is the amount of light directed on an object or surface (Gibson, 1979). Most objects are non-luminous; that is they do not give off light, and they are only seen by the light of luminous objects, such as the sun or fire. However, Jay (1967) notes that the luminance of a surface does not alone indicate how bright the surface will appear to the eye. Ozturk (2003) emphasized that in order to achieve a preferred luminance, three variables must be taken into consideration: the number of luminaires, the luminous intensity distribution, and the placement of the luminaires. All three variables are important to the current study because students were surveyed sitting at dining tables, as well as the number, intensity, and placement of the luminaires. Therefore, the luminous intensity of the tabletops was measured with a lightmeter in both dining locations to determine differences in actual brightness. Additionally, lighting plans of both facilities were constructed to account for the number and placement of luminaires. Refer to Figures 3-2, and 3-4 for annotated lighting plans of both dining facilities.

Light can affect physiological functioning, as well as mood, energy, and behavior (Heerwagen & Heerwagen, 1986). Baron and Rea (1991) observe that peoples' moods influence how they think as well as their behavior—lighting conditions influence mood—and thus, lighting conditions, by changing peoples' moods, can influence many aspects of their behavior and how they think. To test this further, Baron and Rea conducted an

empirical study where participants performed a wide range of tasks under one of several different lighting conditions. The results indicated that lighting conditions do influence participants' performance on all tasks completed. Additionally, research participants rated low, warm illumination as more similar to lighting in homes and restaurants than high, cool illumination as more similar to that in offices and hospitals. Thus, participants were associating different lighting conditions with different locations or types of settings, and most people would describe activities in homes and restaurants as more pleasant and relaxed than those in offices or hospitals. However, Baron and Rea did not conduct this research in a natural setting, and thus, the participants had to imagine themselves in all given settings. Through this research, it is confirmed as Flynn (1973) suggested that lighting conditions do much more than provide necessary levels of illumination for task performance. Conclusively, it is important to design an aesthetic as well as functional lighting system that affords for both the physical and psychological needs of a user.

### **Perception**

Perception involves the pre-knowledge of things, it is individual, and there is no way to know exactly how one person sees the same space as another person (Shapter, 1999). "The human visual system is a pattern seeker of enormous power and subtlety," says Few (2004), who studied how perception influences the way we process information and make decisions (p. 33). Gibson (1979) makes a distinction that *direct* perception is also a process of "picking up information" from the ambient array of light as opposed to the physiological process of receiving information from the optical nerves (p.147). Flynn (1973) believed that users define space through a perceptual process of scanning the space, activity, and tasks for patterns of information.

Visual perception is a continual process of receiving information about the physical environment that is used to make conscious and subconscious judgments (Robson, 1999). Robson empirically studied ambient factors and psychological principles in relation to a quick turnover rate of customers in restaurants. One of the psychological factors she studied is perception. Perception is a continual process of taking in information and interpreting the environment to make conscious or subconscious decisions. This process of perception includes taking in stimuli and sifting through it to retrieve the most important information. Without this process of sifting, our brains would be overloaded and not capable of focusing on anything else. Robson defines three distinct modes of perception people shift between: (a) operational, or concentrating on elements that assist in accomplishing a task, (b) responsive, or noticing things in the environment, and (c) inferential, or focusing on things that support knowledge of an environment. From these three modes of perception the most successful environments are determined that provide information on all three levels.

The brain continuously scans the surrounding environment, taking “perceptual inventory” for familiar cues that help determine which action is most appropriate (Robson, 1999, p.2). For example, an activity, such as ordering food, or a concept such as ‘fine dining,’ all relate strongly to something humans understand clearly. Conclusively, environments that people can scan quickly and comprehend easily are the ones in which people perform most successfully and efficiently. However, as exposure to stimuli increases, the brain becomes uninterested and perception decreases. Conversely, an overwhelming exposure to a certain stimuli may cause confusing or conflicting messages in the brain, thereby leading to sensory overload. These concepts should be

understood when designing a space to provide enough stimulation to attract and stimulate users to stay in an area, while providing a pleasant environment. The current study tests these ideas because one dining setting consists of stimulating designs, lighting fixtures, and even food choices, while the other dining setting does not contain many stimulating, or arousing features. Therefore, this concept can be used to make inferences from the data on how students perceive the lighting in their dining facility.

### **Apparent Brightness**

One basic perceptual process, apparent brightness, has been the focus of much research (Bernecker & Mier, 1985; Fotios, 2001; Flynn, 1973; Jay, 1967; Marsden, 1969; Tiller & Veitch, 1995). Apparent brightness involves both the function of luminance and the adaptation process through which users perceive the physical environment (Jay, 1967). Through his research in subjective lighting, Flynn consistently and repeatedly concluded that apparent brightness was determined by the perceived intensity of light on the horizontal plane (Tiller & Veitch, 1995). Current studies also reveal that apparent brightness can also be influenced by light source color, lamp color, and luminances of vertical surfaces, or a bright element in a luminaire. However, Tiller and Veitch conclude that the distribution and intensity of light has a more significant effect on perceived brightness than any other factors.

To test this, Tiller and Veitch (1995) conducted an empirical experiment, where users had to adjust the brightness of one space until it matched the brightness of another space. Two of the rooms utilized ambient uniform lighting, while two other rooms used a less uniform lighting distribution. The results showed that in the control comparison, the research participants matched the brightness of the two rooms consistently; however, research participants became less accurate as the overall brightness was increased. In the

experimental comparisons, research participants were also consistent in matching the two rooms; and it was found that the non-uniform luminance distribution appeared brighter than the ambient uniform luminance distribution. Thus, rooms with non-uniform luminance distribution appeared brighter to research participants than rooms with uniform luminance distribution. Conclusively, between five and ten percent less illuminance is required to achieve the same perception of brightness in a non-uniform luminance distribution room as opposed to a uniform luminance distributed room. Restaurants, hotels, bars, or clubs, commonly use subjective (non-uniform) lighting distributions, and these spaces are thus more likely to appear brighter than a functional (uniformly) lit room. Tiller and Veitch's study is important to the current research because one university dining space under study operates on primarily functional, uniform lighting distributions, while the other university dining space uses a combination of functional and subjective, non-uniform lighting distributions. However, Tiller and Veitch's study was conducted in an a-contextual experimental setting, while this study was conducted in a contextual natural setting of college dining facilities. Therefore, students did not have to imagine their surroundings when completing the survey and generalized guidelines could be developed that are beneficial to designers seeking to create a successful dining facility.

Biner and Butler (1989) hypothesized that lighting levels and social arrangements both affect arousal. Arousal is defined in this context as a measure of how an environment stimulates our perceptions (Robson, 1999). In Biner and Butler's empirical study, when individuals maintain an optimal arousal level, then preferred lighting levels for particular settings vary based on levels of social arrangements. Using a survey

approach, a list of common behaviors as well as where these behaviors occur; such as eating occurs in a kitchen, was compiled. Next, the behaviors were cross tabulated with three types of social arrangements: (1) performing the behavior in the setting with a platonic friend, (2) performing the behavior with a romantic partner present, and (3) performing the behavior with a group of friends. In the questionnaire each subject responded on a scale from A (very bright) to D (very dark) for each behavior within each social setting. Once again, the participants had to imagine themselves doing a particular behavior, in a particular setting, under four different lighting conditions. Thus, having to create all of these situations in one's mind may be difficult and unreliable. Biner and Butler determined that brightness preferences were lower with romantic partners than with a platonic friend or with a group of platonic friends. In addition, brightness preferences between one friend and a group of friends depended on the specific activity. As a result, the people you dine with can have as much of an effect on your dining experience as the lighting systems alone. Therefore, the current study relates to this information because students' preferences for dining in different social arrangements were evaluated. Additionally, unlike Biner and Butler's study, this study was conducted in the holistic setting of university dining facilities and thus the students did not have to imagine dining in social situations. However, preferences for dining in different social arrangements could only be tested with the existing lighting level in the dining setting. Students were not asked to answer this question in relationship to each of the photographs with varying lighting levels.

### **Subjective Research**

The human visual system, what a user sees, is for the most part subjective – entirely within the mind. Thus, what a person sees is not precisely measurable. Semantic

differential scales are one of the most common methods used in collecting subjective responses to lighting; and scales have been used as complementary techniques with other data collection tools in the past (Houser & Tiller, 2003). In the 1950s, Osgood developed the semantic differential scale as a tool for measuring word and concept meanings; and in the 1970s Flynn was credited with applying the scale in his research on the subjective aspects of lighting (Tiller, 1990).

The purpose of the semantic differential scale is to assess the meanings of two bipolar adjectives at the ends of a seven-step scale. It is important to note that the scale yields quantitative data which reinforce verifiability because other researchers should be able to apply the same set of scales to equal research participants and obtain essentially similar results (Osgood, 1952). Osgood's scale is useful for determining subjective meanings of words. Comfort, beautiful, and brightness have various significance and different implications to people and the semantic differential scale can be used to quantify these differences and gauge statistical significance. In this study, semantic differential scales were used to determine the students' perceptions of four variations in lighting levels in their dining facility.

One finding in current lighting research notes that the semantic scales are limited unless they are used in a consistent fashion. Tiller and Rea (1991) recommend that lighting be clearly identified as the stimulus to be judged. Tiller states, ". . . without an explicit definition of lighting as the stimulus, there is no guarantee that different research participants are evaluating the same stimulus, or even that the stimulus being evaluated remains consistent for individual research participants over time" (p.61). A second limitation provided by Tiller and Rea is that the bi-polar adjectives are not clearly defined

and are not related to the aspect of the environment under study. For example, if lighting is the stimulus to be judged, the adjectives friendly/hostile would not fit in any category because friendly/hostile does not describe lighting conditions. Bi-polar adjectives must be carefully selected that relate to salient and scalable aspects of the lighting environment. In the current study, the bi-polar adjectives fit into one of three categories of impression determined by Flynn: evaluative, perceptual clarity, and spaciousness. Flynn initially discovered these adjectives using a factor analysis to determine the most valid dimensions for judging the subjective levels of lighting. A factor analysis in the current study was not used to determine any adjectives due to the reliability of Flynn's research. The semantic scale was judged on five points (very, quite, neither/nor, quite, very), where the two extremes were located at opposite ends. In addition, each adjective was randomized from positive to negative, or negative to positive. The students' setting as well as four computer enhanced images depicting variations in lighting levels was judged on each adjective.

In addition, Houser and Tiller (2003) advise that semantic differential scaling should always be used in conjunction with a second or third method of data collection; such converging operations assure a high degree of validity. Also, in order to avoid a sequencing effect of responses by the research participants, the order of the bi-polar adjectives should be randomized for each question. Triangulation was used for the data collection, and the bi-polar adjectives were randomized to prevent participants from hastily answering the questions. Additionally, this study was conducted in a natural setting of two contrasting college dining facilities, one, a common fast food space, and two, a residential dining space. One advantage of conducting this research in a natural

setting was that the researcher could provide a questionnaire to the students within the dining setting; thus the students did not have to imagine their surroundings. Unlike Flynn's a-contextual laboratory research, the current study was conducted in a contextual setting, thus adding validity to the findings. Furthermore, there was minimal risk to the students because they were in a comfortable, familiar atmosphere, and the observations were not obtrusive or of a sensitive nature.

### **Computer Graphics**

The use of computers as both a calculating and graphical tool in representing spaces as well as lighting is constantly improving. Robert Davis (1986) argues "with new technologies in three-dimensional graphics, it is now possible to produce a shaded rendering of a space in a perspective view, giving a photograph-like image of a proposed lighting environment (p.38). Furthermore, Davis and Bernecker (1984), found that computer generated images are accurate representations of what an environment actually looks like to the human eye. However, even without the use of computer-generated images photographs continue to be a successful research tool in portraying a space to a research participant. Stamps (1990) emphasizes that subject's responses to color photographs and slides are similar to responses obtained from perceivers located at the actual site where the photograph was taken. Also, Sheppard (1989) and Smardon et al., (1986) have proposed that a visual simulation must be easy to understand, credible, accurate, unbiased, and representative.

In the current study, computer graphics are used as a tool to enhance the visual representation of the dining spaces being studied. Color digital photographs were taken of each dining space and the light levels were adjusted through the use of Adobe Photoshop. The photographs were randomized in a booklet for the research participants

to use to complete the semantic differential scales. In addition, the research participants were located in a natural setting, their dining facility, while looking at the photographs of that facility and completing the questionnaire.

### **Summary**

John Flynn, notable lighting researcher, focused on the psychological effects of lighting. He hypothesized that there are consistent and shared patterns of impressions among users of a space, as well as consistent *changes* in impression as the lighting in the space is varied. Through his research he developed three categories of impressions that people use in their perception of a space. Evaluative impressions are how people perceive their environment based on emotions. Perceptual clarity impressions involve the functional ways in which people perceive their space, and spaciousness impressions help people to perceive their space in terms of its interior architecture. The current study builds upon Flynn's research in testing university students' perceptions of lighting levels in their space as well as four variations in lighting levels as depicted in computer enhanced photographs.

Biner and Butler (1989) hypothesized that lighting levels and social arrangements both affect arousal. Arousal is defined in this context as a measure of how an environment stimulates our perceptions (Robson 1999). When individuals maintain an optimal arousal level, then preferred lighting levels for particular settings should vary in different social arrangements. The current study utilizes Biner and Butler's concept of social arrangements, and tests students' preferences for dining in different types of social arrangements – with a friend, romantic partner, group of friends, and alone.

## CHAPTER THREE RESEARCH METHODOLOGY

This exploratory, holistic study investigated college students' perceptions of lighting in two contrasting on-campus University of Florida dining facilities: the Residential Dining facility and the Fast Food Dining facility. The students' perceptions of lighting levels were measured through the use of semantic differential rating scales. In addition, two open-ended questions about the student's positive and negative reactions toward their dining facility were included. The students' preferences for dining in four types of social arrangements were measured through the use of a Likert Scale.

This survey approach aimed to explore associations between variables, rather than causal connections. As Marsden (1997) notes, a survey approach is especially useful for descriptive studies dealing with unobservable things, such as peoples' thoughts, attitudes, preferences, and feelings. This approach was appropriate for my study and contributed to understanding how students perceived their given evening lighting atmosphere, how students reacted to their dining facility, and with whom students preferred to dine. Appendix A includes the four photographs used in the survey, a room finish schedule, a furniture schedule, and a diagram of the observed frequency of occupied tables for the Residential Dining facility. Appendix B includes the same information for the Fast Food Dining facility.

### **Research Setting**

A two stage process was used to select from a variety of University of Florida campus dining facilities. First, all University of Florida dining facilities were taken into

consideration by the researcher. Second, the researcher selected two on-campus dining facilities where the lighting levels and dining options were contrasting. Table 3-1 summarizes the two dining facilities used and some of their contrasting features.

Table 3-1 Features of Residential and Fast Food Dining Facilities.

