



Honors College Theses

4-14-2022

Biophilic Design in Higher Education: Exploring Nature-Based Design Inclusion in Classrooms

Danielle Burton
Georgia Southern University

Follow this and additional works at: <https://digitalcommons.georgiasouthern.edu/honors-theses>



Part of the [Interior Design Commons](#)

Recommended Citation

Burton, Danielle, "Biophilic Design in Higher Education: Exploring Nature-Based Design Inclusion in Classrooms" (2022). *Honors College Theses*. 734.
<https://digitalcommons.georgiasouthern.edu/honors-theses/734>

This thesis (open access) is brought to you for free and open access by Digital Commons@Georgia Southern. It has been accepted for inclusion in Honors College Theses by an authorized administrator of Digital Commons@Georgia Southern. For more information, please contact digitalcommons@georgiasouthern.edu.

“Biophilic Design in Higher Education: Exploring Nature-Based Design Inclusion in Classrooms”

An Honors Thesis submitted in partial fulfillment of the requirements for Honors
in *School of Human Ecology*.

By
Danielle Burton

Under the mentorship of *Dr. Beth McGee*

ABSTRACT

This study investigated how biophilic design (nature-based design) optimizes one's well-being within a classroom learning environment. It is necessary to understand how a student's performance in higher education depends on the environment. Research supports that when students have access to daylight, feel a sense of belonging and well-being in their classrooms they are able to perform at higher levels. Using a semi-experimental method, a classroom was assessed. Classes using this classroom were surveyed at the beginning of class and at the end of the same class time. The concurrent mixed method sequential design included both quantitative and qualitative data and looked at several key design features and the emotive responses of students. A key finding was that students wished they had access to windows in the classroom. There is limited literature understanding the intersection between biophilic design and students' performance in higher education. This research offers a new perspective in why incorporating biophilic design into higher education classrooms allows students to perform at a higher level.

Thesis Mentor: _____

Dr. Beth McGee

Honors Director: _____

Dr. Steven Engel

April 2022

School of Human Ecology

University Honors College

Georgia Southern University

Acknowledgements

Getting the opportunity to be a part of the University Honors College has been such a privilege. It has pushed me to excel as a student and has allowed me to advance my knowledge and admiration for interior design. This research experience has also given me the opportunity to excel as an interior designer. I would like to thank my parents who have always been my constant support system and have continued to encourage me every step of the way throughout my college career. Secondly, thank you to my faculty mentor, Dr. Beth McGee, for your words of wisdom, encouragement, and positivity throughout completing this research project. Your expertise and support went above and beyond what your requirements were as a mentor. Another thank you goes to my HONS 4610 professor, Dr. Trent Maurer, who has overseen this entire process. Thank you for encouraging me to join the Honors College in the first place. Thank you for your endless support and reassurance that I could do this. I cannot thank you enough. Finally, I would like to thank Georgia Southern University and the University Honors College. This school has shaped me into the person I am today and has allowed me to learn and expand my knowledge on the things I will carry with me for the rest of my life. I have truly grown so much academically and as a person from this school, and for that I will always be beyond grateful.

Introduction

Incorporating biophilic design/ nature-based design into interiors optimizes one's wellbeing (Ulrich, 1984, 1991). Existing references about classroom design show blood melatonin levels of students in classrooms with not enough daylight are much higher than in classrooms with adequate lighting causing students to become more tired and undermining their performance (Ahadi, 2016). The BID-M (The Biophilic Interior Design Matrix, McGee, 2019) has been developed to assess nature-based design incorporation in the interior and also serves as a design decision tool (McGee, 2021) with research supporting a variety of the 54 design attributes. Research specifically supports including nature (Gillis, Gatersleben, 2015) and daylight access (Ahadi, 2016) in classrooms, but there is a need to understand further how nature is being currently implemented into classrooms. This will be explored in relation to the recently formalized language proposed in the BID-M, which may provide guidance for better nature-inclusion optimally benefiting student wellbeing in higher education classrooms.

Literature Review

There are three main themes currently emerging from the literature surrounding classroom design in lower education levels K-12: behavior, lighting, and other biophilic design attributes. There is growing evidence for each of these themes to guide evidence-based design. There is a lack of research supporting the same benefits and conclusions for the post-secondary education level.

Behavior

Studies have established that classroom design can influence behavior in several aspects (Dillon, 2018). This includes helping teachers manage student behavior, build

community, and improve learning within their classroom environment. It also can support student attention, wellbeing, health, and perceived environmental quality, as well as reduce discomfort and impact performance (Dillon 2018).

Classroom design has been found to help teachers manage student **behavior, build community, and improve learning** within their classroom environment. Perimeter and floor plan changes can help teachers manage student behavior and provide students with a more comfortable space and support deeper levels of thinking and concentration (Dillon, 2018). The subjects in the research vary from primary through tertiary school students. Van den Bogerd et al. (2020) examined if students that attended a single lecture in a classroom benefit from the positive effects nature has on one's **attention, wellbeing, health, and perceived environmental quality**. Students experienced study-related stress due to high expectations from themselves and others, which can negatively affect attention, mental health, and overall well-being. To help students cope with everyday life demands, attention is being paid to how a classroom environment can serve as a supportive environment that protects and boosts a student's overall well-being and performance with the help of indoor nature. The study measured controlled classrooms, classrooms with potted plants, classrooms with green walls, and classrooms with flowers. Students were more likely to favor a classroom where indoor nature was accessible. Although, there were no straightforward intervention effects on well-being and health complaints.

Lighting

There is a biological need for natural light which directly impacts biological processes including circadian rhythm and health (Jamrozik et al., 2019). Natural light

includes light that is generated naturally, from the sun as its common source. Natural light sources vary in quality, quantity, color, and direction across the skydome- it is not constant. It supports performance, mood and all-around wellbeing (Theodorson, 2018). “Humans evolved under natural, diurnal light conditions and therefore natural light and natural light processes should be preferred and most beneficial” (Gillis & Gatersleben, 2015).

Exposure to natural light also has been explored in classrooms, for example, **readily available natural lighting** in classrooms was found to be important for performance and mood (Ahadi et al., 2016). In Ahadi’s study, they found “blood melatonin levels of students in classrooms with not enough natural light are so much higher than in classrooms with good lighting” (Ahadi et al., 2016, p. 2). This caused students to become more tired and undermined their performance. Studies have shown that daylight can positively impact a human’s perception and mood causing a positive impact on performance (Ahadi et al., 2016, p. 2).

Natural light is considered a key architectural strategy in achieving high performance with one study finding that “a well daylight school will save electricity for lighting and cooling as well as provide the psychological and biological benefits of natural light” (Theodorson, 2018, p. 1). Many schools have started the transition of “going green” meaning schools are designing buildings for high performance that conserves energy and focus on overall environmental quality (Theodorson, 2018). Theodorson researched three **elementary schools** in the same district with the same programming, sky orientation and budget, but were each designed by different architects and designers who had different strategies for design. The findings concluded that the

north and south skies did offer optimal daylighting with controlled solar radiation (Theodorson, 2018). Illuminance measurements revealed during cloudy conditions that north-facing classrooms receive 65% of the light than south-facing classrooms receive. North-facing classrooms however benefitted from a more even distribution of light while south-facing classrooms suffered from visual “hot spots” at the window (Theodorson, 2018). Orientation and control of natural light ingress is an important design consideration.

Classroom lighting and decor can promote **discomfort and impact task performance**. Discomforts in a classroom can be caused by flickering of fluorescent lights, glare on whiteboards and desks which can cause headaches and impair visual performance. Students experience study-related stress due to high expectations from themselves and others, which can negatively affect attention, mental health, and overall well-being. To help students cope with everyday life demands, attention is being paid to how a classroom environment can serve as a supportive environment that protects and boosts a student’s overall well-being and performance with the help of indoor nature. The findings of the study concluded that the intensity of the glare spots on whiteboards varied in different brands. Ambient lighting reduced image contrast, and venetian blinds had spatial characteristics that induced patterned glare (Winterbottom & Wilkins, 2009).

