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## From Space to Success: An Exploration of Interior Design Practices for Optimal Learning Outcomes in Higher Education

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**From Space to Success: An Exploration of Interior Design Practices for Optimal Learning  
Outcomes in Higher Education**

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**Abstract**

The purpose of this thesis is to explore the impact of interior design practices on optimal learning outcomes in higher education. The design of learning spaces is crucial, as it influences student well-being, engagement, and overall academic success, especially as young people are navigating a new environment away from home for the first time. Creating a sense of belonging in the university environment helps make this a positive experience. This thesis also speaks to the broader context of the built environment, emphasizing its impact on human behavior, interactions, and experiences. Designing student-centered spaces is paramount in higher education in order to cater to a diverse range of student needs and preferences. The research questions delve into specific aspects of interior design, first addressing the impact of environmental factors, then the role of collaborative spaces, and finally how interior design elements have the potential to impact student wellness. A literature review methodology helps synthesize existing research on each topic, revealing the implications of all three. Key findings were able to highlight the critical role of lighting, acoustics, spatial layouts, and biophilic design elements in effective learning environments. Collaborative spaces facilitate meaningful socialization, engagement, and collaborative learning by forcing students to take a more active role in their education. Color psychology and natural elements also have the power to contribute to physical wellness and mental health. The conclusions drawn emphasize the need for evidence-based design and student-centered approaches. Interdisciplinary connections are obvious and underscore the need for a holistic approach to designing successful learning environments.

**Keywords:** Interior design, higher education, place attachment, well-being, collaboration, student-centered, biophilia

### **From Space to Success: An Exploration of Interior Design Practices for Optimal Learning Outcomes in Higher Education**

The abrupt transition to a university environment which is often unfamiliar, marks a significant milestone in any student's life. This transition is not only marked by academic challenges but also challenges in establishing a meaningful connection with the physical dimension of place. Therefore, the concept of place attachment becomes paramount as students try to navigate university life. Place attachment can be defined as the sense of belonging an individual develops with their physical surroundings through emotional connection, features of an actual place, social interactions, and meanings assigned to a place (Wolf & Flora, 2014). This emotional bond plays a pivotal role in shaping mental well-being and successful learning outcomes. Central to the formation of these place attachment bonds is the social interaction and sense of community that students build within their educational institutions. This information unveils that the design of learning spaces in higher education can profoundly impact a student's comfort levels, social life, grades, and overall satisfaction with their university (Allen, 2019).

Understanding the broader context of what makes up the built environment is imperative when trying to understand the role of interior design in shaping higher education institutions. The built environment touches most parts of our lives, encompassing the man-made physical structures, roads and transportation systems, and overall landscapes that set the scene for how we live, work, and interact with one another (*Basic Information about the Built Environment*, 2017). As a built environment discipline, interior design speaks to the user experience in a space through functionality, building code, aesthetics, and materials (*What Is Interior Design?*, 2024). In the context of higher education, these interior spaces include environments like classrooms, studios, libraries, or communal areas. Interior design goes far beyond making spaces look good; it actually shapes the way we experience the world around us. Furthermore, in higher education,

interior designers become responsible for shaping the experience of students in their universities, their levels of engagement, and largely their overall learning outcomes.

With the weight of these outcomes in mind, designers understand that using best practices in interior design for higher education spaces is essential. The primary focus of this thesis is the exploration into what these best practices are, and how they are best implemented in the realm of higher education. A key part of this analysis is understanding the diverse learning styles and preferences that exist among students and how to create a flexible and inclusive environment that can accommodate all learners.

Several unknowns remain when discussing best practices for higher education design. The needs of students are such a complex topic, with varying preferences and the rapid evolution of technology contributing greatly to this confusion. The landscape of higher education is also constantly evolving, with new pedagogical approaches emerging and student demographics diversifying greatly over the past several years. This ever-changing landscape requires a nuanced approach to create the most effective learning environment. To begin to understand these unknowns, this thesis will discuss the interplay between a few of the primary points of confusion: environmental factors, collaborative settings, and wellness considerations. While recognition of the impact of these elements is increasing, the exact practices that allow them to coexist remain largely unknown to the general public.

For the purposes of this paper, environmental factors encompass a wide range of topics, including variables like lighting, acoustics, air quality, and spatial layout. It is important to explore how each of these topics affects student learning outcomes, mood, and productivity. Additionally, with the introduction of new pedagogical approaches, the integration of technology

raises more questions about best practices for seamless technological integration without compromising a student-centered design.

Collaborative settings and settings that encourage social interaction, such as group study areas, communal spaces, and groupings of lounge furniture within classrooms, can offer enhanced opportunities for exchange of thought and creativity among students. The design of spaces like this must create a delicate balance of formality and informality, privacy, and flexibility to support a diverse range of activities and learning styles.