Dining Facility	Date of Construction	Lighting	Design	Food
Residential	2001	Subjective/Functional	Circular	Home-cooked
Fast Food	1967	Functional	Orthogonal	Fast Food

The Residential Dining facility was designed and constructed in 2001. See Appendix A for room-finish and furniture schedules. University planners labeled it a “residential dining center” because it includes upscale, authentic foods from around the world, including a Mediterranean Kitchen, American Bistro, Gator Grille, Latin Flavors, Vegan Corner and more ([www.bsd.ufl.edu/dining](http://www.bsd.ufl.edu/dining)). As seen in Figure 3-1, the floor plan of this facility, an open circular kitchen is used, allowing students to see their food being made, as well as affording for short lines with little waiting time. Another type of food service being utilized in this facility is the food station. These are specific areas in a large dining hall where different types of food are made, such as a pizza station, a grill station, and a vegetarian station. The station concept is useful in achieving several goals. First, students do not have to stand in one long, slow-moving line, rather they can move from station to station to select just the food they want (Mattus, 2004). Second, there is more opportunity to be creative in menu selection and cooking to order. This assures that there will be something for everyone. Multiple stations break up the length of time students

have to wait for their food and it spreads high traffic areas around so no one line is too long.

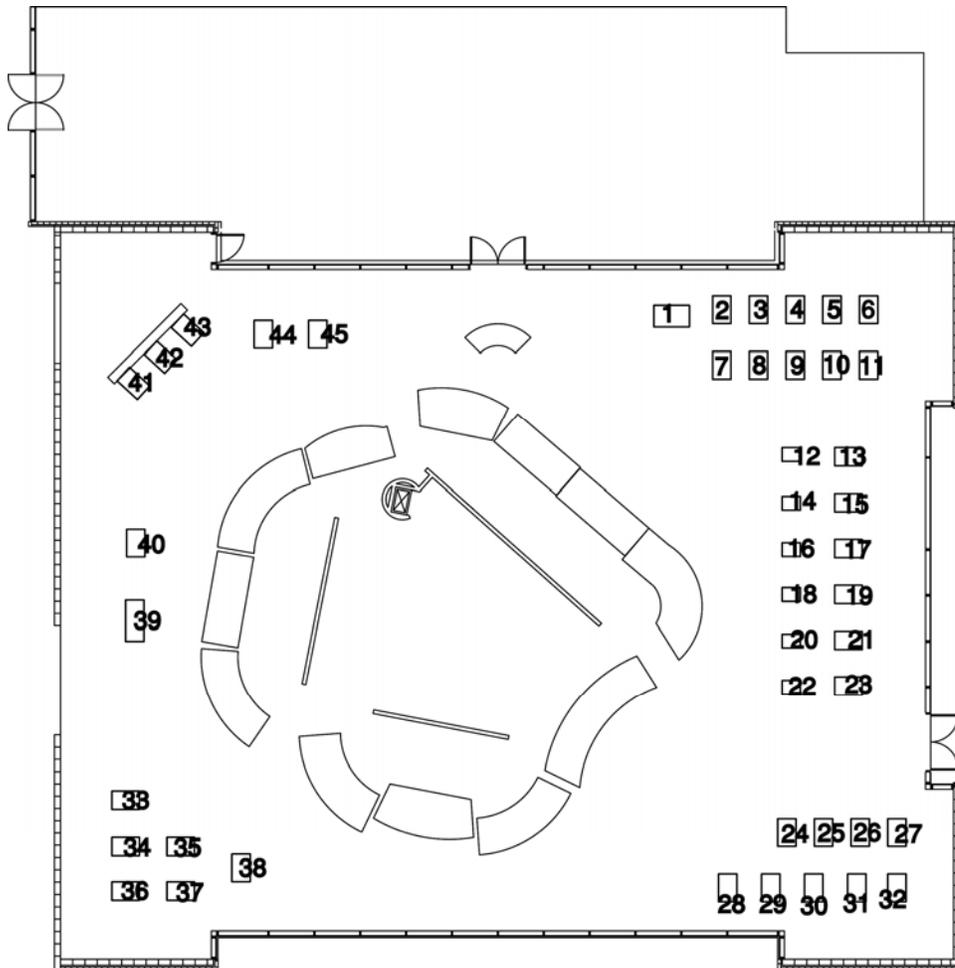


Figure 3-1 Floor Plan of Residential Dining Facility

*Note.* All tables shown were used in this study; tables that were not used are not shown here.

Lastly, Figure 3-2 shows an annotated lighting plan of the Residential Dining facility. It features functional and subjective lighting fixtures as color-coded by the legend – the track lighting is colored blue, the biax/fluorescents are colored green, and the wall sconces are colored red. In the Residential Dining facility the subjective lighting

consists of wall sconces and track lighting, which highlights the different food stations.

The functional lighting is the biax/compact fluorescent lamps.

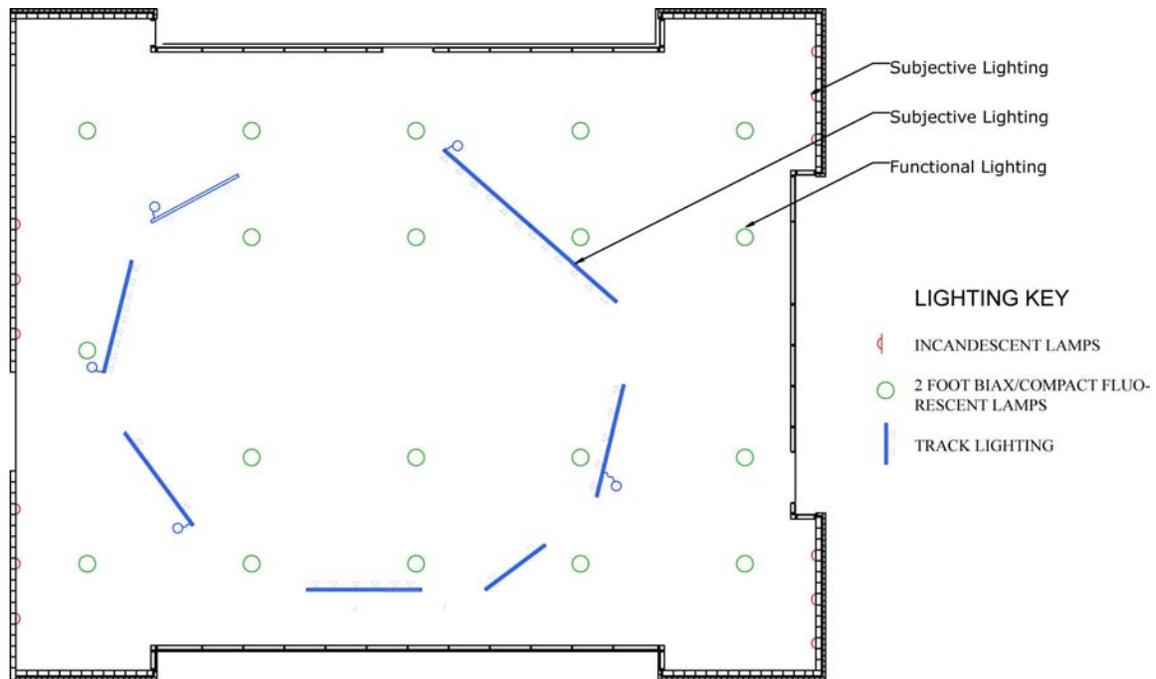


Figure 3-2 Lighting Plan of Residential Dining Facility

*Note.* Subjective lighting used is track lighting and wall sconces. Functional lighting used is biax/compact fluorescents.

The building that houses the Fast Food Dining facility was designed and constructed in 1967, and has been through numerous renovations since then. The food court area has always served fast food, but the current vendors were added in 1996. See Appendix B for room-finish and furniture schedules. Currently it serves fast-food from a selection of popular establishments such as Wendy's, Sushi and Noodle Bar, Home Zone, and Subway. Figure 3-3 shows the floor plan of the space, where fast food stations are offered on one end of the dining facility, while seating utilizes the rest of the space provided. Thus, in this facility long lines are likely to form at the most popular fast food vendors during peak meal times. Additionally, students typically do not see their food

prepared in front of them nor do they interact with the chefs. In this facility, one size fits all.

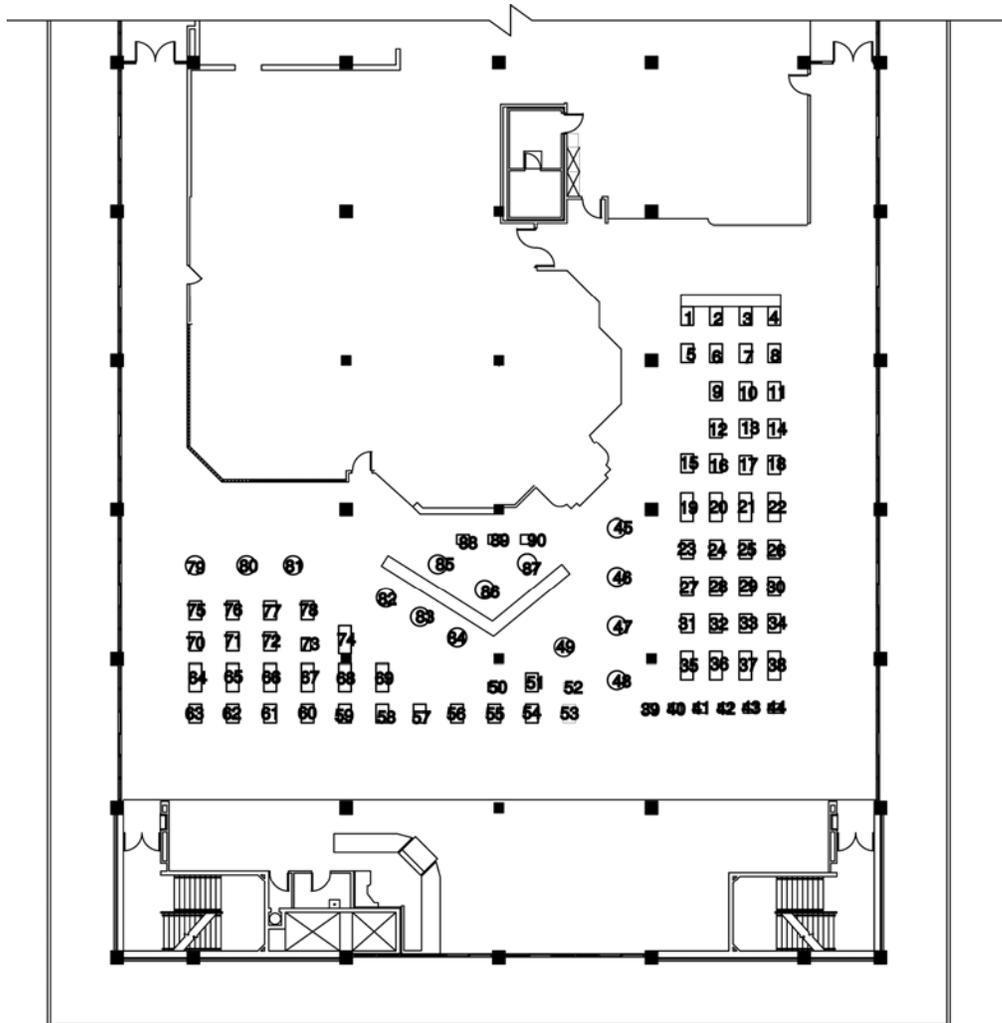


Figure 3-3 Floor Plan of Fast Food Dining Facility

*Note.* All tables shown were used in this study; tables that were not used are not shown here.

Figure 3-4 shows the annotated lighting plan of the space and is color coded in the legend to indicate the lighting fixtures used – the track lighting is colored blue, the T8 and T12 compact fluorescents are colored orange, the soffits lighting is colored purple, and the fans are colored cyan. In the Fast Food Dining facility, the subjective lighting is used in the up-lit soffits, as well as track lighting around two of the fast-food vendors.

The functional lighting in this facility consists of T8 and T12 fluorescent lamps in the fast-food vendors and compact fluorescent lamps recessed in dropped ceiling tiles with 3-inch circular openings.

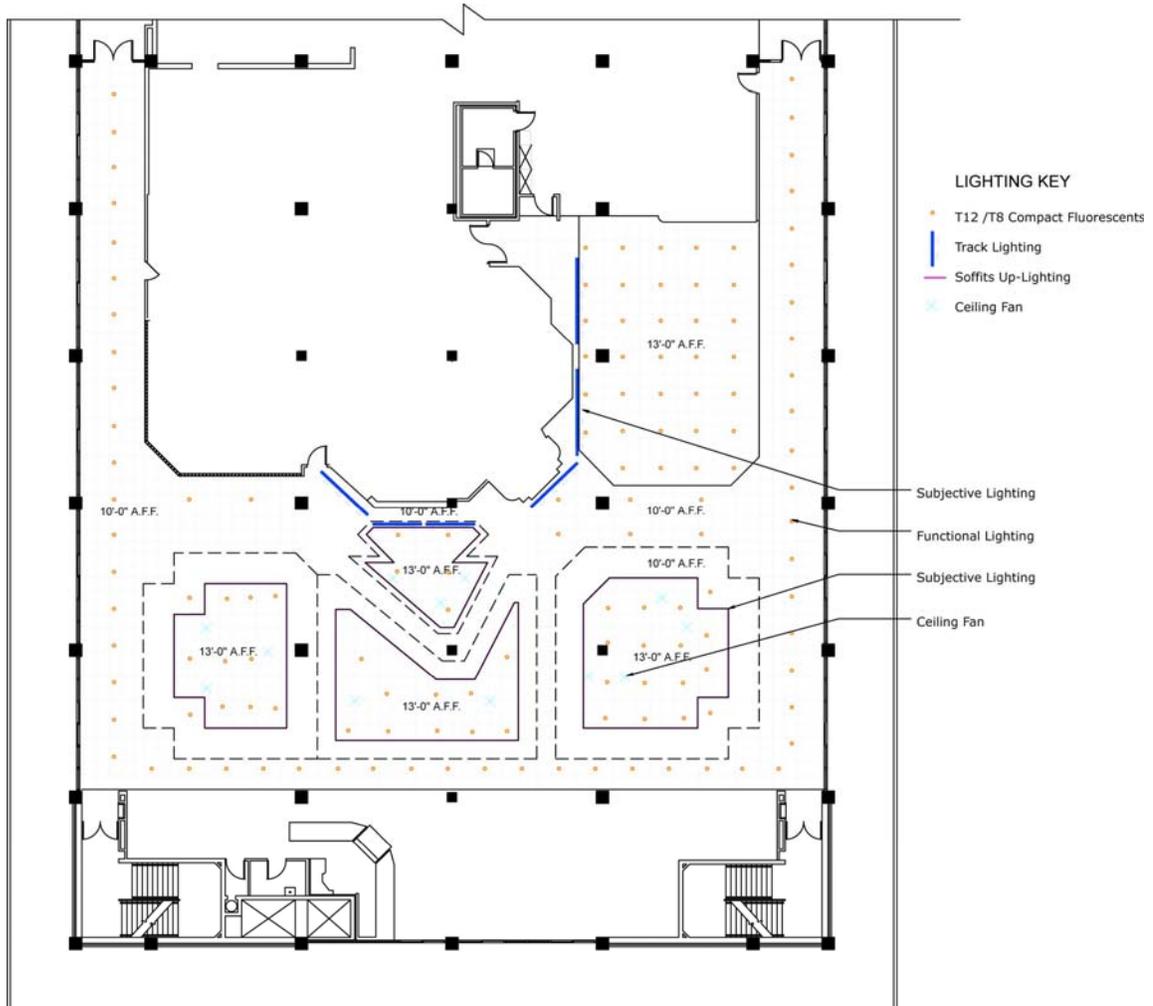


Figure 3-4 Lighting Plan of Fast Food Dining Facility

*Note.* Subjective lighting used is track lighting and up-lighting in soffits. Functional lighting used is T/12 and T/8 compact fluorescents.