Biophilic Design

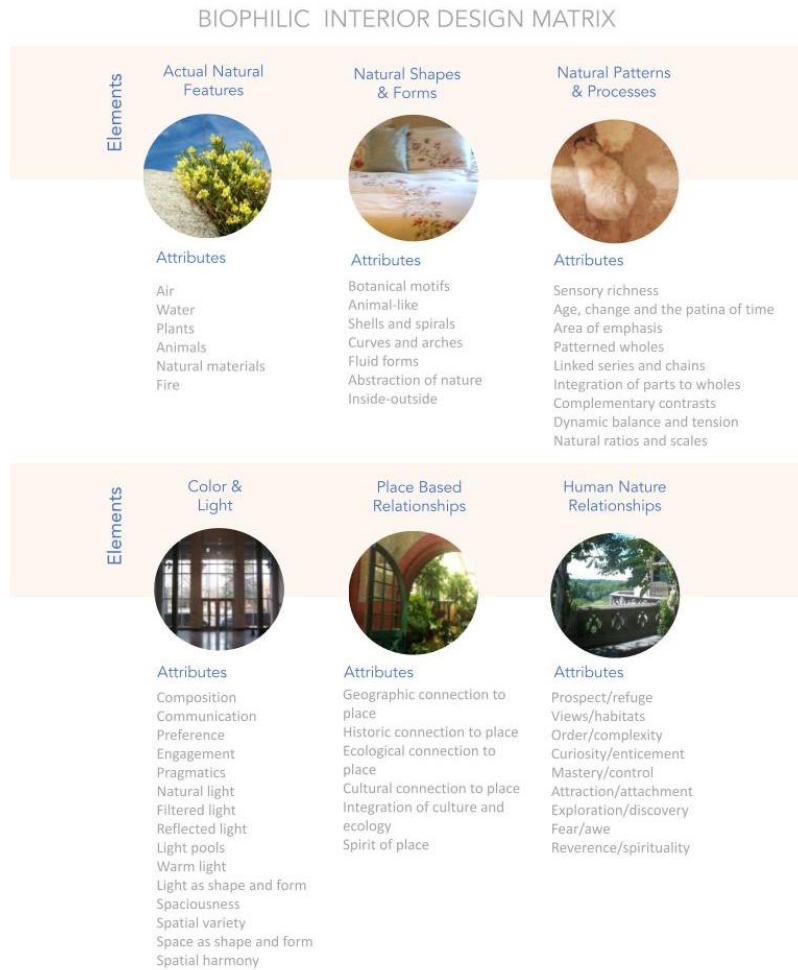
Biophilic Design is the study of the connection between people and nature in the built environment. “People have the innate need to connect with nature and natural systems, or what has become known as biophilia” (Rodgers, 2019, p. 2). The ideas supporting biophilia “have been taken forward in two theories developed in the

environmental psychology literature: Attention Restoration Theory and Stress Recovery Theory” (Gillis & Gatersleben, 2015). Both of these psychological theories state that environments can be stressful, yet other environments can be relaxing and lead people to a quicker recovery physically or mentally (Gillis & Gatersleben, 2015). Research has been growing related to several of the attributes with benefits varying from improved cognition, improved academic productivity, and improved mental health (Peters, 2020).

Research has shown that nature, whether it is active or passive benefits both human health and well-being. Nature in the human environment “allows the mind to shift from directed attention to fascination and contributes to mental and physical well-being. This type of natural stimulation generates ‘neurological nourishment’ as our brains effortlessly process complex information” (McGee et al., 2019, p. 2). The ability to offer a greater variety of biophilic features in the interior environment may support greater connectivity to nature and ultimately reduce stress and improve wellbeing. The Biophilic Interior Design Matrix (BID-M) was created by McGee et al. (2019) to allow for assessment of interior spaces so that the variety of nature is readily apparent. The BID-M has 54 attributes within six elements that support a variety of nature-based design features in the interior environment. Listed below are the elements and attributes, see Figure 1 for the full BID-M. The lack of research exploring how biophilic design and lighting specifically interact with student preferences and experiences in classrooms led to the following research questions:

Figure 1

Biophilic Interior Design Matrix © 2021, Beth McGee, Reproduced with permission.



Research Questions/Hypotheses

Question 1: What are the psychological states of students in a classroom without natural light?

Question 2: What are the classroom experiences of students in a classroom without direct natural light exposure?

Question 3: What are the preferences for students for classroom design attributes?

To answer these research questions, there are two hypotheses that will be tested in this study using a questionnaire.

Hypothesis 1: Based on perceived learning performance, students in a university classroom prefer classrooms with natural light to those without.

Hypothesis 2: Based on perceived well-being, students in a university classroom prefer classrooms with natural light to those without.

Hypothesis 3: Students prefer more diverse representation of nature-based (biophilic) design attributes.

Method

Sample and Participant Selection

One classroom in Georgia Southern University was selected for this study, without windows and natural light (IAB Room 2028) to analyze students' preferences (Figure 2). In order to recruit subjects, professors within this classroom were contacted by email to receive permission to display a digital flyer at the beginning and end of the class period during regularly scheduled class times. The flyer introduced the purpose of the surveys and the related QR codes for a pre survey at the beginning of the class and a post survey at the end of the class.

Figure 2

Room 2028 in the IAB Building



Participants consisted of undergraduate students from majors within the predetermined courses in one academic unit. The course subject area was Child and Family Development. Participation was voluntary. These undergraduate students were of ages 18 and above who range from first year students to senior level. We had 34 students complete the pre-class survey and 31 students complete the post-class survey. At the start of the class time, participants were asked to fill out a pre survey to indicate their thoughts and feelings of the classroom environment. Students were able to pick as many emotional states that applied to them from the predefined list (see Appendix A). At the end of the class time, participants were asked to fill out a post survey to indicate whether or not their thoughts and feelings of the classroom environment had changed at all after sitting in the classroom for the duration of their class time. Students were able to pick as many emotional states that applied to them again.

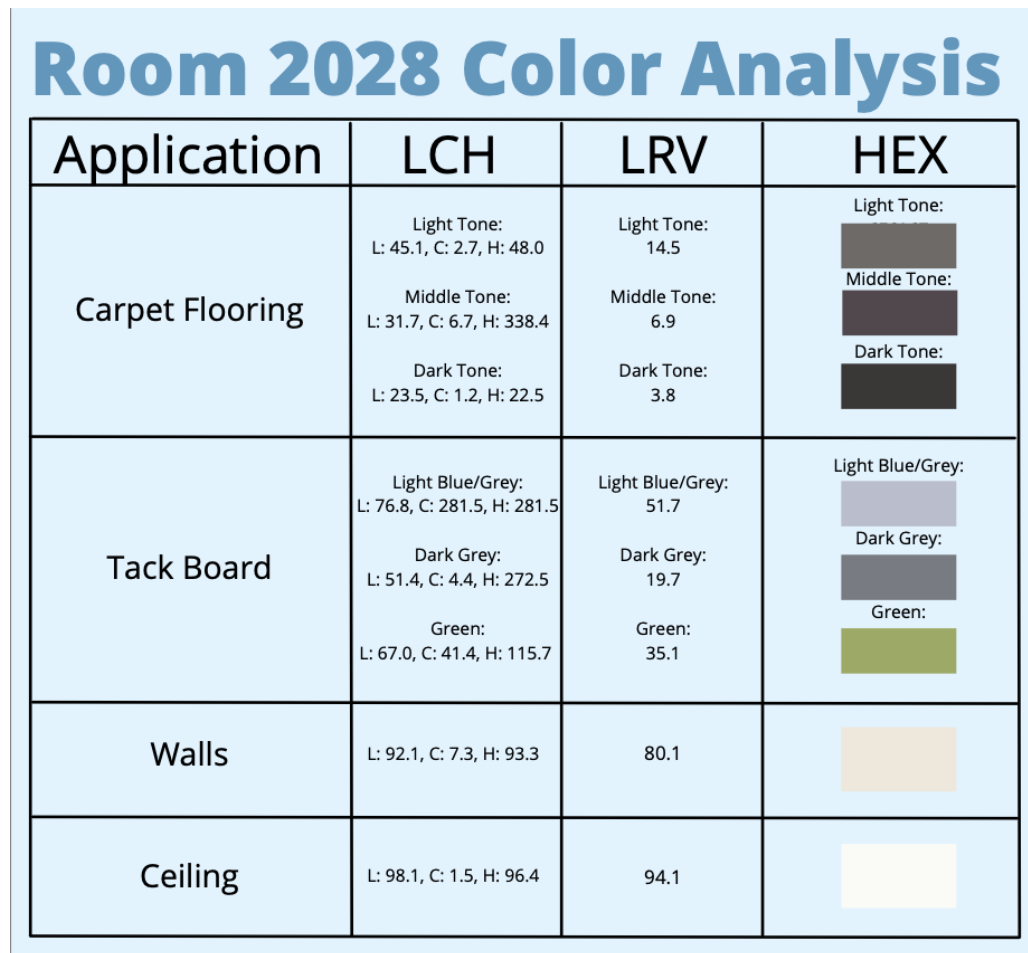
Assessments and Measures

The circumplex model of affect was used as a reference to help develop a questionnaire for this study. The circumplex model of affect proposes that all affective states arise from cognitive interpretations of neural sensations and emotions (Posner et al., 2005). The circumplex model of affect is consistent with many recent findings from behavioral, cognitive neuroscience, neuroimaging, and developmental studies of affect (Posner et al., 2005). This study focused on the students' personal experiences and satisfaction with the conditions of the specific classroom studied. This method was used to get user feedback about the current design of the space and to gain user preferences for classroom design. Data was collected using a questionnaire (see Appendix A) developed from established literature and existing surveys to determine the relationship between the students' overall well-being in their classroom environment and how it affects students' perceived learning performance. The questionnaire consisted of a 7-point scale measuring satisfaction (1 = extremely dissatisfied, 7 = extremely satisfied), interior satisfaction statements (1 = extremely dissatisfied, 7 = extremely satisfied), and a multi-select question to indicate the participants' emotional state related to the circumplex model of affect. An open-ended question was asked at the end of the post class survey (see Appendix B) to give participants a chance to give further explanation or comments on why they felt that the classroom does or does not hinder their academic success.