The researcher focused on the food court space of the Fast Food Dining facility because it offered primarily fast food establishments as opposed to residential dining food. In addition, the cafeteria section of the Fast Food Dining facility differed from the

Residential Dining facility in that the layout, or design concept, was primarily on one wall, while in the Residential Dining facility, an open, circular kitchen is utilized. Both dining facilities differed in the color schemes, lighting installations, and fixtures. Additionally, the service and layout of both facilities differ from one another, while still offering several options to each individual student.

### **Participants**

Research participants were constituted from a convenience sample of students who frequented either the Residential Dining facility or the Fast Food Dining facility during the period when data was collected. Anonymity and confidentiality was assured within each dining facility to each participant. Fifty students from each dining facility were invited to answer the survey. A total of 100 students were surveyed for the entire study. The Residential Dining facility features only open and perimeter seating at tables, while the Fast Food Dining facility features open tables, perimeter seating, and booths, and bars. By considering both the table seating configurations and the facility lighting systems, only the patrons seated at tables in an open central area were recruited. The floor plans for both facilities in Figures 3-1 and 3-3 only show the central area tables that were recruited for this study. Thus, for consistency between dining facilities, students seated in booths, bars, and perimeter tables were not recruited.

Students involved in this study were asked to complete a short demographic questionnaire on their year of birth, gender, how often they ate in the given dining hall on a weekly basis, whether or not they had a meal plan, how much money they expected to pay for a meal, how long they typically stayed, and finally, if they ate, socialized, studied, or were involved in any other activity in addition to dining.

**Year of Birth**

Seventy-three percent ( $n=71$ ) of the participants recruited from both facilities were an average of 19 or 20 years of age at the time of questionnaire completion. Thus, the majority of students in these dining facilities were under-graduate college students.

**Gender**

In the Residential Dining facility, the students recruited were 54% ( $n=27$ ) female and 46% ( $n=23$ ) male. In the Fast Food Dining facility, 65.3% ( $n=32$ ) of participants were female, while 34.7% ( $n=17$ ) of participants recruited were male.

**Weekly Visits**

A total of  $N=99$  students completed the question on how often they attended their given dining facility in a week. Students that reported to eating in their given dining facility four or five times a week consist of 18% ( $n=9$ ) from the Residential Dining facility, and 36.7% ( $n=18$ ) from the Fast Food Dining facility. Students that replied to eating in their given dining hall more than five times a week consist of 54% ( $n=27$ ) from the Residential Dining facility, and 26.5% ( $n=13$ ) from the Fast Food Dining facility.

**Meal Plans**

A total of  $N=99$  students completed the yes or no question on whether or not they use a meal plan to purchase their food. There were two types of meal plan memberships: 1) The All Campus Meal Plan and 2) The Regular Declining Balance account, in which money is deducted from an account on the student ID card. In the Residential Dining facility, over twice as many students or 68% ( $n=34$ ) reported that they used a meal plan, as students did in the Fast Food Dining facility 32.7% ( $n=16$ ).

### **Expected Cost per Meal**

A total of  $N=99$  students completed the question on how much money they expect to pay in one visit to their given dining facility. The students were given seven options for their response that ranged from: \$2.00 to \$10.00 or more. The choice, \$4.01-\$6.00, had the majority of responses: 36% ( $n=18$ ) from the Residential Dining facility and 69.4% ( $n=34$ ) from the Fast Food Dining facility. The option \$6.01-\$8.00 was also chosen: 38% ( $n=19$ ) from the Residential Dining facility and 20.4% ( $n=10$ ) from the Fast Food Dining facility. Thus, most students recruited from both dining facilities spend at least \$4.01, but no more than \$8.00 per evening meal.

### **Length of Time Spent per Visit**

A total of  $N=99$  students completed the question on how much time they typically spend during one visit to their given dining location. The students had five options that ranged from 15 minutes or less, to over 2 hours. In the Residential Dining facility, the majority of participants, 64% ( $n=32$ ) selected 16-30 minutes. The majority of students from the Fast Food Dining facility 51% ( $n=25$ ) stayed between 31-60 minutes.

### **Activities**

A total of  $N=99$  students completed one question with a series of four responses on whether or not they attended the given dining facility to eat, socialize, study, or partake in another activity. All students from both the Residential Dining facility and the Fast Food Dining facility responded positively 100% ( $n=99$ ) to eating in their given dining facility. It should be noted that all students that enter the Residential Dining facility must pay at the entrance before they were allowed access.

The largest percentage of students from both facilities also responded positively to socializing in their environment. A total of 80% ( $n=40$ ) of the participants from the

Residential Dining facility and 87.8% ( $n=43$ ) of the participants from the Fast Food Dining facility agreed to socializing. However, the researcher notes that socialization may be more likely to be a property of the students than a property of the space. In response to studying, only 28% ( $n=14$ ) of students from the Residential Dining facility replied positively, while a slightly larger percentage of students, 55.1% ( $n=27$ ) from the Fast Food Dining facility agreed that they use the space to study. Finally, the largest percentage of students from both dining halls did not respond to participating in any other activities: 92% ( $n=46$ ) from the Residential Dining facility and 81.6% ( $n=40$ ) from the Fast Food Dining facility. Those students were given space to write in what other activities they participated in while dining in their given facility.

### **Procedures and Instruments**

This study was conducted over a four-week period. Questionnaires were distributed Monday, January 10<sup>th</sup>, 2005 to Friday February 4<sup>th</sup>, 2005 during the two hours between 7:00 p.m. and 9:00 p.m. The researcher collected data by five different means: 1) pre-study observations 2) a short demographics questionnaire to collect the students' background information, 3) Osgood's Semantic Differential scale to measure students' subjective perceptions of the lighting levels, 4) two open-ended questions for the students to qualitatively clarify their positive and negative reactions toward their dining facility, and finally 5) a Likert Scale to measure students' preferences for dining in four types of social arrangements (See Appendix C for the full questionnaire). The pre-study observations, the demographics questionnaire, and the two open-ended questions were developed locally by the researcher. The semantic differential scale, the bi-polar adjectives, and the categories of impression determined by Flynn (1973) were adopted for this research. Additionally, the Likert scale was adopted from Biner and Butler (1987,

1989) and was used to determine the four social arrangements for which the students' preferences were measured.

The researcher gained permission for the study from Jill Rodriguez, Marketing Program Manager for Aramark, which is the food provider for University of Florida Gator Dining facilities. The Residential Dining facility required payment to enter, thus the researcher needed approval from the management of the Residential Dining facility. Approval was not needed from management in the Fast Food Dining facility because it was public and charged no entrance fee. After the Institutional Review Board (IRB) approved the project, the researcher began her data collection (See Appendix D for IRB Informed Consent Form). A timeline for the project is summarized below.

*Week One – Residential Dining Facility*

This phase entailed observing students':

Recorded range of activities, length of stay, which tables were occupied, and how many people were generally in a party.

*Week Two – Fast Food Dining Facility*

This phase entailed observing students':

Recorded range of activities, length of stay, which tables were occupied, and how many people were generally in a party.

*Week Three – Residential Dining Facility*

This phase entailed distributing the questionnaire to 50 willing students to determine:

1. Students' perceptions of lighting in their space as well as four computer enhanced images of lighting level variations.

2. Students' positive and negative reactions to their dining facility
3. Students' preferences for dining in four types of social arrangements.

*Week Four – Fast Food Dining Facility*

This phase entailed distributing the questionnaire to 50 willing students to determine:

1. Students' perceptions of lighting in their space as well as four computer enhanced images of lighting level variations.
2. Students' positive and negative reactions to their dining facility
3. Students' preferences for dining in four types of social arrangements.

**Physical Data Collection in the Setting**

**Data Collection Prior to the Formal Study**

**Lighting levels.** Prior to the behavioral observations, lighting levels on the table tops were recorded by using a lightmeter to measure footcandles. Luminous intensity is measured and reported in footcandles (fc). One footcandle is equal to the total intensity of light that falls on a one square foot surface that is one foot away from the point source of the light ([www.iesna.org](http://www.iesna.org) 1999). As determined by the IESNA Lighting Handbook, 8<sup>th</sup> edition, the recommended light level for task area dining is 15 footcandles, while the recommended light level for general area dining is 10 footcandles ([www.iesna.org](http://www.iesna.org) 1999). Footcandle levels on the table tops were measured in each dining facility. In the Residential Dining facility, the footcandle level measured 11 f.c. on the table top, and in the Fast Food Dining facility, the footcandle level measured 10 f.c. on the table top, and thus there is not a large difference between the amounts of light reflected off of these surfaces. The researcher contacted Clint Robinson from the University of Florida Facilities Planning and Construction Office to obtain lighting plans for both dining

facilities. Pat Day, the Maintenance Supervisor for the Fast Food Dining facility, also assisted the researcher in providing information on the lighting fixtures.

**Digital photographs.** The researcher used a digital camera to take photographs of both dining facilities at the same time of night when sunlight would not be a factor in the images. Each photograph was taken of one perspective in each dining facility, and the lighting was adjusted through the use of Adobe Photoshop to yield four variations in light levels of the original image. These adjustments were calibrated by modifying the brightness/contrast option. The categories of variation included “very dim (-50),” “dim (-25),” “bright (+50),” and “very bright (+100).” These categories were developed from Biner and Butlers’ (1989) study that tested subjects’ responses to lighting on a scale from A (very bright) to D (very dark) for a specific behavior within different social settings. See Appendix A for the four lighting level variations in the Residential Dining facility. See Appendix B for the four lighting level variations in the Fast Food Dining facility.

The researcher created two booklets containing four photographs of the Residential Dining facility, and four photographs of the Fast Food Dining facility. In total, four booklets of each dining facility were made for the purpose of efficiency, as well as several students eating with more than one person. The photographs in the booklet were the same perspective view in every picture, with the only variation being the lighting level. However, the photographs were randomly placed in the booklets to eliminate copying between students. Also, the photographs were randomized to prevent an ordering sequence effect from very bright to very dim or vice versa.

In the Residential Dining facility, the photograph that most similarly resembles the actual space at this evening hour was the image labeled “dim,” (See Appendix A) and in

the Fast Food facility the photograph that most similarly resembles the space at the same time of night was also the “dim” image (See Appendix B). Four variations in the given light levels were created to determine the strongest response of the students to their most preferred lighting levels based upon the seven bi-polar adjectives.

**Pre-study observations.** As noted above, observations lasted one week for each dining facility. The pre-study observations provided a basis for understanding the students’ behavior prior to distribution of the questionnaires. Additionally, the features that the researcher observed helped to construct the questionnaire used in the formal study. See Appendix A for the Residential Dining facilities’ seating configuration. See Appendix B for the Fast Food Dining facilities’ seating configuration.

Each student the researcher observed was given a number when they sat down at a table. Next, the researcher observed the students and recorded how many people were in the party, which table was occupied according to the number on the floor plan, and how long the students stayed at the table. Additionally, the researcher recorded whether or not the students studied, ate, talked, or participated in any other activity. The number of people in a party, as well as how long the students stayed in the facility helped the researcher to develop the demographic portion of the questionnaire.

In the Residential Dining facility the researcher observed alone, however, in the Fast Food Dining facility the researcher utilized an assistant to help observe students due to the vast size of the space. The researcher sat at a different table each night, and was seated at a table in the corner to provide maximum viewing. The researcher also brought books and a notepad to resemble studying.

The amount of time the students in the Residential Dining facility remained at one table ranged from 5 minutes to 112 minutes with a mean of 32.34 minutes. The amount of time the students in the Fast Food Dining facility stayed at a table ranged from 2 minutes to 112 minutes with a mean of 24.96 minutes.

In the Residential Dining facility, 98% ( $n=49$ ) of students who were observed were not studying, while in the Fast Food Dining facility, 78% ( $n=39$ ) of students observed were not studying. In the Residential Dining facility, 98% ( $n=49$ ) of students observed were eating, while in the Fast Food Dining facility, 94% ( $n=47$ ) of students were also eating. In the Residential Dining facility and the Fast Food Dining facility, 50% ( $n=25$ ) of students observed talked to others. Lastly, in the Residential Dining facility, 100% ( $n=50$ ) of students did not participate in any other activity, while in the Fast Food Dining facility, 88% ( $n=44$ ) of students observed did not participate in any other activity. Other activities included listening to headphones, reading magazines, attending group meetings, or talking on a cellular phone.

### **Data Collection during the Formal Study**

In the Fast Food Dining facility, the researcher was assisted by another person to recruit students to complete the questionnaire. The assistant was located on the opposite side of the Fast Food Dining facility, so as to not approach any students already approached by the researcher. An assistant was not needed during data collection in the Residential Dining facility.

**Semantic differential scale.** The researcher explained to the students that lighting in the dining facility was being studied. The students rated their perception of the lighting in their actual dining facility before judgments were made of the photographs.

The students then stated their perceptions of the lighting levels in the four computer-enhanced photographs using seven bi-polar adjective scales.

Figure 3-5 shows the design of the study with two groups of students that were chosen from the residential (subjective and functional lighting) and fast-food (functional lighting) college dining facilities. The students evaluated these four photographs based upon the bi-polar adjectives developed by Flynn, and are outlined under each category of impression (*Dislike/Like*, *Unpleasant/Pleasant*, *Visually Cool/Visually Warm*, *Hazy/Clear*, *Dim/Bright*, *Blurry/Focused*, and *Confined/Spacious*).

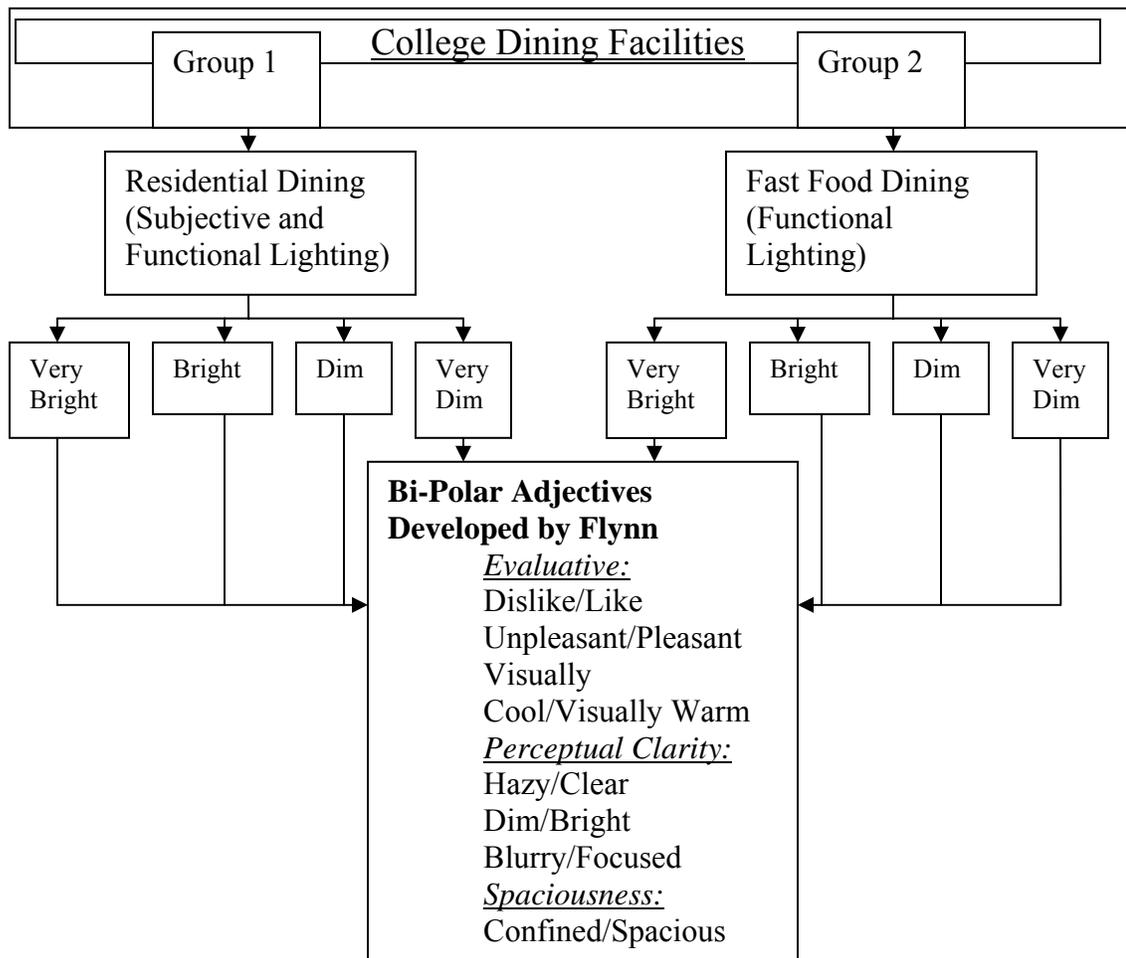


Figure 3-5 Diagram of Research Design Using a Semantic Differential Scale.

**Open-ended questions.** Two open-ended questions about the students' preferences for the dining space were also included. The researcher chose to use open-ended questions because there were several possible answers to these two questions, and the researcher wanted to avoid suggesting answers. Additionally, the researcher wanted the students' own words to be used in order to clarify how they felt about the space as well as aspects they would change. Also, open-ended questions determine the salience of an issue. Sommer and Sommer (2002) add that when answering an open-ended question, the items that stand out in a person's mind will be mentioned first. The researcher analyzed students' open responses using a domain analysis, which determines common categorical variables in each student's data. This was completed by reading the subjects' responses and finding a cover or overall term, which encompasses what the subject was trying to convey. Next, all of the cover terms were organized into common themes and hierarchically ordered from the most frequently responded items to the least. These cover terms were then categorized into larger common themes such as positive and negative characteristics of each dining facility.

**Likert scale.** The Likert scale portion of the questionnaire studied the subjects' preference for dining in social arrangements. The students were instructed to rate their preference for dining in four different social arrangements based upon the space they were in on a scale from one (never) to five (very often). The students did not refer to the four photographs, but used their own judgment based on being in the space at the time the questionnaire was distributed. The social arrangements being studied were 1) dining with a friend, 2) dining with a romantic partner, and 3) dining with a group of friends, and 4) dining alone. This question sought to determine if either dining facility was more

successful in promoting atmospheres for students who preferred to dine alone, with a friend or groups of friends, or with a romantic partner.

### **Data Analysis**

Statistical analysis techniques were used on the semantic differential scale, the Likert social scale, the pre-study observations, and the demographics portion of the survey to compare the results of the two dining facilities to determine significant associations. Cross-tabulations were first conducted on the semantic differential scale to determine the students' majority of responses in relation to their perception of lighting based on the bi-polar adjectives. A multiple analysis of variance (MANOVA) test was used because there was more than one dependent variable. MANOVA'S were conducted on the semantic differential scale to determine if the dining facility, the lighting, and the interaction of the dining facility and lighting had statistical significance on students' perception of lighting in their space. The two open-ended questions were analyzed using descriptive statistics to determine basic data, such as the means or averages of responses. Lastly, cross-tabulations and a MANOVA were also conducted on the students' preferences for dining in types of social arrangements. All statistical analysis was completed using "Statistical Package for the Social Sciences" (SPSS) 12.0.

## CHAPTER FOUR FINDINGS

### **Students' Perception of Lighting Level Variations**

*Do students who dine in the Residential Dining facility—lit with a combination of functional and subjective lighting—express a significantly greater preference for lighting in this setting than those students who dine in the Fast Food Dining facility—lit predominantly with functional lighting?*

Students judged the lighting in their space as well as the four computer enhanced photographs of lighting level variations. The following five cross-tabulations provide descriptive numerical data that shows students perceptions of lighting in their space as well as the four variations and is broken down by each bi-polar adjective. The yellow highlighting are the highest responded to items by the students. A five point semantic differential scale was used to rate the lighting based on seven bi-polar adjectives. Table 4-1 demonstrates the differences between students' responses in the two contrasting dining facilities based on perceptions of lighting in their space.

Table 4-1 shows that the students from the Residential Dining facility had mostly consistent positive responses about the lighting in their space based upon the seven bi-polar adjectives used. In the Fast Food Dining facility, the students' responses were inconsistent about the lighting in their space based upon the seven bi-polar adjectives. Tables 4-2, 4-3, 4-4, and 4-5 are summarized below.

Table 4-1 Cross-Tabulation of Students' Perception of Lighting Levels in the Actual Space.

<b>Residential Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	1 (2%)	4 (8%)	12 (24%)	25 (50%)	8 (16%)
<i>Unpleasant-Pleasant</i>	2 (4%)	4 (8%)	12 (24%)	26 (52%)	6 (12%)
<i>Cool-Warm</i>	2 (4%)	12 (24%)	13 (26%)	21 (42%)	2 (4%)
<i>Hazy-Clear</i>	3 (6%)	15 (30%)	4 (8%)	20 (40%)	8 (16%)
<i>Dim-Bright</i>	2 (4%)	9 (18%)	18 (36%)	12 (24%)	9 (18%)
<i>Blurry-Focused</i>	1 (2%)	10 (20%)	15 (30%)	20 (40%)	4 (8%)
<i>Confined-Spacious</i>	0 (0%)	3 (6%)	10 (20%)	22 (44%)	15 (30%)
<b>Fast Food Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	1 (2%)	12 (24.5%)	20 (40.8%)	16 (32.7%)	0 (0%)
<i>Unpleasant-Pleasant</i>	0 (0%)	10 (20.4%)	21 (42.9%)	18 (36.7%)	0 (0%)
<i>Cool- Warm</i>	3 (6.1%)	12 (24.5%)	14 (28.6%)	19 (38.8%)	1 (2%)
<i>Hazy-Clear</i>	4 (8.2%)	13 (26.5%)	13 (26.5%)	13 (26.5%)	6 (12.2%)
<i>Dim-Bright</i>	4 (8.2%)	20 (40.8%)	9 (18.4%)	13 (26.5%)	3 (6.1%)
<i>Blurry-Focused</i>	2 (4.1%)	12 (24.5%)	21 (42.9%)	12 (24.5%)	2 (4.1%)
<i>Confined-Spacious</i>	4 (8.2%)	6 (12.2%)	20 (40.8%)	16 (32.7%)	3 (6.1%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

Table 4-2 Cross-Tabulation of Students' Perception of Lighting Levels in the *Very Bright* Image.

<b>Residential Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	16 (32%)	17 (34%)	8 (16%)	7 (14%)	2 (4%)
<i>Unpleasant-Pleasant</i>	10 (20%)	19 (38%)	11 (22%)	8 (16%)	2 (4%)
<i>Cool-Warm</i>	4 (8%)	12 (24%)	16 (32%)	12 (24%)	6 (12%)
<i>Hazy-Clear</i>	20 (40%)	19 (38%)	6 (12%)	3 (6%)	2 (4%)
<i>Dim-Bright</i>	1 (2%)	3 (6%)	3 (6%)	11 (22%)	32 (64%)
<i>Blurry-Focused</i>	10 (20%)	25 (50%)	10 (20%)	5 (10%)	0 (0%)
<i>Confined-Spacious</i>	0 (0%)	6 (12%)	16 (32%)	23 (46%)	5 (10%)
<b>Fast Food Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	9 (18.4%)	23 (46.9%)	8 (16.3%)	7 (14.3%)	2 (4.1%)
<i>Unpleasant-Pleasant</i>	6 (12.2%)	23 (46.9%)	11 (22.4%)	8 (16.3%)	1 (2%)
<i>Cool-Warm</i>	4 (8.2%)	11 (22.4%)	15 (30.6%)	16 (32.7%)	3 (6.1%)
<i>Hazy-Clear</i>	10 (20.4%)	23 (46.9%)	6 (12.2%)	4 (8.2%)	6 (12.2%)
<i>Dim-Bright</i>	1 (2%)	4 (8.2%)	4 (8.2%)	16 (32.7%)	24 (49%)
<i>Blurry-Focused</i>	8 (16.3%)	19 (38.8%)	11 (22.4%)	6 (12.2%)	5 (10.2%)
<i>Confined-Spacious</i>	3 (6.1%)	3 (6.1%)	13 (26.5%)	22 (44.9%)	8 (16.3%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

Table 4-3 Cross-Tabulation of Students' Perception of Lighting Levels in the *Bright* Image.

<b>Residential Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	1 (2%)	4 (8%)	13 (26%)	28 (56%)	4 (8%)
<i>Unpleasant-Pleasant</i>	0 (0%)	3 (6%)	14 (28%)	29 (58%)	4 (8%)
<i>Cool-Warm</i>	1 (2%)	12 (24%)	12 (24%)	22 (42%)	3 (6%)
<i>Hazy-Clear</i>	1 (2%)	7 (14%)	8 (16%)	24 (48%)	10 (20%)
<i>Dim-Bright</i>	3 (6%)	14 (28%)	7 (14%)	25 (50%)	1 (2%)
<i>Blurry-Focused</i>	1 (2%)	7 (14%)	8 (16%)	29 (58%)	5 (10%)
<i>Confined-Spacious</i>	1 (2%)	12 (24%)	10 (20%)	21 (42%)	6 (12%)
<b>Fast Food Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	1 (2%)	11 (22.4%)	10 (20.4%)	18 (36.7%)	9 (18.4%)
<i>Unpleasant-Pleasant</i>	1 (2%)	1 (2.2%)	12 (24.5%)	20 (40.8%)	5 (10.2%)
<i>Cool-Warm</i>	3 (6.1%)	6 (12.2%)	19 (38.8%)	17 (34.7%)	4 (8.2%)
<i>Hazy-Clear</i>	4 (8.2%)	10 (20.4%)	10 (20.4%)	19 (38.8%)	6 (12.2%)
<i>Dim-Bright</i>	6 (12.2%)	16 (32.7%)	11 (22.4%)	14 (28.6%)	2 (4.1%)
<i>Blurry-Focused</i>	0 (0%)	10 (20.4%)	11 (22.4%)	21 (42.9%)	7 (14.3%)
<i>Confined-Spacious</i>	1 (2%)	11 (22.4%)	19 (38.8%)	13 (26.5%)	5 (10.2%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

Table 4-4 Cross-Tabulation of Students' Perception of Lighting Levels in the *Dim* Image.

<b>Residential Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	0 (0%)	18 (36%)	12 (24%)	15 (30%)	5 (10%)
<i>Unpleasant-Pleasant</i>	1 (2%)	16 (32%)	11 (22%)	20 (40%)	2 (4%)
<i>Cool-Warm</i>	4 (8%)	19 (38%)	14 (28%)	10 (20%)	3 (6%)
<i>Hazy-Clear</i>	3 (6%)	16 (32%)	15 (30%)	13 (26%)	3 (6%)
<i>Dim-Bright</i>	11 (22%)	30 (60%)	7 (14%)	2 (4%)	0 (0%)
<i>Blurry-Focused</i>	0 (0%)	9 (18%)	17 (34%)	20 (40%)	4 (8%)
<i>Confined-Spacious</i>	3 (6%)	15 (30%)	19 (38%)	12 (24%)	1 (2%)
<b>Fast Food Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	12 (24.5%)	20 (40.8%)	6 (12.2%)	10 (20.4%)	1 (2%)
<i>Unpleasant-Pleasant</i>	8 (16.3%)	31 (63.3%)	5 (10.2%)	3 (6.1%)	2 (4.1%)
<i>Cool-Warm</i>	7 (14.3%)	16 (32.7%)	18 (36.7%)	6 (12.2%)	2 (4.1%)
<i>Hazy-Clear</i>	7 (14.3%)	21 (42.9%)	9 (18.4%)	12 (24.5%)	0 (0%)
<i>Dim-Bright</i>	30 (61.2%)	13 (26.5%)	4 (8.2%)	1 (2%)	1 (2%)
<i>Blurry-Focused</i>	4 (8.2%)	14 (28.6%)	13 (26.5%)	15 (30.6%)	3 (6.1%)
<i>Confined-Spacious</i>	6 (12.2%)	18 (36.7%)	14 (28.6%)	9 (18.4%)	2 (4.1%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

Table 4-2 summarizes the cross-tabulation of the two contrasting dining facilities based on the students' perception of lighting in the image, *very bright*. Both groups of students rated the image positively in terms of very bright and quite spacious. The remaining five adjectives were rated overall negatively.

Table 4-3 describes the cross-tabulation of the two contrasting dining facilities based on the students' perception of the lighting in the photograph, *bright*. The students from the Residential Dining facility had consistently positive responses for all possible lighting levels. The students from the Fast Food Dining facility had inconsistent responses across the seven bi-polar adjectives.

Table 4-4 illustrates the cross-tabulation of the two contrasting dining facilities based on the students' perception of the lighting in the image, *dim*. Both groups of students rated this space more negatively than positively. However, as seen in Figure 4-1, the image "dim" most closely represents the lighting level in the actual residential space. Furthermore, as seen in Figure 4-2, the image "dim" most closely represents the lighting level in the actual fast food dining space.

Table 4-5 shows the cross-tabulation of the two contrasting dining facilities based on the students' perception of the lighting in the photograph, *very dim*. The students in the Residential Dining facility had almost all negative responses, while the students in the Fast Food Dining facility had entirely consistent negative responses to this lighting level.