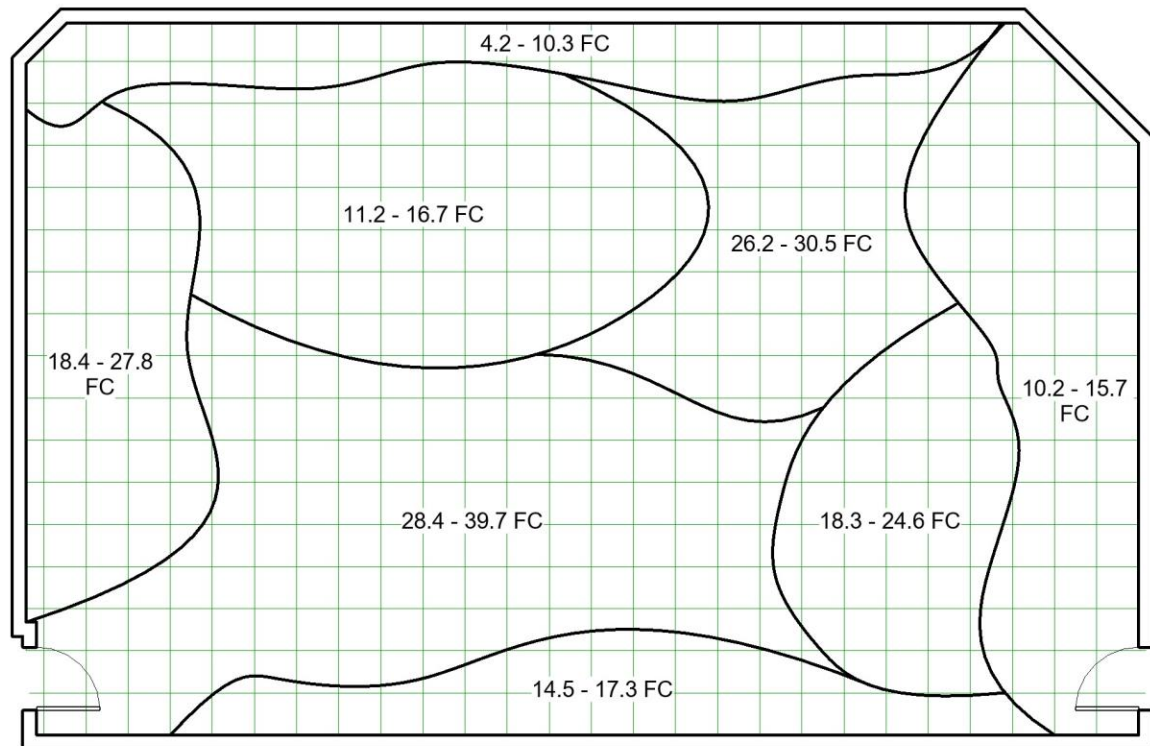
A room assessment was also performed in the classroom. The lighting conditions (see Table 1 and Figure 3) and nature-based attributes present were recorded to establish the room conditions (see Appendix C for the full list of nature-based attributes present in the classroom). The BID-M Qualtrics form was used to document and understand the different attributes present within the six elements. The BID-M assessment of the 54

attributes used a Likert-type scale with four options (0- none, 1-weak, 2-moderate, 3-strong, and a not applicable check box) and was based upon being present in the room with both researchers conducting joint assessment. After using the BID-M Qualtrics form to assess the biophilic elements in Room 2028, the room had a 17.9% rating for the space for its variety and strength in biophilic design, which shows room for much more variety to be included. Referring to the IES guidelines, the lighting conditions were measured using a light meter in a 2' grid pattern at a 2.5' A.F.F. (above finished floor) for the desk height tasks in the classroom. The IES recommends 200 lux or 20 footcandles for people under 25 years old in an education room. This type of space is noted to be a candidate for strategies employing daylighting to achieve the recommended lighting levels.

Table 1*Room 2028 Color Analysis*

**Figure 3**

Room 2028 Foot Candle Measurements



Procedure

The questionnaire was administered over a span of two weeks. The professors placed the digital flyer on the projector for the participants to scan the QR code and complete both pre and post class surveys. Each questionnaire took approximately five to ten minutes to complete. After data was collected, descriptive statistics and cross-tabulation data was analyzed using SPSS software. The findings are reported using descriptive statistics data. In addition, qualitative responses were analyzed to find themes that supported the quantitative responses. Content analysis was used for the qualitative data with no predefined codes. An open coding process started with initial thematic coding being the two researchers. Next, the codes were merged into broader themes. The responses were all re-coded into the agreed-upon themes. Then the researchers reviewed

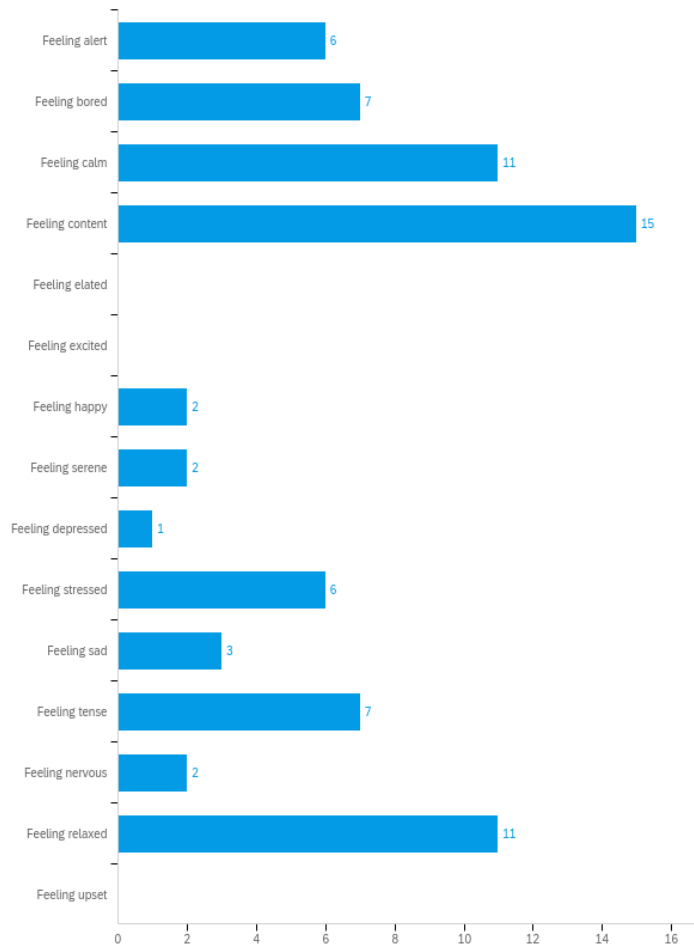
the coding and identified issues, and these areas then revised. A final joint round of coding among the researchers finalized the themes.

Results

According to Figure 4, at the start of the students' class time, 20.55% of the participants indicated that they were feeling emotionally content, 15.07% indicated that they were feeling emotionally calm, and 15.07% indicated that they were feeling emotionally relaxed before the class started.