A MANOVA was conducted, with the Wilks' Lambda test statistic used to determine significance. The advantage of using a MANOVA is that it tests for significance with multiple dependent variables; in this study there are seven bi-polar adjectives. The significance level was set at .05. As shown in Table 4-6, the MANOVA



Figure 4-1 Actual Image (Top) Compared to “Dim” Image (Bottom) of the Residential Dining Facility.



Figure 4-2 Actual Image (Top) Compared to “Dim” Image (Bottom) of the Fast Food Dining Facility.

Table 4-5 Cross-Tabulation of Students' Perception of Lighting Levels in the *Very Dim* Image.

<b>Residential Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	22 (44%)	19 (38%)	3 (6%)	5 (10%)	1 (2%)
<i>Unpleasant-Pleasant</i>	16 (32%)	21 (42%)	7 (14%)	6 (12%)	0 (0%)
<i>Cool-Warm</i>	11 (22%)	10 (20%)	19 (38%)	7 (14%)	3 (6%)
<i>Hazy-Clear</i>	14 (28%)	22 (44%)	10 (10%)	3 (6%)	1 (2%)
<i>Dim-Bright</i>	44 (88%)	3 (6%)	1 (2%)	1 (2%)	1 (2%)
<i>Blurry-Focused</i>	7 (14%)	17 (34%)	15 (30%)	8 (16%)	3 (6%)
<i>Confined-Spacious</i>	13 (26%)	19 (38%)	12 (24%)	4 (8%)	2 (4%)
<b>Fast Food Dining</b>					
Bi-Polar Adjectives	Perception				
	<u>Very</u>	<u>Quite</u>	<u>Neither/Nor</u>	<u>Quite</u>	<u>Very</u>
<i>Dislike-Like</i>	34 (69.4%)	8 (16.3%)	4 (8.2%)	2 (4.1%)	1 (2%)
<i>Unpleasant-Pleasant</i>	29 (59.2%)	15 (30.6%)	2 (4.1%)	3 (6.1%)	0 (0%)
<i>Cool-Warm</i>	19 (38.8%)	6 (12.2%)	18 (36.7%)	4 (8.2%)	2 (4.1%)
<i>Hazy-Clear</i>	24 (49%)	14 (28.6%)	8 (16.3%)	2 (4.1%)	1 (2%)
<i>Dim-Bright</i>	45 (91.8%)	3 (6.1%)	1 (2%)	0 (0%)	0 (0%)
<i>Blurry-Focused</i>	17 (34.7%)	14 (28.6%)	9 (18.4%)	5 (10.2%)	4 (8.2%)
<i>Confined-Spacious</i>	21 (42.9%)	11 (22.4%)	11 (22.4%)	4 (8.2%)	2 (4.1%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

statistical analysis revealed that the dining facility had a significant effect on how the space was perceived by the students  $F(7, 479) = 5.41, p < .05$ . In addition, the five different lighting level conditions had a significant effect on how the space was perceived by the students  $F(28, 1728.48) = 30.53, p < .05$ . Lastly, the interaction between the dining facility and lighting levels also had a significant effect on how the students perceived their space  $F(28, 1728.48) = 1.52, p < .05$ . Thus, the statistical significance found here supports the validity of the cross-tabulation data on the students' perceptions of the lighting level in their dining facility.

Table 4-6 MANOVA of Students' Perception of their Space.

	<u>Value</u>	<u>F</u>	<u>df</u>	<u>p</u>
Dining Facility	.927	5.410	7	*.000
Lighting	.235	30.528	28	*.000
Interaction**	.916	1.516	28	*.041

*Note.* \* = Significance,  $p < .05$ .

\*\* = Interaction of the dining facility and the lighting combined.

To further study the significance, the researcher conducted a between-subjects MANOVA that tested the specific variables of the seven bi-polar adjectives. Table 4-7 illustrates the significance levels for the dining facilities' affect on how the students perceived their space. Thus, the adjectives dislike/like  $F(1, 15.76) = 15.35, p < .05$ , unpleasant/pleasant  $F(1, 23.20) = 26.74, p < .05$ , dim/bright  $F(1, 13.49) = 15.16, p < .05$ , and confined/spacious  $F(1, 8.70) = 8.65, p < .05$  were all significant to how the students perceived their space. Table 4-8 shows the significance level for the lighting levels' affect on how the students perceived their space. In this table, all bi-polar adjectives had a significant affect on how the students perceived their space  $F(4, 56.45) = 54.98, p <$

.05,  $F(4, 47.97) = 55.29$ ,  $p < .05$ ,  $F(4, 11.63) = 10.37$ ,  $p < .05$ ,  $F(4, 40.82) = 33.95$ ,  $p < .05$ ,  $F(4, 146.36) = 164.50$ ,  $p < .05$ ,  $F(4, 24.41) = 23.09$ ,  $p < .05$ ,  $F(4, 35.97) = 35.75$ ,  $p < .05$ . Lastly, Table 4-9 shows the significance level for the interaction of the dining facility and the lighting levels' affect on how the students perceived their space. Now, the adjectives dislike/like  $F(4, 3.64) = 3.54$ ,  $p < .05$ , unpleasant/pleasant  $F(4, 2.97) = 3.43$ ,  $p < .05$ , hazy/clear  $F(4, 3.57) = 2.97$ ,  $p < .05$ , blurry/focused  $F(4, 2.86) = 2.70$ ,  $p < .05$ , and confined/spacious  $F(4, 2.62) = 2.60$ ,  $p < .05$  all affect how the students perceived their space.

Table 4-7 MANOVA of *Dining Facilities'* Affect on Students' Perception of their Space.

	Between-Subjects			
	<u>Sum of Squares</u>	<u>F</u>	<u>df</u>	<u>p</u>
<u>Bi-Polar Adjectives</u>				
Dislike/Like	15.76	15.35	1	*.000
Unpleasant/Pleasant	23.20	26.74	1	*.000
Cool/Warm	2.39	2.13	1	.145
Hazy/Clear	3.64	3.02	1	.083
Dim/Bright	13.49	15.16	1	*.000
Blurry/Focused	2.95	2.79	1	.095
Confined/Spacious	8.70	8.65	1	*.003

*Note.* \* = Significance,  $p < .05$ .

Table 4-8 MANOVA of *Lightings Levels' Affect* on Students' Perception of their Space.  
Between-Subjects

	<u>Sum of Squares</u>	<u>F</u>	<u>df</u>	<u>p</u>
Bi-Polar Adjectives				
Dislike/Like	225.79	54.98	4	*.000
Unpleasant/Pleasant	191.89	55.29	4	*.000
Cool/Warm	46.52	10.37	4	*.000
Hazy/Clear	163.29	33.95	4	*.000
Dim/Bright	585.43	164.50	4	*.000
Blurry/Focused	97.63	23.09	4	*.000
Confined/Spacious	143.90	35.75	4	*.000

Note. \* = Significance,  $p < .05$ .

Table 4-9 MANOVA of *Interaction of Dining Facilities' and Lightings' Affect* on Students' Perception of their Space.  
Between-Subjects

	<u>Sum of Squares</u>	<u>F</u>	<u>df</u>	<u>p</u>
Bi-Polar Adjectives				
Dislike/Like	14.54	3.54	4	*.007
Unpleasant/Pleasant	11.89	3.43	4	*.009
Cool/Warm	1.96	.44	4	.782
Hazy/Clear	14.28	2.97	4	*.019
Dim/Bright	2.41	.68	4	.609
Blurry/Focused	11.42	2.70	4	*.030
Confined/Spacious	10.48	2.60	4	*.035

Note. \* = Significance,  $p < .05$ .

The findings suggest that the combination of successful functional and subjective lighting systems used in the Residential Dining facility had a positive affect on how the students perceived their space, and as well, elicited consistent shared impressions and shared changes in impressions as the lighting in the space was varied. While functional and subjective lighting was also used in the Fast Food Dining facility, the unsuccessful installations and fixtures contributed to the fact that the students did not share their impressions of the lighting in their space, as well as did not share changes in their perception of the space as the lighting level was varied.

### **Students' Positive and Negative Responses toward their Dining Facility**

*Do students who dine in the Residential Dining facility—with an open kitchen and enhanced food choices—express a higher preference score for their overall dining experience than students in the Fast Food Dining facility—with a closed kitchen and limited food choices?*

This portion of the questionnaire consisted of two open-ended questions about the students positive and negative reactions toward their dining facility. The dependent variables included the students' responses, and the independent variables were the two contrasting dining facilities. In the Residential Dining facility, students had 193 responses with a 60% positive response, and a 40% negative response. In the Fast Food Dining facility, the students had 168 responses, with a 44% positive response, and a 56% negative response.

### **Residential Dining Facility**

In analyses of the responses from the students from the Residential Dining facility, the researcher first read and recorded all written responses, and then categorized these into cover terms, which signify an overall meaning of a category. The Residential

Dining facility received a total of n=115 positive responses, and a total of n=78 negative responses. Table 4-10 outlines the top four responses (food, spaciousness, design, lighting) and all other responses were categorized under the term, “other.” The items that are in the “other” category include music, staff, windows, cleanliness, price, color scheme, temperature, and social qualities.

Table 4-10 Open-Ended Responses from the Residential Dining Facility Students.

Positive		Negative	
Food Setup/Selection	27%, n=31	Food Setup/Selection	28%, n=22
Spaciousness	14%, n=16	Lighting	17%, n=13
Design	14%, n=16	Design	15%, n=12
Lighting	10%, n=11	Spaciousness	9%, n=7
Other	35%, n=40	Other	31%, n=24
Total=	100%, N=114	Total=	100%, N=78

*Note.* Other includes music, staff, windows, cleanliness, price, color scheme, temperature, and social qualities. The term, location, had the third largest response; however, it was dropped from the data because only interior variables are being considered for this study.

**Positive responses.** The terms used for positive responses for the Residential Dining facility were organized from the most reaction to the least reaction. The four highest responses are outlined here.

The term, food setup/selection received the most responses (27%, n=31). Some examples of students’ positive reactions were towards the variety of foods, the flow—specifically the round serving area, all you can eat dining, and the easy access to the food. Spaciousness had the second largest responses (14%, n=16); and the positive comments included the overall spaciousness, the open feeling, and ample seating. One student wrote that he liked the design of a “space within a space,” referring to the traffic area separate from the seating area, which is separate from the ordering area. The design of the space also had the second largest response (14%, n=16). The students positively

responded to the layout of the space, the separation between food service and seating, the open kitchen, and the modern, comfortable décor. The lighting in the dining hall had the fourth largest response (9%, n=10). The students' responses were optimistic towards the right amount of light used (intensity) and the diverse selection of lighting fixtures.

Students commented that the lighting is “very open and bright” and it “doesn't look gloomy.” One student wrote that the lighting was “very spatial” and that they liked the “different fuses of lighting in different orientations.”

**Negative responses.** The terms used for the negative responses for the Residential Dining facility were also organized from the most frequent to the least frequent. The four highest responses are outlined here.

Notably, while the most positive responses from the Residential Dining facility were reactions to the food setup/selection, the most negative responses were also to the food setup/selection (28%, n=22). The students reported that they would like more focus on the food selection or variety, healthier balanced food, better quality food, and easier access to the food. Lighting was the item with the highest negative response (17%, n=13). The students were split between the lighting needing to be brighter, and the lighting being too bright. One student wrote that the lighting needs to be “a little brighter with more focus on the food than the interior decoration.” Other students responded negatively to the fluorescent fixtures, the glare, a need for more perimeter lighting, as well as more intimate sources of lighting. This split between the students' preferences for the lighting being too dim or too bright may be caused by the different activities students participate in while dining. For example, some students may want to study and

thus would need a higher level of illumination, while other students may want to dine in a more intimate environment, which would be supported by low levels of illumination.

The design of the facility also had the third largest negative responses (15%, n=12) as it did positive responses. The students reported that the space was not comfortable, the tables were laid out too sporadically, it had a cold, factory look, and it had an overall very busy, cluttered look. The spaciousness was responded to negatively as well (9%, n=7). The students wrote that more tables are needed and that the space often is crowded during peak hours. Interpretations of these results as well as generalized guidelines for designers will be discussed in chapter five.

### **Fast Food Dining Facility**

In analyses of the responses from the students of the Fast Food Dining facility, the researcher first read and recorded all written responses, and then categorized them into terms. The Fast Food Dining facility received a total of n=74 positive responses, and n=94 negative responses. Table 4-11 outlines the top four responses and all other responses were categorized under the term, “other.” The top four positive responses are spaciousness, food, social qualities and music, while the top four negative responses are spaciousness, lighting, design, and food. The items that are in the “other” category include staff, windows, cleanliness, price, color scheme, temperature, and studying.

**Positive responses.** The terms used for the positive responses for the Fast Food Dining facility were organized from the most reaction to the least reaction. The four highest responses are outlined here.

The most frequent term used, spaciousness, (31%, n=23) was positively received in terms of openness, abundance of seating, accessibility, and large tables. A response from one student was that it had “ample seats” it was “spread out” and there was a “clever

Table 4-11 Open-Ended Responses from the Fast Food Dining Facility Students.

Positive		Negative	
Spaciousness	31%, n=23	Spaciousness	30%, n=28
Food Setup/Selection	15%, n=11	Lighting	17%, n=16
Social Qualities	14%, n=10	Design	16%, n=15
Music	8%, n=6	Food Setup/Selection	11%, n=9
Other	32%, n=23	Other	26%, n=24
Total=	100%, N=73		100%, N=92

*Note.* Other includes staff, windows, cleanliness, price, color scheme, temperature, and studying. The term, location, had the second largest response; however, it was dropped from the data because only interior variables are being considered for this study.

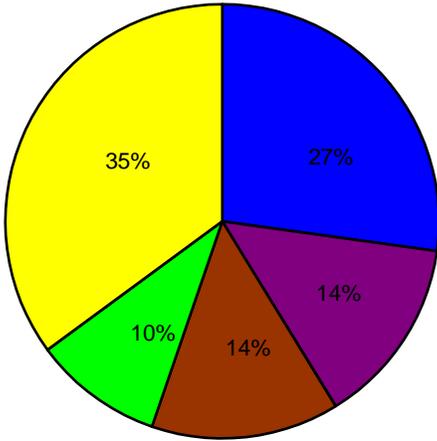
utilization of the space.” Next, the food setup/selection (15%, n=11) was received well in terms of the food vendors, as well as the different varieties of food stations offered. The social qualities of the space were also highly received (14%, n=10) by the students in reaction to the friendly environment and the constant movement or flow of people. One student commented that they liked the “mutual ground between students and teachers.”

**Negative responses.** The terms used for the negative responses for the Fast Food Dining facility were also organized from the most reaction to the least reaction. The four highest responses are outlined here.