Figure 4

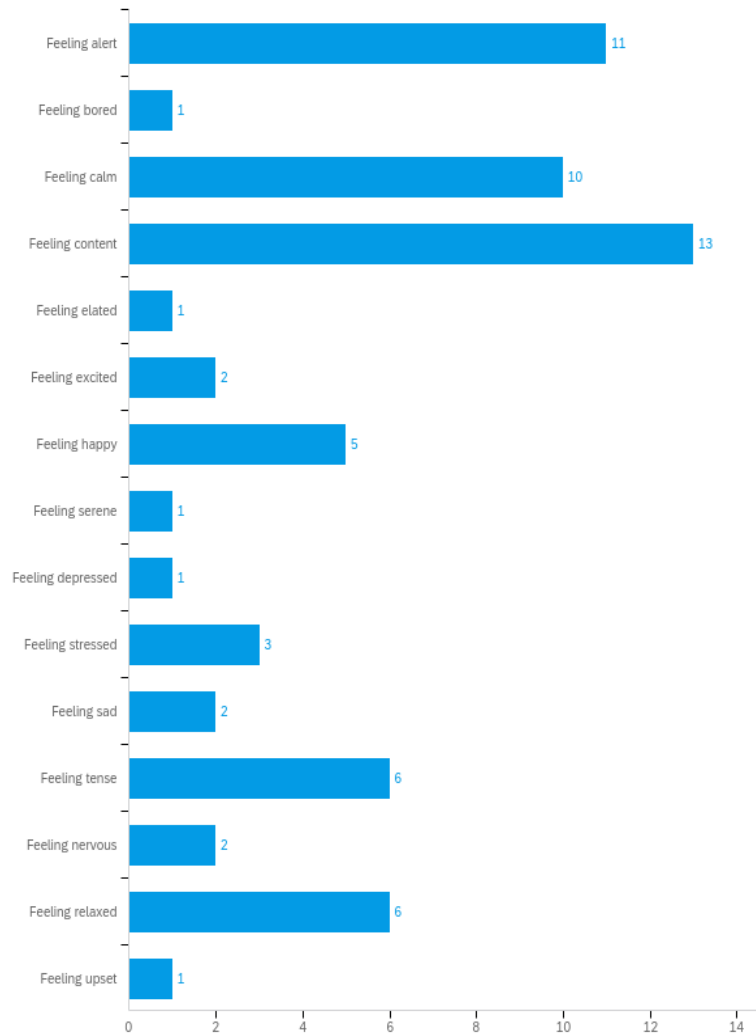
Pre-Class Emotional State



At the end of class time, 20.00% of students indicated that they were feeling emotionally content, 16.92% of students indicated that they were feeling emotionally alert, and 15.38% of students indicated that they were feeling emotionally calm (see Figure 5).

Figure 5

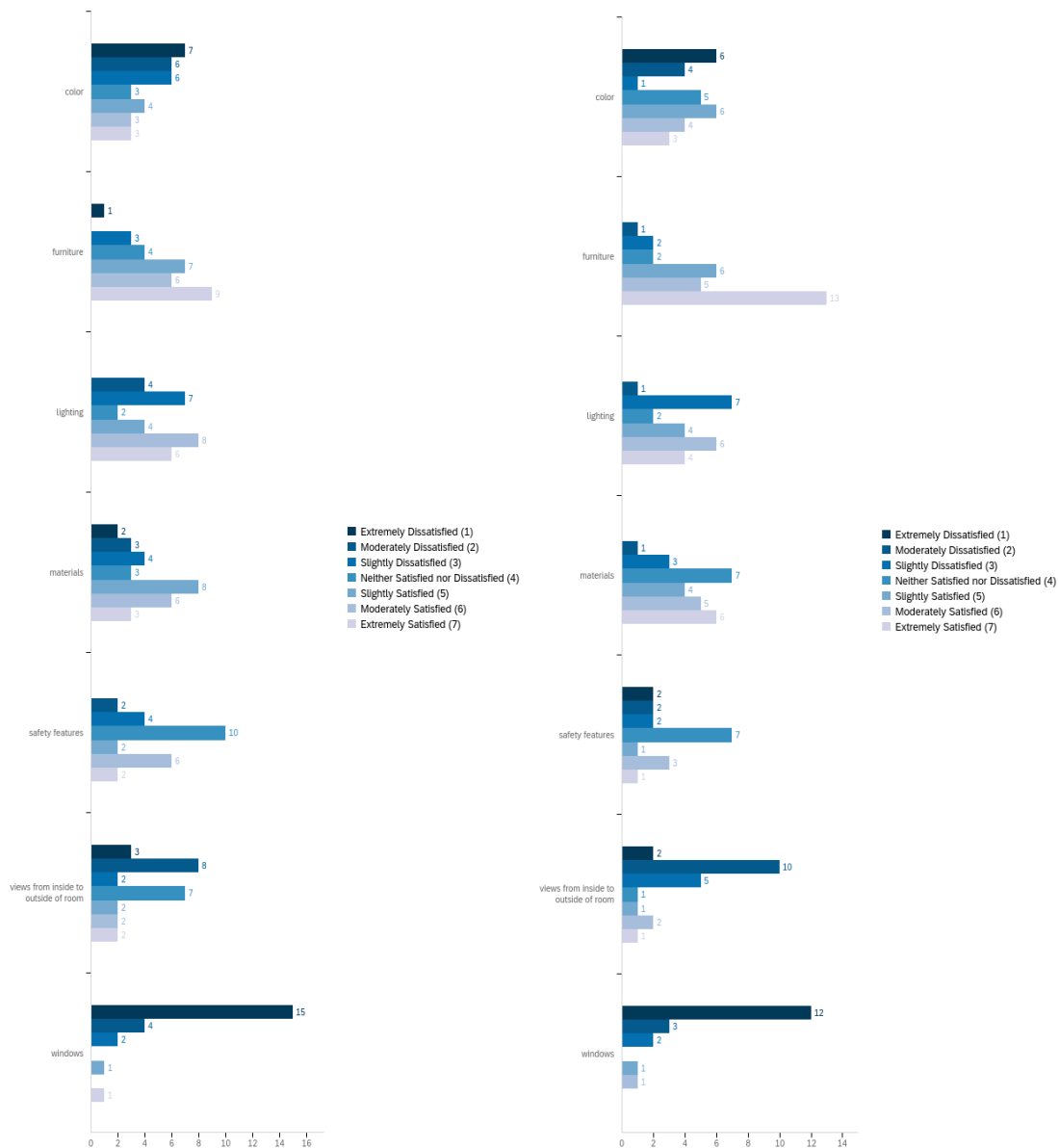
Post-Class Emotional State



The participants indicated that they were extremely dissatisfied with the color in the classroom at the beginning of the class (see Figure 6), but after sitting in the classroom for the duration of the class, participants indicated that they were slightly satisfied with the color in the classroom (see Figure 7). Majority of the participants were extremely satisfied with the furniture in the classroom at the start of the class and at the end of class. At the start of class, participants noted that they were moderately satisfied with the overall lighting in the classroom environment, yet at the end of class the majority of participants noted that they were slightly dissatisfied with the lighting conditions in the

classroom. The majority of the participants felt slightly satisfied with the materials in the classroom at the start of class, and the majority of participants felt neither satisfied nor dissatisfied with the materials at the end of the class. The participants indicated that they were neither satisfied nor dissatisfied with the safety features in the classroom both at the start and end of class. The majority of participants felt moderately dissatisfied with the option of views from the inside of the classroom to the outside both at the start and end of class. As well as the majority of the participants were extremely dissatisfied with the options of windows in the classroom at the start and end of class.

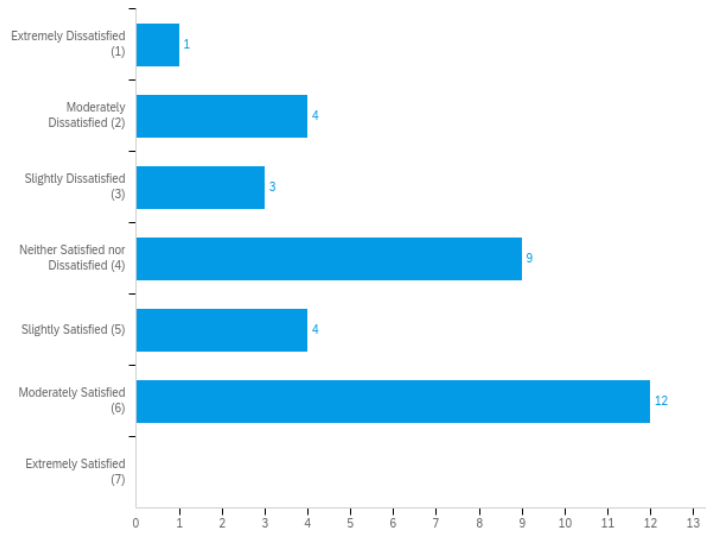
Figure 6*Pre-Class Interior Design Assessment***Figure 7***Post-Class Interior Design Assessment*



Participants felt moderately satisfied with their overall satisfaction of the classroom at the beginning of the class ($n = 33$, $M = 4.42$, $SD = 1.50$, $V = 2.24$, See Figure 8).

Figure 8

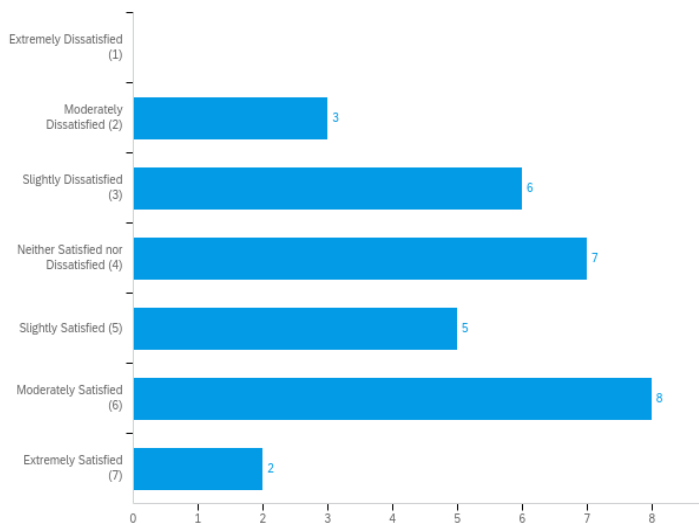
Pre-Class Overall Satisfaction



At the end of the class participants indicated that they were still moderately satisfied with their overall satisfaction of the classroom ($n = 31$, $M = 4.48$, $SD = 1.46$, $V = 2.12$, see Figure 9).

Figure 9

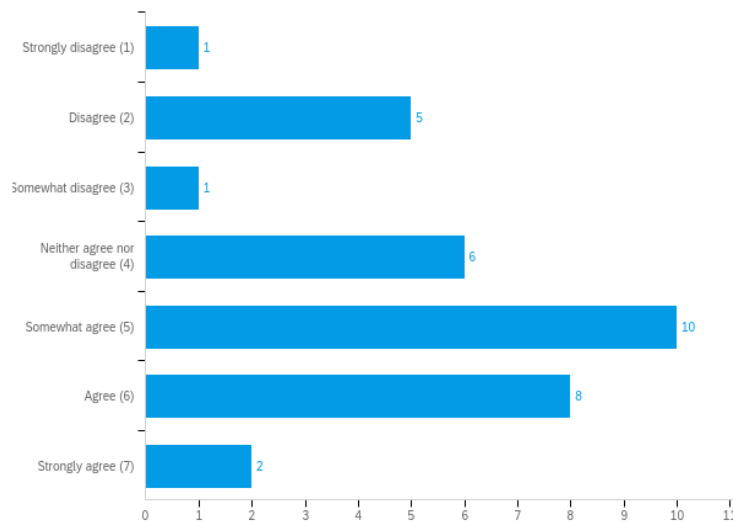
Post-Class Overall Satisfaction



At the start of class, the majority of the participants somewhat agreed that the overall design of the classroom contributed to their academic success ($n = 31$, $M = 4.52$, $SD = 1.21$, $V = 1.48$, see Figure 10).

Figure 10

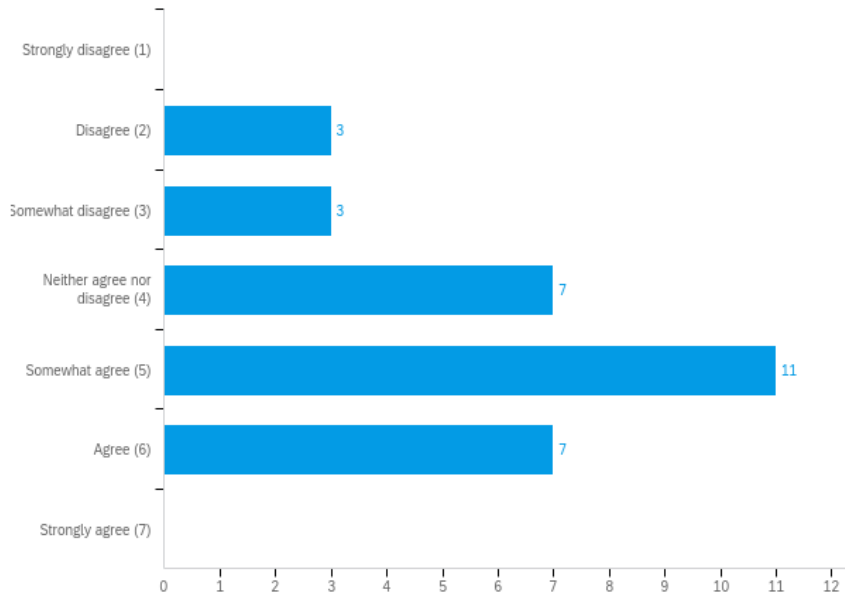
Pre-Class Overall Academic Success



At the end of the class time, students were still somewhat agreeable that the overall interior design of the classroom contributed to their overall academic success ($n = 31$, $M = 4.52$, $SD = 1.21$, $V = 1.48$, see Figure 11).

Figure 11

Post-Class Overall Academic Success



Lastly, participants were asked an open-ended question to explain why or why not the classroom either does or does not contribute to their academic success (see Table 2).

Many of the respondents who provided the qualitative responses indicated that they felt the classroom design was bland/boring and they preferred to have windows with views and natural lighting in their classrooms. As well as the fact that having comfortable furniture is important to students while they are in class.

Table 2

Post-Class How Does Design Hinder Academic Success?

Thematic Analysis	Frequency
Preference for windows w/views and natural light	9
Comfortable furniture is important	7
Design is bland/boring	7
Lighting strength/color is important	6

Color affects mood/focus	4
Design makes me calm/sleepy	3
Design makes me feel focused	2
Design makes me feel tired	2
Mixed view of affecting success	1
Aesthetics are not supporting success	1
Having little number of distractions helps	1
Spacious space is preferred	1
Space planning w/ teacher station location is important for engagement	1

Discussion

This study examined students' perceptions, learning performance, and overall well-being while they were in a university classroom environment. The two questionnaires focused on the students' emotional state at the beginning and end of the class time. The questionnaires also discussed the overall physical environment relating to the students' learning and well-being, as well as their academic performance. An open-ended question was asked to support the quantitative responses. The themes that emerged from the responses to the questionnaires highlighted some of the elements that are most important to students while they are in a learning environment. Hypotheses were tested that students in a university classroom environment would prefer the classroom to have access to natural light to those without based on perceived learning performance and that students in a university classroom environment would prefer the classroom to have access to natural light on perceived well-being. In response to the first hypothesis, the results found that based on Q3, "Indicate how satisfied you are with the interior design in this classroom" of the pre and post class survey, participants were moderately dissatisfied with the views of the outside environment from inside the classroom, they were also

extremely dissatisfied with the windows inside the classroom. The overall emotional state of wellbeing found that being content was still the most frequent state. However, the secondary and tertiary choices changed in hierarchy during class.

In response to the second hypothesis about *the experiences of students in a classroom without direct natural light* exposure, the results show experiences in the room only somewhat contributed to their academic success and a secondary emotional state of being alert was experienced more at the end of class than at the beginning. In reference to Figure 5, the findings for Q2 on the post-class survey were expected to have a higher number of participants feeling stressed, tense, or sad in order to support *Hypothesis 2*. Access to natural light has been shown to support performance, mood and all-around wellbeing (Theodorson, 2018). It is understood that the participants may not ever have experienced taking a class in a classroom environment that has access to windows so they may not know any difference, or the time wasn't significant in length. Hence, the most common emotive state was not changed after sitting in a class without windows for a single class period. The increase of alertness was an unexpected finding but the current color temperature being cooler in the classroom is supported by research for helping with alertness (Theodorson, 2018). This was not an experience all students reported and in the qualitative responses' students did wish their classroom had access to views to the outside environment. Other responses to the qualitative question support the statement from Dillion (2018) that classroom design can influence behavior in several aspects. A participant supports this in their response to Q6 of the post-class survey stating, "The colors and lack of windows make me feel sleepy and bleh. They don't make me excited to learn (participant #13).

The preferences for students for classroom design attributes varied but focused on many nature-based features. Van den Bogerd et al. (2020) examined the positive effects that nature has on a student's attention, wellbeing, and health during a single lecture in a classroom. The positive effects that nature had during Van den Bogerd et al.'s study relates to Q6 in which a participant stated, "The way the classroom itself looks makes me feel tired and bored. If there were more colors, I could feel more awake and alert. If there were some outside views through a window, I'd have more stimulation" (participant #?). Perhaps if this classroom offered more variety of nature-based attributes inside the classroom such as more curvilinear lines, natural materials, plants or views to nature, this participant would feel more awake and alert during their class time. Literature supports that a student's classroom environment can serve as a supportive environment that protects and boosts a student's overall well-being and performance with the help of indoor nature (Van den Bogerd et al., 2020).

Results of the question regarding overall satisfaction with the classroom found that the majority of the participants were moderately satisfied with the classroom environment. Although the results also show that the other half of the participants indicated that they were either slightly dissatisfied, moderately dissatisfied, or neither satisfied nor dissatisfied with the classroom environment. Which then leads one to question what made one half of the participants feel dissatisfied with the classroom environment and the other half feel moderately satisfied with the classroom environment? The mixed effect of the lighting conditions to support concentration and the limited biophilic design variety (including no window views or daylight) may have contributed to

experiences where the existing state of the students coming into the class was not able to be modified significantly in the studied room within just one class time.