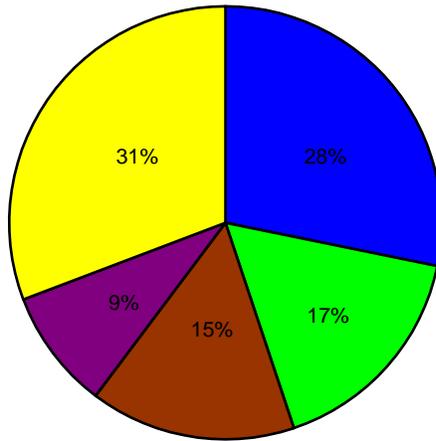
In addition to the term spaciousness having the most positive responses from the students, spaciousness also had the majority of negative responses from the students (30%, n=28). The students reported that there needed to be more space between the tables, it was too crowded at meal times, there should be more tables overall, and the dining area should be expanded. The next term, lighting, had several negative responses (17%, n=16). The largest percentage of students felt the lighting conditions in the space were too harsh and glaring. One student commented that the lighting was “too bright to

bring a romantic partner.” Additionally, they believed that there should be bright, white lights, as opposed to the dim fluorescent lighting currently in use. Also, several students responded negatively to the fans under the lighting fixtures which caused a noticeable flicker. The next term, design, had several negative reactions (16%, n=15) in that there should be some addition to the décor, such as coffee tables or sofas for groups to work and study together. Furthermore, the students added that there should be a separation between different areas for privacy or groups of students. The next factor, food setup/selection, (10%, n=9) had responses from students stating that they wanted all of the facilities to be open later, in addition to having a larger selection of dining venues.

Figure 4-3 shows pie charts of the top four positive and negative responses from the students in the Residential and Fast Food Dining facilities. There was a total of N=114 positive, and N=78 negative responses from these five dimensions in the Residential Dining facility. There was a total of N=73 positive, and N=92 negative responses from these five dimensions in the Fast Food Dining facility. As mentioned above, the “other” category includes all other items the students responded to. Lastly, the term “location” was greatly responded to positively in both dining facilities; however, because interior variables are only being considered for this study, it was eliminated from the results and pie charts.

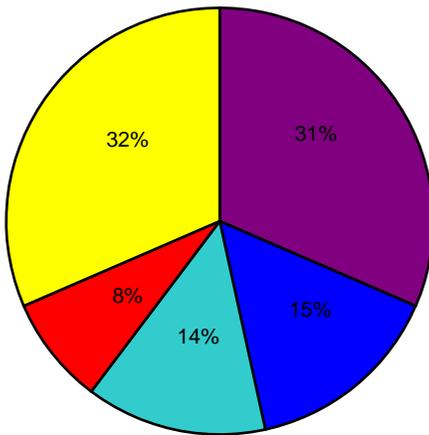
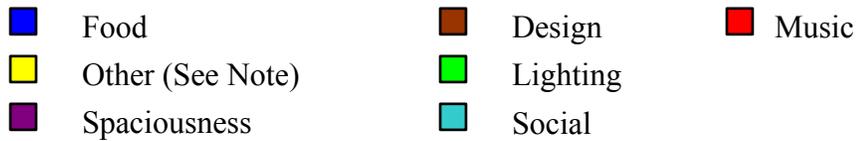


Residential (Positive)

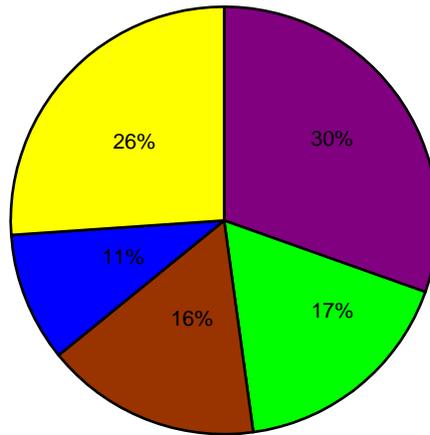


Residential (Negative)

*Note.* Other includes music, staff, windows, cleanliness, price, color scheme, temperature, and social qualities.



Fast Food (Positive)



Fast Food (Negative)

*Note.* Other includes staff, windows, cleanliness, price, color scheme, temperature, and studying.

Figure 4-3 Pie Charts of Frequency of Responses for the Residential (Top) and Fast Food (Bottom) Dining Facilities.

### **Students' Preferences for Dining in Four Types of Social Arrangements**

*Do students in these two contrasting dining facilities differ significantly in their preferences for dining with a friend, a romantic partner, a group of friends, or alone?*

This final closed-ended portion of the questionnaire asked the students to rate their preference, on a scale from one (never) to five (very often), for dining in their facility in four types of social arrangements—with a friend, romantic partner, group of friends, and alone. In this test, the dependent variables were the types of social arrangements. The independent variable was the dining facility, which consisted of two levels (the Residential Dining facility and the Fast Food Dining facility).

Four different types of social arrangements were cross-tabulated with both dining facilities to determine which types of social arrangement was the strongest in each dining facility. It should be noted that the questionnaires' instructions explicitly stated that the students were to judge their preference for dining in each social arrangement based upon the space they were in, not on any of the photographs.

Table 4-12 demonstrates that there is no correlation between the dining facility and students' preferences for dining in any of the four different types of social arrangements. The social arrangement of the students bringing a friend (arrangement 1) to the dining facility had the responses of "very often." The social arrangement of the students bringing a romantic partner (arrangement 2) to their dining facility had overwhelming responses of "never." Additionally, the students responded to "occasionally" dining with a group of friends (arrangement 3) from both dining facilities. Lastly, students also responded to "occasionally" dining alone (arrangement 4) in both facilities.

Table 4-12 Cross Tabulation of Students' Preferences for Dining in Four Different Social Interactions.

<b>Residential Dining</b>					
Contexts	Preferences				
	<u>Never</u>	<u>Rarely</u>	<u>Occasionally</u>	<u>Often</u>	<u>Very Often</u>
Friend	1 (2%)	4 (8%)	11 (22%)	9 (18%)	25 (50%)
Romantic Partner	32 (64%)	10 (20%)	2 (4%)	0 (0%)	6 (12%)
Group	1 (2%)	10 (20%)	18 (36%)	13 (26%)	8 (16%)
Alone	4 (8%)	15 (30%)	16 (32%)	9 (18%)	6 (12%)
<b>Fast Food Dining</b>					
Contexts	Preferences				
	<u>Never</u>	<u>Rarely</u>	<u>Occasionally</u>	<u>Often</u>	<u>Very Often</u>
Friend	0 (0%)	5 (10.2%)	15 (30.6%)	14 (28.6%)	15 (30.6%)
Romantic Partner	21 (42.9%)	14 (28.6%)	7 (14.3%)	6 (12.2%)	1 (2%)
Group	2 (4.1%)	11 (22.4%)	14 (28.6%)	9 (18.4%)	13 (26.5%)
Alone	9 (18.4%)	13 (26.5%)	14 (28.6%)	8 (16.3%)	5 (10.2%)

*Note.* In the Residential Dining facility, N=50. In the Fast Food Dining facility, N=49. Highlighted items are students' majority of responses.

A MANOVA was conducted, with the Wilks' Lambda test statistic used to determine significance. As shown in Table 4-13, the MANOVA statistical analysis reveals that the dining facility did not have a significant effect on the students' preferences for dining in any of the four types of social arrangements  $F(4, 94) = 2.10, p > .05$ .

Table 4-13 MANOVA of Students' Preferences for Dining in Four Different Social Interactions.

	<u>Value</u>	<u>F</u>	<u>df</u>	<u>p</u>
Dining Facility	.92	2.10	4	.087

Upon closer examination of Biner and Butler's (1989) study, the researcher re-coded the data into three categories of dining: 1) alone, 2) platonic, and 3) romantic partner to test for significance. These categories are clear and specific types of dining arrangements. The researcher conducted a new MANOVA with the updated and re-coded categories, and Table 4-14 reveals that once again, statistical significance was not found  $F(3, 194) = 1.67, p > .05$ .

Table 4-14 Re-Coded MANOVA of Students' Preferences for Dining in Four Different Social Interactions.

	<u>Value</u>	<u>F</u>	<u>df</u>	<u>p</u>
Dining Facility	.98	1.67	3	.174

The lack of statistical significance found on the dining facilities' affect on the students' preferences for dining in different types of social arrangements reinforces the results from the students' cross-tabulation data. Therefore, the students from both dining facilities do not differ in their preferences for dining in any of the types of social arrangements.

### Summary

In the current study, empirical evidence indicated that both the dining facility and the lighting levels had a significant effect on how the space was perceived. Additionally, the interaction of the facilities and lighting levels together were associated with how the space was perceived by the students. The students in the Residential Dining facility

supported Flynn's (1973) theory based upon consistent shared impressions of their facility, and shared *changes* in impressions as the lighting in their facility was varied. The students from the Fast Food Dining facility had inconsistent impressions for the lighting in their facility, as well as inconsistent impressions in the variations in lighting levels as depicted in the four photographs.

Students' written responses on their positive and negative reactions towards their facility also gave insight into the numerous dimensions that are important to creating a successful dining facility. The Residential Dining facility received more positive responses than negative responses. The Fast Food Dining facility received more negative responses than positive responses. However, all replies and reactions toward the space were valuable to the researcher in determining general guidelines for designers, which will be discussed in chapter five. Lastly, it was determined that the dining facility had no significant effect on the student's preferences for dining in the four different types of social arrangements.

## CHAPTER FIVE DISCUSSION AND CONCLUSIONS

“The presence of food and the anticipation of eating seem to create an atmosphere of comfort and informality, a softening of the situation, encouraging participants to feel more relaxed and to enjoy themselves, even if they are alone” (Franck, 2002 p.12).

Interior designers, architects, and facility planners design holistic settings, and base their designs on a large number of variables. Empirical studies, such as Flynn’s lighting research, can only provide limited evidence and recommendations for designers because experimental studies must isolate variables one at a time to test their significance. Inferences about one variable are of limited use to designers until they are tested in a natural setting. Therefore, this exploratory study was conducted in a holistic setting of two contrasting University of Florida dining facilities. The procedures and instruments were identified from significant studies (Flynn, 1973; Biner and Butler, 1989) and linked heuristically. This study yielded empirical findings in students’ perceptions of lighting and environmental preferences for dining in different types of social arrangements in campus dining facilities. Merit can be found in exploring a complex natural setting as a way to develop design guidelines. Therefore, the current study establishes a dialog between several possible dimensions that go into creating a successful dining facility from the students’ point of view.

Another positive result of carrying out this study with a holistic, exploratory approach was that the students were able to be observed in the pre-study phase in their natural, existing environment, and these observations were then used to design measures

to isolate the variables of lighting, dining preferences, and social arrangement.

Furthermore, after these observations were conducted and absorbed, the researcher could return to the same settings and survey the students about their perceptions of the lighting based on Flynn's categories of impressions (EI, PC, S), as well as preferences for dining, and preferences for types of social arrangements in their setting. The importance of returning to the contextual setting where the observations were made was critical to this study because unlike previous research, the students taking part in the survey were in the setting when they answered the survey questions. Empirical studies completed in controlled or a-contextual settings do not provide the realistic and complex setting to the participants that the current study was able to achieve.

One limitation to this study is the use of two groups of students rather than one that could dine in both facilities. Thus, the two groups of students from each facility were convenience samples that were unable to compare the two facilities. Therefore, it is not possible to definitively say which setting is better or, which lighting design is more successful. Another limitation to this exploratory study is that there are three research questions rather than one. The three questions were not theoretically linked and therefore answers cannot be linked empirically. Nonetheless, the findings indicate that each question is relevant and warrants further investigation. Furthermore, logical connections can be made between the findings that will provide designers with generalized guidelines on the dimensions studied. Lastly, it is important to remember that people comment on things they care about. Although this study does not produce empirically linked findings, the logical associations made between the three research questions posed, as well as the

inferences made from the data, can contribute to designers seeking to create a successful dining facility.

### **Interpretations of Students' Perceptions of Variations in Light Levels**

*Do students who dine in the Residential Dining facility—lit with a combination of functional and subjective lighting—express a significantly greater preference for lighting in this setting than those students who dine in the Fast Food Dining facility—lit predominantly with functional lighting?*

The findings conclude that the students in the Residential Dining Facility had a greater preference for their perception of lighting in their setting than the students in the Fast Food Dining facility. Flynn's (1973) hypothesis was supported by the students' responses to the semantic differential scale in a natural campus dining setting. The students from the Residential Dining facilities' consistent impressions of the lighting in their space, as well as their consistent shared impressions of the variations in lighting are in line with Flynn's research. However, the students in the Fast Food Dining facility had inconsistent impressions of the lighting conditions in their actual space.

Also, Flynn (1973) defined and isolated three main categories of impressions that may affect how people perceive lighting in their space. The interaction of the dining facility and the lighting significantly influenced how students perceived five of the adjectives developed by Flynn. The evaluative, or emotional impressions that yielded significance were the adjectives dislike/like, and unpleasant/pleasant. The perceptual clarity or functional impressions that were found to be significant were hazy/clear and blurry/focused. Lastly, the spaciousness, or interior architecture adjective that was determined significant was confining/spacious. Therefore, designers and architects should be aware that lighting systems can impact students' perceptions of their space, and

thus should take into consideration these five adjectives when designing lighting systems to afford for a likeable, pleasant, clear, focused and spacious university dining facility.

Lastly, not only do the findings in this study support Flynn's hypothesis as stated earlier, but several contributions were made in addition to Flynn's work. First, this study was conducted in a natural holistic setting of two contrasting college dining facilities; one, a residential dining space, and two, a common fast food space. Unlike Flynn's a-contextual laboratory research, the current study was conducted in a contextual setting. Second, pre-study observations were made of the students in both dining facilities before distributing the survey. Thus, the researcher was able to understand the students' behavior before any data was collected. In addition, through pre-study observations, it was found that the students in the Residential Dining facility stayed approximately ten minutes longer in this location, and thus this supports the semantic differential findings that indicate that these students have a higher preference for their dining facility than the Fast Food Dining students do. In addition, this study was triangulated by adding open-ended questions, and preferences for dining in four types of social arrangements. Lastly, the current study used computer-enhanced photographs to depict the four variations in the lighting levels of the two dining facilities.

### **Interpretations of Students' Positive and Negative Reactions toward their Dining Facility**

*Do students who dine in the Residential Dining facility—with an open kitchen and enhanced food choices—express a higher preference score for their overall dining experience than students in the Fast Food Dining facility—with a closed kitchen and limited food choices?*

The findings infer that the students in the Residential Dining facility had a higher preference for their dining experience than the students in the Fast Food Dining facility. When asked directly what the students liked and disliked about their setting, the Residential Dining facility received a majority of positive responses, while the Fast Food Dining facility received a majority of negative responses. Additionally, the students in the Residential Dining facility had consistent top four responses, both positively and negatively for food, spaciousness, lighting, and design. Although the four items were rated both positively and negatively, it is clear that these items are important to students when occupying a university dining facility. Thus, students care about the food, but also important, they care about the design, the spaciousness, and the lighting – the physical environment. However, in the Fast Food Dining facility, there were not as clear indications of the top four important dimensions to students in this space. One consistent positive and negative response from the students in the Fast Food Dining facility was the term spaciousness. The students indicated that spaciousness may be defined in several ways, and were not merely the facilities' square footage. While several positive responses related to the Fast Food Dining facilities' physical size, the same proportion of responses were negative, thus indicating that other factors are important to how students perceive spaciousness. Furthermore, because the Fast Food Dining facility was two and a half times larger than the Residential Dining facility, factors such as over-crowding or distracting ambient noise may lead the students to feel the space is closing in on them, leading to over-stimulation and thus, a perception of non-spaciousness. Nonetheless, students pay attention to their dining facility, and they have opinions about how well it suits their needs.