Limitations and Future Directions

First and foremost, COVID-19 was quite a large limitation. Beginning this research process in the midst of a pandemic was quite the undertaking. I had to learn how to begin the process of research over Zoom which was certainly an adjustment. I had also gotten a late start when it came to completing my IRB applications which then pushed my data collection back to the following semester. This led me to my biggest limitation in this study. Originally my study was to compare two classrooms in the IAB. These two classrooms were almost the same, but one had a window and the other one did not. This would allow me to gather research on the effects that windows and nature access can have on a student in a classroom versus the effects that a classroom with no windows or natural access has on a student. We were not able to complete this comparison because I was not able to recruit any participants in the classroom I had selected with windows. This limitation completely changed my research project because I was not able to collect any data from students in the classroom with the actual windows and access to outdoor features. If we were able to collect this data, I do believe that the research found would have been more cohesive with the overall goal of my research. Although things did not go quite as planned, I am very grateful to have collected at least some data from my other classroom so that I could still have some data analysis to back up my literature review and give me the experience to collect my own data.

I think this project has the potential to go in further directions in the future. Future research could support a comparison of two classrooms, one with windows and

biophilic features and one without windows or any biophilic features. Individuals being compared with their pre- and post-results could also be used to determine how each of the classrooms has affected their overall statements for each survey. In-person behavior analysis and interviews could also be taken and assessed. When thinking of ways to improve the classroom environments based on the findings in this study, it would be ideal to incorporate windows in the current classrooms that do not have windows, or some kind of access or diversion to nature and/or natural lighting, as well as provide more biophilic variety in the design features.

Reflective Critique

Completing this research project has probably been one of the most challenging things I have completed throughout my college career, but also one of the biggest learning experiences I have ever had. Some of the biggest lessons learned and takeaways would be to never procrastinate a research project. Things will creep up on you fast if you aren't one step ahead! As well as keeping up my motivation and drive to complete the paper. There have been multiple occasions where I had to remind myself of why this matters to me to keep me going. I have also grown numerous skills such as completing my own research and collecting my own data. I have learned how to find sources that support my hypotheses and that challenge my ideas. I have learned how to back up what I'm saying with facts, and I am able to discuss what current literature has already said about my topic. Most of all, I have learned there is always an alternative even if something does not go as planned or as I had hoped. This project has had a few roadblocks and even when I have wanted to give up, I reminded myself why I did this in the first place.

References

Ahadi, A. A., Khanmohammadi, M., Masoudinejad, M., & Alirezaie, B. (2016).

Improving student performance by proper utilization of daylight in educational environments. *Acta Technica Napocensis: Civil Engineering & Architecture*, 59(1), 1-21.

[https://constructii.utcluj.ro/ActaCivilEng/download/atn/ATN2016\(1\)_1.pdf](https://constructii.utcluj.ro/ActaCivilEng/download/atn/ATN2016(1)_1.pdf).

Dillon, R. (2018). Room for improvement: Becoming more intentional about classroom design can help teachers manage behavior, build community, and improve learning. *Educational Leadership*, 76(1), 40–45.

<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=ulh&AN=131744392>.

Gillis K., & Gatersleben, B. (2015). A review of psychological literature on the health and wellbeing benefits of biophilic design. *Buildings*, 5(3):948-963.

<https://doi.org/10.3390/buildings5030948>.

Jamrozik, A., Clements, N., Hasan, S. S., Zhao, J., Zhang, R., Campanella, C., Loftness, V., Porter, P., Ly, S., Wang, S., & Bauer, B. (2019). Access to daylight and view in an office improves cognitive performance and satisfaction and reduces eyestrain: A controlled crossover study. *Building and Environment*, 165, 1-13.

<https://doi.org/10.1016/j.buildenv.2019.106379>.

McGee, B., Park, N., Portillo, M., Bosch, S., & Swisher, M. (2019). DIY Biophilia:

Development of the Biophilic Interior Design Matrix as a design tool. *Journal of Interior Design*, 44(4), 201–221. <https://doi.org/10.1111/joid.12159>.

Peters, T., & D’Penna, K. (2020). Biophilic design for restorative university learning environments: A critical review of literature and design recommendations.

Sustainability (2071-1050), 12(17), <https://doi.org/10.3390/su12177064>.

Posner, J., Russell, J. A., & Peterson, B. S. (2005). *The Circumplex model of affect: An*

integrative approach to Affective Neuroscience, Cognitive Development, and

psychopathology. Development and psychopathology. Retrieved March 3, 2022,

from

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2367156/#idm139815709323936>
[title](#).

Rogers, K. (2019). *Biophilia hypothesis*. *Encyclopedia Britannica*.

<https://www.britannica.com/science/biophilia-hypothesis>.

Theodorson, J. (2018). North v. South: The impact of orientation in daylighting school classrooms. *SOLAR 2008: Catch the Clean Energy Wave*

https://www.academia.edu/8568609/North_V._South_The_Impact_of_Orientation_in_Daylighting_School_Classrooms.

Ulrich, R. (1984). View through a window may influence recovery from surgery.

Science, 224(4647), 420–421. <https://doi.org/10.116/science.6143402>.

Ulrich, R. (1991). Effects of interior design on wellness: Theory and recent scientific research. *Journal of HealthCare Interior Design*, 3, 97–109.

<https://pubmed.ncbi.nlm.nih.gov/10123973/>.

Van den Bogerd, N., Dijkstra, S. C., Tanja-Dijkstra, K., de Boer, M. R., Seidell, J. C.,

Koole, S. L., & Maas, J. (2020). Greening the classroom: Three field experiments

on the effects of indoor nature on students' attention, well-being, and perceived environmental quality. *Building and Environment*, 171, 1-10.

<https://doi.org/10.1016/j.buildenv.2020.106675>

Winterbottom, M., & Wilkins, A. (2009). Lighting and discomfort in the classroom.

Journal of Environmental Psychology, 29(1), 63–75.

<https://doi.org/10.1016/j.jenvp.2008.11.007>

Yale, K. (2019). Harvesting natural lighting for interiors: The benefits are

clear; see how it's implemented in buildings. *Buildings*, 113(1), 15.

<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=edsig&AN=edsbig.A572145468>.

Appendix A

“Biophilic Design in Higher Education: Pre-Class Survey”

Biophilic Design in Higher Education: Pre-Class Survey

Start of Block: IC

IC Informed Consent:

We are Danielle Burton, Undergraduate, and Beth McGee, Assistant Professor. We are faculty and an undergraduate student in the College of Behavioral and Social Sciences, School of Human Ecology at Georgia Southern University.

Purpose of the Study: This study investigates how biophilic design affects a student's satisfaction in higher education learning environments.

Procedures to be followed: Participation in this research will include completion of two online questionnaires before and after a class based upon personal experiences.

Discomforts and Risks: The discomforts and risks that may be included are those associated with normal computer use. If you have any questions, please see the Researcher Beth McGee at Phone: 912-478-0477.

Benefits: There are no direct benefits for participating. The benefits to society include a better understanding of how to design for Generation Z.

Duration/Time required from the participant: 5 to 10 minutes.

Statement of Confidentiality: All data collected will be anonymous and not include personal identifiers. The data will be stored in Qualtrics which uses password protection, and all print copies will be filed in a locked file cabinet in one of the primary investigator's office for three years.

Future use of data: You will not be identified by name in the data set or any reports using

information obtained from this study, and your confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

Right to Ask Questions: Participants have the right to ask questions and have those questions answered. If you have questions about this study, please contact the researcher named above whose contact information is also located at the end of the informed consent. For questions concerning your rights as a research participant, contact Georgia Southern University Institutional Review Board at 912-478-5465.

Compensation: No compensation will be provided.

Voluntary Participation: You don't have to participate in this research; you may end participation at any time by telling the person in charge or not returning the instrument. You do not have to answer any questions you do not want to answer. This is voluntary and voluntary participation means that you can choose whether or not to do the surveys.

Penalty: There is no penalty for deciding not to participate in the study; you may decide at any time you don't want to participate further and may withdraw without penalty or retribution.

FERPA: We will not be collecting any student protected information. All information will be treated confidentially. There is one exception to confidentiality that we need to make you aware of. In certain research studies, it is our ethical responsibility to report situations of child or elder abuse, child or elder neglect, or any life-threatening situation to appropriate authorities. However, we are not seeking this type of information in our study nor will you be asked questions about these issues. Each participant will be assigned a code and names will not be used. Any identifying information from open-ended questions will be further amended for confidentiality. You must be 18 years of age or older to consent to participate in this research study. You may be given a copy of this consent form to keep for your records, please see the researchers.