### **Interpretations of Students' Preferences for Dining in Four Types of Social Arrangements**

*Do students in these two contrasting dining facilities differ significantly in their preferences for dining with a friend, a romantic partner, a group of friends, or alone?*

The findings deduce that there is no association between the dining facility and the students' preferences for dining in four types of social arrangements. Biner and Butler (1989) hypothesized that lighting levels and social arrangements both affect arousal, and it was found that brightness preferences were lower with romantic partners than with a platonic friend or with a group of platonic friends. In Biner and Butler's empirical study, when individuals maintain an optimal arousal level, then preferred lighting levels for particular settings should vary in different social arrangements. While the Likert scale results for the current study did not yield any significant findings, inferences can be made that link the physical design setting to the student's arousal level. The Fast Food Dining facility did not have a stimulating physical design; however, it was possible that the students were over-stimulated by such elements as the volume and size of the space, the number of students that frequented the space, and the ambient noise. This may explain the student's low preferences for their dining facility. Additionally, the Residential Dining facility did have a stimulating physical design, and therefore it may be inferred that the student's moderate arousal level affected their positive response to their dining facility. However, this study did not link students' preferences for social arrangements with variations in lighting levels, but only students' preferences for dining in different types of social arrangements in the space.

### **Limitations**

It should be noted that several factors influenced and impacted the results of this study. Initially, students who were seated at tables being recruited who were unwilling to take part in the questionnaire were limiting. The photographs taken for this study vary in that the images from the Residential Dining facility contain more people than the images from the Fast Food Dining facility. Although students are not comparing photographs between facilities, the presence of people dining in the Residential Dining facility may have represented a more sociable dining atmosphere than the absence of people in the images from the Fast Food Dining facility. Another limitation of the photographs is that because the lighting levels were manipulated in Adobe Photoshop, footcandle measurements could not be recorded for these variations.

Also, a selection bias was used to limit this study, because students were more likely to be recruited who attended their facility more often, and thus typically stayed longer. In relation to this, questionnaires were distributed at one facility in one week and at the second facility the next week. However, it would have been more reliable to this study to alternate between facilities day by day to account for unknown factors, such as possible exams during one week.

### **Suggestions for Further Research**

As noted by Sommer and Sommer (2002), "If you want to find out what people do, you should observe them. If you want to find out what they think, you should ask them directly" (p.60). Through this study, information was sought that may be applied to other university dining facilities. While this study yielded several individual questions and separate ideas, further studies need to logically connect and develop on these three research questions. Additional exploration of students' perceptions of lighting levels, as

well as their environmental preferences for their dining facility, and preferences for dining in different types of social arrangements must be completed before definitive results can be concluded. As discussed earlier, this study is holistic and exploratory in nature. Therefore, empirical research should be conducted that focuses on each research question individually; or one variable should be consistently studied in each research question to empirically link all data.

Further research should compare two contrasting dining facilities with one group of students. Through this one group, students could attend both dining facilities for a specified number of days per week and then could make comparisons of both facilities. Additionally, students could complete a short questionnaire each time they visit the facility to consistently track their perceptions of the lighting levels. Thus, methodical data collection tools are required as this may draw conclusions that are more definitive. Additionally, further studies should increase the time for data collection. This data was collected during four weeks at the start of the spring semester, and schedules could have affected several factors such as how long the students stayed in the space, or whether or not they studied.

For further studies, physical lighting dimmers should be used for the spaces being studied, as opposed to variations in lighting levels through photographs. While it was successful for the students to complete the questionnaire in the space itself, validity would have further increased if the lighting levels were to be manually adjusted and recorded for each adjustment with a light-meter. Therefore, the students would not have to respond to photographs depicting different lighting level variations, but would have been able to see the variations of the lighting levels in the space while completing the

questionnaire. One way to complete this would be to change the lighting levels during closed hours in order to measure any changes in the students' responses. However, the students would have to be present each day the lighting was changed.

Furthermore, if the lighting levels were to be adjusted manually, this technique should be used for determining the students' preferences for dining in different social arrangements. As previously mentioned, the final research question on students' preferences for social arrangements was not connected to the first research question on students' perceptions of lighting levels within their setting. This remains to be tested in another study in a natural, holistic setting. However, if the three categories used in the first research question (EI, PC, S) could be tied into students' preference for dining in four types of social arrangements, this will also link the variable of lighting. Therefore, the students would be responding to their preference for dining in different social arrangements in their space as well as the four variations in lighting levels. For example, students may prefer dining with a group of friends in bright lighting, while students may prefer dining with a romantic partner in dim lighting. In addition, further questions and data collection tools should be examined. Students, staff and management should be interviewed to obtain a more complete, qualitative concept of the students' desires, as well as the staff and management's concerns.

### **Suggestions for Architects, Designers, Facility Planners, and College Dining Management**

Generalized guidelines have been constructed that can be applied for both types of the contrasting dining facilities. These guidelines should be taken into consideration by architects, designers, and facility planners, as well as university management who are seeking to create a successful college dining facility that goes beyond the standard and

explores deeply into the overall dining experience of the students. In addition to these guidelines, designers should consider using digital photographs as a tool in surveying students' preferences for their dining facility before construction begins. Furthermore, design drawings could be evaluated in terms of the three categories of impressions for judging lighting: evaluative, perceptual clarity, and spaciousness, before the facility was completed. Thus, meeting the students preferences for these categories will afford for a successful dining facility.

### **Lighting**

The combination of functional and subjective lighting systems in college dining facilities creates a cohesive, compositional design element. The use of compact fluorescents provides large spaces with ample lighting without causing glare or flicker. Decorative lighting fixtures also create attractive focal points for the eye, as well as contributing to an informal, relaxed ambience. Lighting fixtures should be installed non-uniformly at specific points of interest to lead the eye around the room, such as over table tops. Additionally, the findings from the students' open-ended responses indicated that the combination of functional and subjective lighting in the Residential Dining facility received both positive and negative responses, while the Fast Food Dining facility, lit with predominantly functional lighting received all negative responses. Thus, providing college dining facilities with a cohesive assortment of functional and subjective lighting fixtures will be more preferred than a purely functional lighting system.

According to the IESNA Lighting Handbook, 8<sup>th</sup> edition, the recommended light level for task area dining is 15 footcandles, while the recommended light level for general area dining is 10 footcandles (www.iesna.org 1999). Also, as Ozturk (2003) emphasized, three variables must be taken into consideration in order to provide a successful lighting

environment: the number of luminaires, the luminous intensity distribution, and the placement of the luminaires. Depending on the size of the space, as well as its function of residential or fast food type dining, the IESNA Lighting Handbook should be consulted to provide for these three variables.

Furthermore, because studying was observed and reported in the Fast Food Dining facility, designers should consider creating spaces or zones for defined tasks such as group studying, individual studying, and group meetings, in addition to dining areas simply used for eating. Therefore, different types of lighting fixtures and installations in addition to the settings' ambient lighting should be incorporated into these defined zones. For example, task lighting may be used in studying zones, while accent lighting may be integrated in group meeting zones. Therefore, students will be more likely to have an optimal arousal level while dining or studying due to the combined functional and subjective lighting installations that reinforce the various zones and tasks.

### **Design**

The dining facility should offer seating areas that afford for social arrangement as well as spaces for individuals who wish to dine alone. Also, ample seating should be provided for students during peak meal times. In large cafeteria-like spaces, the backs of chairs should be kept at a distance to prevent bumping when sitting down and standing up (21"-24" Chiara et al., 2001). A social atmosphere can be created by placing some tables in circular cluster arrangements that will also afford for group studying. Secluded, quiet zones are useful for students who wish to study or dine alone. Additionally, variations in table sizes are useful for large groups who are dining or studying together as well as people who are dining or studying alone.

For students using computers, several outlets should be installed in the walls, the floor, or in the tabletop, depending on the table arrangements. Also, wireless internet should be installed for computer networks. In Residential Dining facilities, an open kitchen should be utilized to promote arrangement between staff and students.

Additionally, this will create short lines during peak meal hours. In Fast Food Dining facilities, several choices of vendors will reduce long lines as well as afford for customer satisfaction by providing many options. The use of some soft materials, such as fabric on the chairs, or carpet designed for commercial use, will reduce the distracting noise level.

Additionally, if music is to be played, it should be rotated between different genres of music to satisfy all customers' preferences. Also, the temperature of the facility should not be too cold so that it affects the temperature of the students' food. Just the same, if the temperature is too warm, the students will be uncomfortable in the dining space. Lastly, a cohesive color scheme that is not too bright and jarring, but that is also not one plain color should be considered. The use of warm, saturated colors such as shades of red and orange provide a quick turnover of customers, while cool, colors such as shades of blue and green promote relaxation and a longer time spent in the facility. One color scheme should be applied throughout the space, as well as in the details, such as the dishware, furniture and fixtures.

### **Food**

Provide the students with food options, such as healthy foods for a balanced diet. Also, consider using local resources to keep the food seasonal and fresh. Specifically, in Residential Dining facilities, during off-peak hours there should be a consistent selection of food available to students. Also, to minimize lines in open kitchens, several chefs should be cooking at stations for meals that are prepared individually, such as sandwiches

or omelets. In Fast Food Dining facilities, a wide variety of fast food vendors should open for longer hours due to students' various schedules (5:00 a.m. to 2:00 a.m.).

### **Conclusion**

“The pleasure of eating is one we share with animals . . . The pleasures of the table are known only to the human race” (Jean Anthelme Brillat-Savarin, p. 182).

There is a significant increase in the modernization of university dining, and thus, more designers are looking to the students' needs to fulfill these requirements. This researcher hopes to shed light on the importance of students' perceptions of lighting levels, preferences for dining facilities, and preferences for dining in different types of social arrangements in order to create and foster successful college dining facilities. Conclusively, the findings indicate that lighting is important in both residential and fast-food type campus dining facilities for a number of issues that designers care about. The type and quality of the lighting does significantly affect students' reported perceptions of lighting in their setting three ways: 1) how a person emotionally evaluates lighting, 2) how a person functionally evaluates lighting, and 3) how a person spatially evaluates lighting. The students' positive and negative preferences toward their dining facility also shed light on the several dimensions important to creating and fostering a successful dining facility. This will further contribute to the field of research in students' perceptions to lighting in university dining settings, as well as students' environmental preferences for their dining facilities. Lastly, the general guidelines outlined above provide important contributions to designers that will further enhance students' overall experience when dining on campus.

APPENDIX A  
RESIDENTIAL DINING FACILITY



Figure A-1 Residential Dining – *Very Dim*



Figure A-2 Residential Dining – *Dim*



Figure A-3 Residential Dining – *Bright*



Figure A-4 Residential Dining – *Very Bright*

Table A-1 Residential Dining Facility Room Finish Schedule

Floor		Walls	Ceiling
Finish	Baseboards		Materials
Dark Brown	None	Lime Green Paint Dark Purple Paint Concrete Block	Open Plenum Suspended cables Painted black cables, HVAC system, and trusses.
Orange		Wall-length windows	Clerestory Window
Brick Red			
Teal			
Stained Concrete With Semi-gloss Finish.			

Table A-2 Residential Dining Facility Furniture Schedule

Chairs		Tables
Dimensions	Materials	Dimensions
<b>Short Chairs</b>	<b>Short Chairs</b>	<b>Short Small Tables:</b>
Seat diameter: 16"	Seat: Black Vinyl	24"x30"x30"
Seat height: 18"	Frame: Steel Painted	
Total Height: 30"	Gray	<b>Short Medium Tables</b>
		30"x48"x30"
<b>Tall Chairs</b>	<b>Tall Chairs</b>	<b>Short Large Tables</b>
Seat diameter: 16"	Seat: Black Vinyl	30"x72"x30"
Seat height: 30"	Frame: Steel Painted	
Total Height: 42"	Gray	<b>Tall Small Tables</b>
		24"x30"x42.5"
		<b>Tall Medium Tables</b>
		30"x48"x42.5"

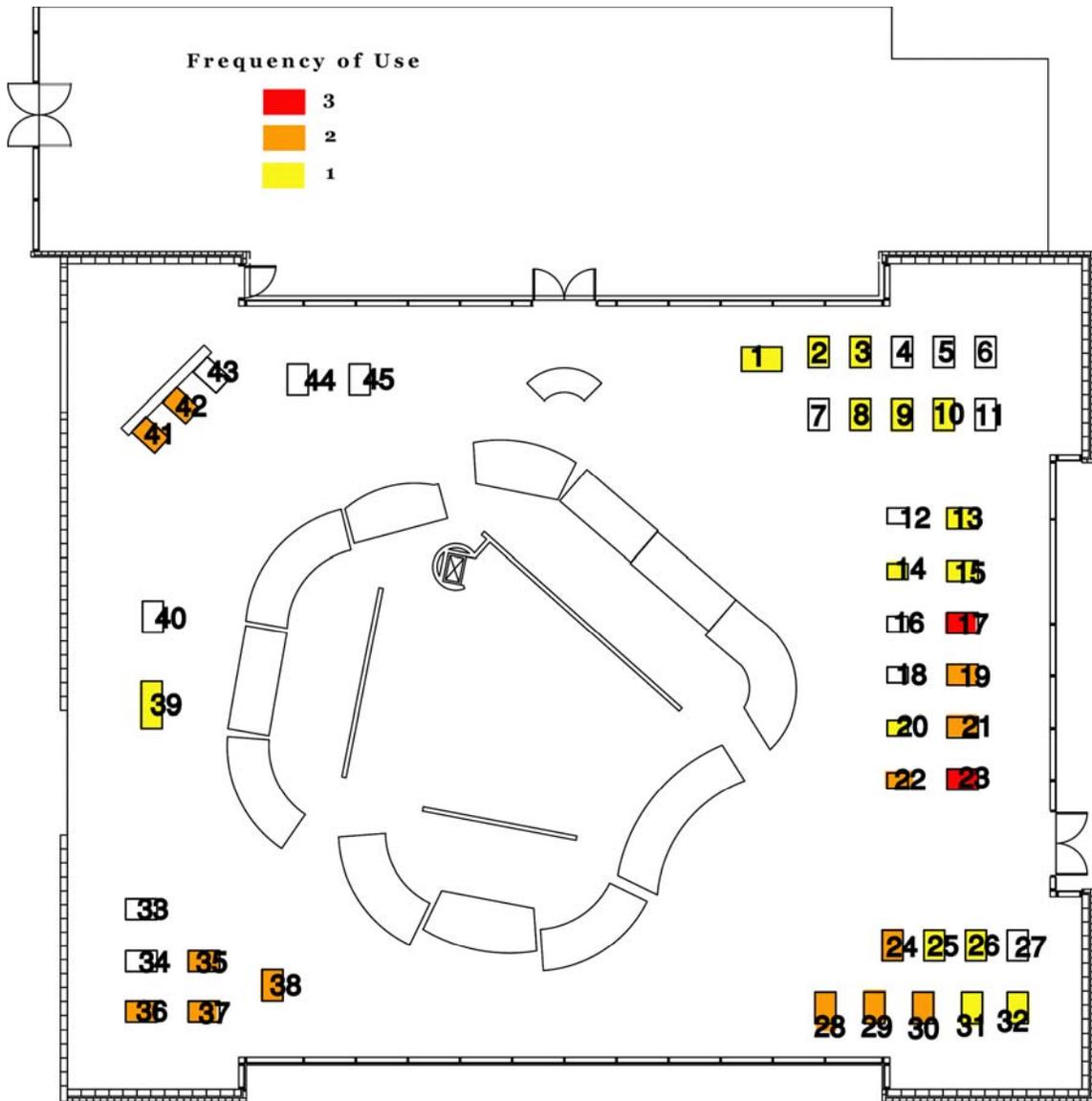


Figure A-5 Residential Dining Facility – Observed Frequency of Occupancy

APPENDIX B  
FAST FOOD DINING FACILITY



Figure B-1 Fast Food Dining – *Very Dim*



Figure B-2 Fast Food Dining – *Dim*



Figure B-3 Fast Food Dining –*Bright*



Figure B-4 Fast Food Dining –*Very Bright*

Table B-1 Fast Food Dining Facility Room Finish Schedule

Floor		Walls	Ceiling
Finish	Baseboards		Materials
Seating= 12"x12" Carpet tiles (Woven blue, Green, red, Purple and Neutral).	None	Wendy's Sushi & Noodle Bar Home Zone Subway  Wall-length Windows	Acoustical Tiles (2'x2')  Dropped Gypsum Ceiling (Off-White)
Circulation= Terrazzo (Beige/ Yellow)		Supporting columns Off-White Fabric	Wood Veneer Paneling in Soffits  Hanging Ceiling Fans

Table B-2 Fast Food Dining Facility Furniture Schedule

Chairs		Tables
Dimensions	Materials	Dimensions
<b>Short Chairs</b>	<b>Short Chairs</b>	<b>Short Small Tables:</b>
Seat Diameter: 18"	Seat: Dark Blue Vinyl	24"x30"x30"
Seat Height: 18"	Frame: Steel Painted	
Total Height: 37"	Brown	<b>Short Medium Tables</b>
		30"x48"x30"
<b>Tall Chairs</b>	<b>Tall Chairs</b>	<b>Short Large Tables</b>
Seat Diameter: 18"	Seat: Dark Blue Vinyl	30"x60"x30"
Seat Height: 30"	Frame: Steel Painted	
Total Height: 42"	Brown	<b>Round Tables:</b>
		48" Diameter
		Height=30"

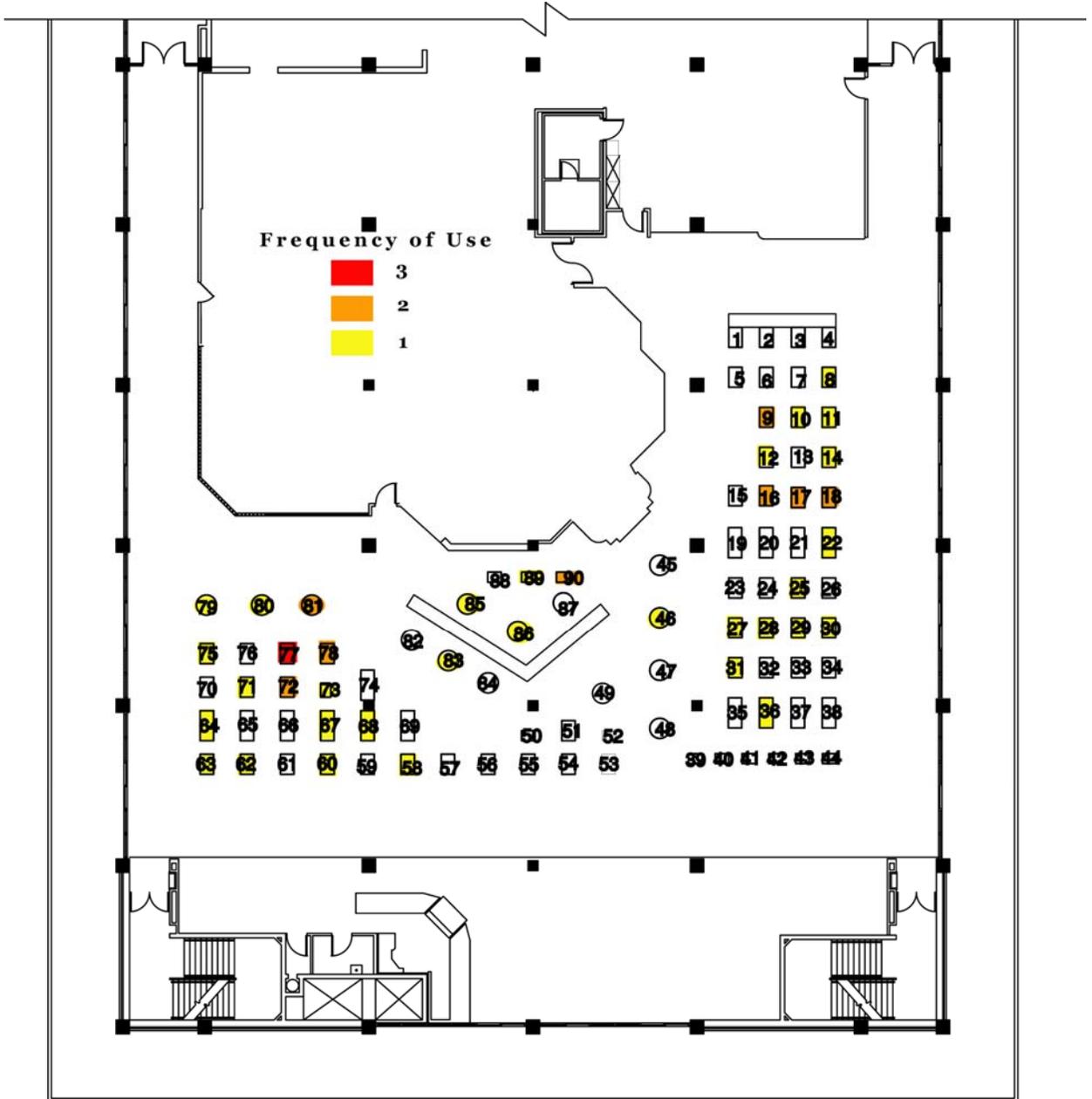


Figure B-5 Fast Food Dining Facility – Observed Frequency of Occupancy

APPENDIX C  
QUESTIONNAIRE

*Assessing the College Dining Experience*

This study examines your perceptions of the lighting conditions in this dining facility as well as your preferences for this dining location. You will be shown four different photographs on which to make your judgments. You will also be asked to answer two questions on the space you are in. There are no correct or incorrect answers. I am only interested in your preferences of the photographs and of the space you are in. Thank you for your time and participation.

## Semantic Scale Instructions

The following instructions explain how you are to use the scales provided.

If you feel that the photograph is very closely related to one end of the scale, you should place the check mark as follows:

	Very	Quite	Neither/Nor	Quite	Very	
Dislike	[    ]	[    ]	[    ]	[    ]	[ <input checked="" type="checkbox"/> ]	Like

OR

	Very	Quite	Neither/Nor	Quite	Very	
Dislike	[ <input checked="" type="checkbox"/> ]	[    ]	[    ]	[    ]	[    ]	Like

If you consider the photograph to be neutral on the scale, both sides of the scale equally associated with the photograph, then you should place the check mark as follows:

	Very	Quite	Neither/Nor	Quite	Very	
Dislike	[    ]	[    ]	[ <input checked="" type="checkbox"/> ]	[    ]	[    ]	Like

If the photograph is slightly related to one end of the scale, but not neutral, you should place the check mark as follows:

	Very	Quite	Neither/Nor	Quite	Very	
Dislike	[    ]	[    ]	[    ]	[ <input checked="" type="checkbox"/> ]	[    ]	Like

OR

	Very	Quite	Neither/Nor	Quite	Very	
Dislike	[    ]	[ <input checked="" type="checkbox"/> ]	[    ]	[    ]	[    ]	Like

- Be sure to read both words before you make your decision.
- Place your check marks as shown above in the blank spaces, do not circle a word.
- Be sure you check every scale for every photograph.
- Never put more than one check mark on a single scale.
- Please do not look back and forth through the items.
- Work at a fairly high speed through this questionnaire.
- Do not worry over individual items. I am only looking for your first thoughts.

You are now ready to begin the questionnaire.

For Question # 1 use the SPACE you are in to complete the scale.

For Question #2-5 Please use the attached booklet.

**1. To what degree does the lighting in the space invoke a perception of...**

Dislike	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Like
Unpleasant	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Pleasant
Visually Cool	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Visually Warm
Hazy	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Clear
Bright	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Dim
Focused	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Blurry
Confining	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Spacious

**2. To what degree does the lighting in Photograph 1 invoke a perception of...**

Dislike	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Like
Unpleasant	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Pleasant
Visually Cool	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Visually Warm
Hazy	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Clear
Bright	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Dim
Focused	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Blurry
Confining	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Spacious

**3. To what degree does the lighting in Photograph 2 invoke a perception of...**

Dislike	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Like
Unpleasant	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Pleasant
Visually Cool	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Visually Warm
Hazy	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Clear
Bright	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Dim
Focused	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Blurry
Confining	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Spacious

**4. To what degree does the lighting in Photograph 3 invoke a perception of...**

Dislike	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Like
Unpleasant	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Pleasant
Visually Cool	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Visually Warm
Hazy	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Clear
Bright	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Dim
Focused	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Blurry
Confining	Very [   ]	Quite [   ]	Neither/Nor [   ]	Quite [   ]	Very [   ]	Spacious

**5. To what degree does the lighting in Photograph 4 invoke a perception of...**

Dislike	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Like
Unpleasant	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Pleasant
Visually Cool	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Visually Warm
Hazy	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Clear
Bright	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Dim
Focused	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Blurry
Confining	Very [    ]	Quite [    ]	Neither/Nor [    ]	Quite [    ]	Very [    ]	Spacious

## Social Scale

Please Circle One Answer

IN THIS DINING SPACE, HOW OFTEN DO YOU...

1. Dine with a Friend?

Never	Rarely	Occasionally	Often	Very Often
1	2	3	4	5

2. Dine with a Romantic Partner?

Never	Rarely	Occasionally	Often	Very Often
1	2	3	4	5

3. Dine with a Group of Friends?

Never	Rarely	Occasionally	Often	Very Often
1	2	3	4	5

4. Dine Alone?

Never	Rarely	Occasionally	Often	Very Often
1	2	3	4	5



1. Please specify the year you were born: 19\_\_\_\_
2. Please specify your gender
  - a. Male\_\_\_\_
  - b. Female\_\_\_\_
3. How many times a week do you visit this location?
  - a. First Visit\_\_\_\_
  - b. One\_\_\_\_
  - c. Two or Three\_\_\_\_
  - d. Four or Five\_\_\_\_
  - e. More than Five\_\_\_\_
4. Are you on a meal plan?
  - a. Yes\_\_\_\_
  - b. No\_\_\_\_
5. How much do you expect to pay for a meal at this location?
  - a. \$0-\$2.00\_\_\_\_
  - b. \$2.01-\$4.00\_\_\_\_
  - c. \$4.01-\$6.00\_\_\_\_
  - d. \$6.01-\$8.00\_\_\_\_
  - e. \$8.01-\$10.00\_\_\_\_
  - f. More than \$10.00\_\_\_\_
  - g. I do not know\_\_\_\_
6. How long do you normally stay at this location?
  - a. 15 Minutes or Less\_\_\_\_
  - b. 16-30 Minutes\_\_\_\_
  - c. 31-60 Minutes\_\_\_\_
  - d. 61 Minutes to 2 Hours\_\_\_\_
  - e. Over 2 Hours\_\_\_\_
7. What activities do you participate in at this location? (Check all that apply)
  - a. Eating\_\_\_\_
  - b. Socializing\_\_\_\_
  - c. Studying\_\_\_\_
  - d. Other\_\_\_\_

APPENDIX D  
INSTITUTIONAL REVIEW BOARD INFORMED CONSENT FORM

**Protocol Title:** University students' subjective preferences for dining locations and perceptions of lighting in two contrasting college dining facilities.

*Please read this consent document carefully before you decide to participate in this study.*

**Purpose of the research study:** To investigate University of Florida students' subjective preferences for eating and socializing in a particular social setting as well as their subjective perceptions of lighting levels.

**What you will be asked to do in the study:** To complete a total of three questionnaires.

**Time required:** Approximately 15 minutes.

**Risks and Benefits:** No more than minimal risk. There is no direct benefit to the participant in this research. However, through the findings of this research I hope to provide a guide for designers seeking to create a college dining environment that affords for greater customer satisfaction.

**Compensation:** There is no compensation for participating in this study.

**Confidentiality:** Your identity will be kept confidential to the extent provided by law. The questionnaire will not ask for your name to be provided.

**Voluntary Participation:** Your participation in this study is completely voluntary. There is no penalty for not participating.

**Right to withdraw from the study:** You have the right to withdraw from the study at anytime without consequence. You do not have to answer any questions you do not want to answer.

**Whom to contact if you have questions about the study:**

Holly Sutherin, College of Design, Construction, and Planning, Department of Interior Design, 138 ARCH, (352) 514-7566, [hbsutherin@earthlink.net](mailto:hbsutherin@earthlink.net)  
Dr. Mary Joyce Hasell, 362 ARCH, PO Box 115705, Gainesville, FL 32611, (352) 392-0252 x337, [hasell@ufl.edu](mailto:hasell@ufl.edu)

**Whom to contact about your rights as a research participant in the study:**

UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; ph 392-0433

**I have read the procedure outlined above. I voluntarily agree to participate in this study and have received a copy of this description.**

Participant's signature and date

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Principle investigator's signature and date

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## BIOGRAPHICAL SKETCH

Holly Sutherin was born in 1982 in Charleston, South Carolina. During high school she was involved in classical clarinet performance, and through this was able to travel internationally to such countries as Australia, Austria, and Germany. She also took up black and white photography, and through these activities, developed an appreciation for the arts. After graduating from Lake Brantley High School with honors, she received the Bright Futures Scholarship to attend the University of Florida in 2000, studying Interior Design in the College of Design, Construction, and Planning. After completing her sophomore year, she attended the Vicenza Institute of Architecture's Interior Design summer program in Italy, which also gave her the opportunity to travel to France and Switzerland. During her junior year, she enrolled in the 4+1 one program, in order to obtain a Master of Interior Design one year after completion of her bachelor's degree. In 2004, she graduated with a Bachelors of Design, and in 2005, she will obtain a master's degree. Upon completion of her academic studies, she will move back to her hometown of Orlando, Florida, to work for the prestigious architectural firm, Farmer and Company Architects.