This project has been reviewed and approved by the GSU Institutional Review Board under tracking number H22152. Title of Project: Biophilic Design in Higher Education: Exploring Nature-Based Design Inclusion in Classrooms Principal Investigator: Danielle Burton, PO Box 8034, (404) 731-6206, db10721@georgiasouthern.edu, Beth McGee, PO Box 8034, (912) 478-0477, bethmcgee@georgiasouthern.edu. By completing the survey you are acknowledging that you have consented to participate according to the terms above.

End of Block: IC

Start of Block: Default Question Block

Q1 What is the classroom number of the classroom you are in right now?

Q2 Indicate your emotional state right now, before your class starts. (Choose as many that apply.)

- ☐ Feeling alert (1)
 - ☐ Feeling bored (2)
 - ☐ Feeling calm (3)
 - ☐ Feeling content (4)
 - ☐ Feeling depressed (9)
 - ☐ Feeling elated (5)
 - ☐ Feeling excited (6)
 - ☐ Feeling happy (7)
 - ☐ Feeling nervous (13)
 - ☐ Feeling sad (11)
 - ☐ Feeling serene (8)
 - ☐ Feeling stressed (10)
 - ☐ Feeling tense (12)
 - ☐ Feeling relaxed (14)
 - ☐ Feeling upset (15)
-

Q3 Indicate how satisfied you are with the interior design in this classroom.

	color (1)	furniture (2)	lighting (3)	materials (4)	safety features (5)	views from inside to outside of room (7)	windows (8)
Extremely Dissatisfied (1) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderately Dissatisfied (2) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slightly Dissatisfied (3) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neither Satisfied nor Dissatisfied (4) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slightly Satisfied (5) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderately Satisfied (6) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Extremely Satisfied (7) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4 Indicate overall how satisfied you are with this classroom.

- ☐ Extremely Dissatisfied (1) (1)
 - ☐ Moderately Dissatisfied (2) (2)
 - ☐ Slightly Dissatisfied (3) (3)
 - ☐ Neither Satisfied nor Dissatisfied (4) (4)
 - ☐ Slightly Satisfied (5) (5)
 - ☐ Moderately Satisfied (6) (6)
 - ☐ Extremely Satisfied (7) (7)
-

Q5 Respond to this statement: The overall interior design of this classroom contributes to my academic success.

- ☐ Strongly disagree (1) (1)
- ☐ Disagree (2) (2)
- ☐ Somewhat disagree (3) (3)
- ☐ Neither agree nor disagree (4) (4)
- ☐ Somewhat agree (5) (5)
- ☐ Agree (6) (6)
- ☐ Strongly agree (7) (7)

End of Block: Default Question Block

Appendix B

“Biophilic Design in Higher Education: Post-Class Survey”

Biophilic Design in Higher Education: Post-Class Survey

Start of Block: IC

IC Informed Consent:

We are Danielle Burton, Undergraduate, and Beth McGee, Assistant Professor. We are faculty and an undergraduate student in the College of Behavioral and Social Sciences, School of Human Ecology at Georgia Southern University.

Purpose of the Study: This study investigates how biophilic design affects a student's satisfaction in higher education learning environments.

Procedures to be followed: Participation in this research will include completion of two online questionnaires before and after a class based upon personal experiences.

Discomforts and Risks: The discomforts and risks that may be included are those associated with normal computer use. If you have any questions, please see the Researcher Beth McGee at Phone: 912-478-0477.

Benefits: There are no direct benefits for participating. The benefits to society include a better understanding of how to design for Generation Z.

Duration/Time required from the participant: 5 to 10 minutes.

Statement of Confidentiality: All data collected will be anonymous and not include personal identifiers. The data will be stored in Qualtrics which uses password protection, and all print copies will be filed in a locked file cabinet in one of the primary investigator's office for three years.

Future use of data: You will not be identified by name in the data set or any reports using

information obtained from this study, and your confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

Right to Ask Questions: Participants have the right to ask questions and have those questions answered. If you have questions about this study, please contact the researcher named above whose contact information is also located at the end of the informed consent. For questions concerning your rights as a research participant, contact Georgia Southern University Institutional Review Board at 912-478-5465.

Compensation: No compensation will be provided.

Voluntary Participation: You don't have to participate in this research; you may end participation at any time by telling the person in charge or not returning the instrument. You do not have to answer any questions you do not want to answer. This is voluntary and voluntary participation means that you can choose whether or not to do the surveys.

Penalty: There is no penalty for deciding not to participate in the study; you may decide at any time you don't want to participate further and may withdraw without penalty or retribution.

FERPA: We will not be collecting any student protected information. All information will be treated confidentially. There is one exception to confidentiality that we need to make you aware of. In certain research studies, it is our ethical responsibility to report situations of child or elder abuse, child or elder neglect, or any life-threatening situation to appropriate authorities. However, we are not seeking this type of information in our study nor will you be asked questions about these issues. Each participant will be assigned a code and names will not be used. Any identifying information from open-ended questions will be further amended for confidentiality. You must be 18 years of age or older to consent to participate in this research study. You may be given a copy of this consent form to keep for your records, please see the researchers.

This project has been reviewed and approved by the GSU Institutional Review Board under tracking number H22152. Title of Project: Biophilic Design in Higher Education: Exploring Nature-Based Design Inclusion in Classrooms Principal Investigator: Danielle Burton, PO Box 8034, (404) 731-6206, db10721@georgiasouthern.edu, Beth McGee, PO Box 8034, (912) 478-0477, bethmcgee@georgiasouthern.edu. By completing the survey you are acknowledging that you have consented to participate according to the terms above.

End of Block: IC

Start of Block: Default Question Block

Q1 What is the classroom number of the classroom you are in right now?

Q2 Indicate your emotional state right now, after your class. (Choose as many that apply.)

- ☐ Feeling alert (1)
 - ☐ Feeling bored (2)
 - ☐ Feeling calm (3)
 - ☐ Feeling content (4)
 - ☐ Feeling depressed (9)
 - ☐ Feeling elated (5)
 - ☐ Feeling excited (6)
 - ☐ Feeling happy (7)
 - ☐ Feeling nervous (13)
 - ☐ Feeling sad (11)
 - ☐ Feeling serene (8)
 - ☐ Feeling stressed (10)
 - ☐ Feeling tense (12)
 - ☐ Feeling relaxed (14)
 - ☐ Feeling upset (15)
-

Q3 Indicate how satisfied you are with the interior design in this classroom.

	color (1)	furniture (2)	lighting (3)	materials (4)	safety features (5)	views from inside to outside of room (7)	windows (8)
Extremely Dissatisfied (1) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderately Dissatisfied (2) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slightly Dissatisfied (3) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neither Satisfied nor Dissatisfied (4) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slightly Satisfied (5) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderately Satisfied (6) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Extremely Satisfied (7) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4 Indicate overall how satisfied you are with this classroom.

- ☐ Extremely Dissatisfied (1) (1)
 - ☐ Moderately Dissatisfied (2) (2)
 - ☐ Slightly Dissatisfied (3) (3)
 - ☐ Neither Satisfied nor Dissatisfied (4) (4)
 - ☐ Slightly Satisfied (5) (5)
 - ☐ Moderately Satisfied (6) (6)
 - ☐ Extremely Satisfied (7) (7)
-

Q5 Respond to this statement: The overall interior design of this classroom contributes to my academic success.

- ☐ Strongly disagree (1) (1)
 - ☐ Disagree (2) (2)
 - ☐ Somewhat disagree (3) (3)
 - ☐ Neither agree nor disagree (4) (4)
 - ☐ Somewhat agree (5) (5)
 - ☐ Agree (6) (6)
 - ☐ Strongly agree (7) (7)
-

Q6 Why do feel the design of the classroom does or does not contribute to your academic success? Consider the color, furniture, lighting, materials, safety, views, and windows.

End of Block: Default Question Block

Appendix C

“Biophilic Interior Design Matrix Assessment Results”

Thank you for taking the time to help develop the Biophilic Design Matrix.
Below are the **assessment scores** you gave **for the space** for its variety and strength of biophilic design.
Please close out this window after you review your scores.

29/162

17.9%

Q1.

Air

Natural ventilation.

(e.g., operable windows, inside/outside fresh air connections)

Feature

0/3

Q2.

Water

Any type of actual water feature in the interior.

(e.g., water fountain, sink, or fish tank)

Feature

0/3

Q3.

Plants

Actual plants in any form (alive or preserved) in the interior.

(e.g., potted plants or dried leaves in a shadow box)

Feature

0/3

Q4.

Animals

Actual animals in any form (alive or preserved) in the interior.

(e.g., fish in a fish tank)

Feature

0/3

Q5.**Natural materials****Materials extracted from nature.**
(e.g., wood, stone, or paper)**Feature****1/3****Q6.****Views & vistas****Exterior views of natural features such as vegetation.**
(e.g., window view of Central Park)**Feature****0/3****Q7. Habitats & vistas****The interior of buildings and their landscapes that possess a close and compatible relationship to local habitats.**
(e.g., views to locally appropriate landscape)**Feature****0/3****Q8.****Fire****Fire providing comfort and civilization when controlled, includes color, warmth & movement.**
(e.g., fireplace)**Feature****0/3****Q9.****Botanical motifs****Representations of shapes, forms & patterns of plants & vegetative matter.**
(e.g., painting of flowers)**Feature****0/3****Q10.****Animal-like****Representations of animals, may be highly stylized.**
(e.g., animal forms, claws or heads)**0/3**

Feature**Q11.****Shells & spirals****Representations of invertebrates.****(e.g., images or forms of shells and spirals, bees & their hives, butterflies, spiders & their webs)****Feature****0/3****Q12.****Curves & arches****Representing curves found in nature like treelike shapes, ovals, semi curvilinear forms.****(e.g., egg & dart moulding, arching columns & domes)****Feature****1/3****Q13.****Fluid forms****Shapes resisting straight lines and right angles that are flowing; they act as if they are adapting to forces found in nature.****(e.g., sinuous floor inlay)****Feature****1/3****Q14.****Abstraction of nature****A simulation rather than replication of natural form or function; forms are vaguely reminiscent of those naturally found but use nature as a model.****(e.g., Monet painting of flowers, fleur de lis ironwork, Gaudi's Sagrada Familia)****Feature****0/3****Q15.****Inside-Outside****Interior spaces that appear connected to the outside environment, embracing inside what's nearby outside near to the building.****(e.g., interior gardens, ocean motif used if located at the beach, same flooring used both inside & outside)****0/3**

Feature

Q16.

Sensory richness

1/3

Information richness can include complexity in visual, sound, touch, smell and/or taste for a sensuous & intellectually challenging environment.
(e.g., assortment of patterns, texture and color for sensory variety)

*Base this assessment upon the visual richness, typically in person observation would be needed

Feature

Q17.

Age, change & the patina of time

0/3

Showing age or change, such as in wear or growth, particularly by organic forms like wood but even inorganics like stone.
(e.g., use of plants that have obviously grown over time and "taken over", farmhouse table of weathered wood)

Feature

Q18.

Area of emphasis

1/3

An area of reference or interest in a space, central focal point.
(e.g., fireplace or grand staircase)

Feature

Q19.

Patterned wholes

2/3

Unique individual parts become organized in a pattern, variety united.
(e.g., tile floor mosaic inlay)

Feature

Q20.

Bounded spaces

3/3

A delineated space with clear boundaries or borders.

(e.g., walled room with a sense of enclosure)

Feature

Q21.

Linked series & chains

**Spaces connected that bring you from one space to another in a series.
(e.g., coordinated design tying together a series of rooms, clear glass walls separating adjoining spaces)**

Feature

1/3

Q22.

Integration of parts to wholes

**Individual similar components come together to create a greater whole.
(e.g., small wood planks can make up a wood floor, glass mullion pattern, subway tile backsplash)**

Feature

2/3

Q23.

Complementary contrasts

**The blend of contrasting features or opposites.
(e.g., light & dark areas, open & closed space, high & low ceilings)**

Feature

2/3

Q24.

Dynamic balance & tension

**Shapes, forms or materials that are both balanced and show a degree of tension.
(e.g., symmetrically balanced ceiling mobile, view of a balancing sculpture)**

Feature

1/3

Q25.

Natural ratios & scales

**Patterns such as natural arithmetic or geometric ratios or scales.
(e.g., golden ratio, golden sections, golden proportion, golden spiral, & Fibonacci's sequence: 0,1,1,2,3,5,8,13,21,34..., these can be highly complex patterns yet seem organized like a sunflower patterned fabric or artichoke light fixture)**

0/3

Feature

Q26.

Composition

Color, light & materials applied as a composition through unity &/or variety connecting with nature.

(e.g., variety of natural materials used throughout with a unified color scheme)

Feature

0/3

Q27.

Communication

Color, light & materials used to connect people with the site or locale; concepts symbolize identity to send a message.

(e.g., color selection coming from the site for communing with the surrounding nature)

Feature

0/3

Q28.

Preference

Color, light & materials reflecting the time, place, and circumstances in which we live.

(e.g., a designer/firm signature style, market trends such as the Pantone color of the year)

Feature

1/3

Q29.

Engagement

Natural inspired color, light & materials integrated for physiological, psychological &/or behavioral responses.

(e.g., light fixtures that mimic sunrise/sunset patterns)

Feature

0/3

Q30.

Pragmatics

Color, light & materials selection based upon maintenance, life cycle cost, existing conditions, external weather &/or environmental choices.

(e.g., sustainable flooring choice for high traffic area)

1/3

Feature	
<p>Q31. Natural light Daylight/ sunlight access. (e.g., window, clearstory, skylight)</p> <p>Feature</p>	1/3
<p>Q32. Filtered light Modulated daylight, reduces glare. (e.g., blinds, shades, tinted glazing)</p> <p>Feature</p>	0/3
<p>Q33. Reflected light Light reflecting off surfaces. (e.g., reflective surfaces that may provide sparkle)</p> <p>Feature</p>	0/3
<p>Q34. Light pools Pools of connected light in a series on the floor or wall drawing you from one area to another, often surrounded by darker areas. (e.g., high contrast lighting environment)</p> <p>Feature</p>	0/3
<p>Q35. Warm light Warm & inviting lighting, 2,000 to 3,000 K color temperature. (e.g., incandescent lighting, candle light)</p> <p>Feature</p>	0/3
<p>Q36. Light as shape & form</p>	0/3

Natural light manipulated to create stimulating, dynamic and/or sculptural form.
(e.g., light shaft)

Feature

Q37. **Spaciousness**
Openness or feeling of large expanse.
(e.g., a high ceiling)

2/3

Feature

Q38. **Spatial variety**
Variance in the interior space
(e.g., different ceiling heights or room widths)

1/3

Feature

Q39.
Space as shape & form
Space that is manipulated into a natural inspired form or shape.
(e.g., Sydney Opera House)

0/3

Feature

Q40. **Spatial harmony**
Coherence in the interior space.
(e.g., repetition of design elements for coherence)

2/3

Feature

Q41.
Geographic connection to place
Emphasizing geographic features such as climates, countries, people and/or natural resources within the interior environment.
(e.g., photograph of a well-known local natural landmark)

0/3

Feature

Q42.
Historic connection to place

0/3

Relation to the past through the marking of the passage of time, linking the past to the present, fostering a culture's collective memory.
(e.g., historical portrait)

Feature

Q43.

Ecological connection to place

Emphasizing ecological features within the interior environment of forest, grassland, desert, tundra, freshwater or marine.
(e.g., interior bamboo garden)

0/3

Feature

Q44.

Cultural connection to place

Integrating cultural identities.
(e.g., regional decorative craft)

0/3

Feature

Q45. Integration of culture and ecology

A social center that fosters community building.
(e.g., sustainable artwork)

0/3

Feature

Q46. Spirit of place

A metaphorical place given life, when a place becomes cherished by people it gives rise to and sustains human culture and ecology over time.
(e.g., Mount Vernon, gothic cathedral)

0/3

*May need in person assessment

Feature

Q47. Prospect/Refuge

A place with the ability to survey the distance in a place of security/ a view of the entire space AND a place of protection/ separated from spaciousness.

1/3

(e.g., view from an alcove to a larger space, interior view of spacious landscape)

Feature

Q48. Order/Complexity

Designs that meld order AND stimulate the desire for variety in a controlled manner, a balance of structured organization with intricacy of detail that together appears orderly.
(e.g., bookshelves)

2/3

Feature

Q49.

Curiosity/Enticement

Spaces that elicit exploration, discovery or mystery AND draws you farther in.
(e.g., space planning that draws you around the corner to view more)

0/3

Feature

Q50. Mastery/Control

Respectful mastery of nature which expresses ingenuity & cleverness AND user ability to manipulate the environment.
(e.g., occupant control of air, light or sound quality; furniture with ergonomic adjustments)

2/3

Feature

Q51. Attraction/Attachment

Appealing natural designs AND affection for features together can create a lasting loyalty.
(e.g., beautiful wishing fountain)

0/3

Feature

Q52. Exploration/Discovery

The desire for further inquiry AND revealing a sensory rich interior.
(e.g., nature themed play structure)

0/3

Feature

Q53. Fear/Awe

**Design integrating a feeling of peril AND feelings of wonder or delight.
(e.g., rock climbing wall, bridge with see-through flooring)**

0/3**Feature****Q54. Reverence/Spirituality**

**Affirming the human need for establishing meaningful relationships to
creation AND reverential feelings of connection vs. the aloneness of a single
person isolated in space and time.
(e.g., tall stain glass windows)**

0/3

***May need in person assessment**

Feature