Wellness is such an important consideration in design, especially in higher education. Wellness encompasses physical, mental, and emotional well-being among students in all spaces, whether it is a specifically wellness-oriented space or not. Biophilic design principles, ergonomic considerations, and mindfulness spaces are all aspects of design that have the potential to support student wellness and, in turn, learning outcomes. However, the specific design strategies that support student wellness best require more exploration.

Addressing these categories of unknowns requires an interdisciplinary approach and a deep exploration of practical design applications. The dynamic nature of higher education, with evolving pedagogies, priorities, and student populations, really adds another layer of complexity around the discussion of best practices for the design and functionality of learning spaces. It is a continuous challenge for designers to balance the demands of current educational practices with the need for future-proof, adaptable environments that make a university sustainable. By exploring this balance, we can be better equipped to produce evidence-based, student-centered designs that ultimately contribute to better learning and mental health outcomes. To delve into the intricate relationship between interior design practices and optimal learning outcomes in higher education, this thesis will address the following research questions:

**How do environmental factors in learning spaces impact student learning outcomes and well-being in higher education?**

Environmental factors in learning spaces have a critical impact on student learning outcomes and well-being in higher education settings. Several environmental factors will be explored in order to understand their contribution to best practices in higher education design. Firstly, the effect of natural and artificial lighting sources will be investigated in order to determine their effects on focus and productivity. Acoustic and noise control strategies will also be discussed, as they have a direct impact on concentration and information retention. The effects of indoor air quality and the inclusion of indoor plants will be examined for their effects on human health, emphasizing the importance of indoor environmental quality for optimal user experiences. Lastly, best practices for spatial layouts and technological integration will be examined as a push for more active learning environments emerges in higher education settings.

**How do collaborative spaces contribute to social interaction and engagement in higher education?**

To explore best practices for encouraging social interaction and engagement, the use of group study areas will be assessed, focusing on layout, flexibility, and formality. The benefit of communal spaces, such as lounges, cafes, and informal study spots will be discussed as well. Lastly the use of flexible learning zones within classrooms will be analyzed, with an emphasis on exploring adaptable furniture arrangements. This point of research will aim to uncover the best way to design classrooms that promote active learning, student preferences, and group dynamics.

**How can interior design elements contribute to student wellness and mental health support in higher education settings?**

The integration of biophilic design elements will be explored in this section, focusing on how these elements can be applied to higher education interiors. Biophilic design is a philosophy that encourages the use of natural elements in the built environment to positively impact human health and wellbeing (Gillis & Gatersleben, 2015). Place attachment will also be revisited, and a thorough examination of how place attachment can be facilitated through design will be conducted. Lastly, color psychology will be investigated to determine how color can positively impact students' mental health.

### **Summary of Literature Review**

To thoroughly explore these research topics and unknowns, a literature review was conducted. A literature review allows us to dive into a comprehensive analysis of the relationship between interior design practices and student learning outcomes in higher education. The backbone of this investigation is based upon the three previously stated research questions. Each of these three questions represent a critical aspect of the interior designer's role in shaping the learning experiences of students in higher education settings. The subsequent sections will present evidence of effective design practices, analyze their implications, and explore their challenges when necessary.

This literary analysis will begin by examining the various environmental aspects that affect the way we experience spaces. These factors include elements like lighting, acoustics, temperature regulation, indoor air quality, the inclusion of natural elements, spatial layouts, and technology integration. By analyzing empirical research, student opinions, and various theoretical frameworks, it can be determined which specific design practices contribute to successful learning outcomes and overall student satisfaction.



Next, the analysis will focus on exploring collaborative spaces and designing for student interaction and socialization. By examining design practices for group study areas, informal spaces, and adaptable furniture arrangements within classrooms, it can be determined what is best practice for encouraging meaning socialization for new pedagogical approaches.

Finally, the literary analysis will delve into how interior design elements can contribute to student wellness outcomes, stress and anxiety management, and mental health support within the higher education space. This examination will involve a look into biophilic design elements, color psychology, and the formation of place attachment. This will allow for a better understanding of the potential for interior design practices to directly impact the formation of successful learning environments that support student wellbeing.

Throughout the entire section, the focus will be critically evaluating each design practice, considering its alignment with learning outcomes or wellness, its connection to other disciplines, and any topics that may require further exploration. This comprehensive analysis of the available literature will deepen our understanding of the complex dynamics between interior design and successful learning outcomes in higher education, while also highlighting the gaps in the current research.

### **How do environmental factors in learning spaces impact student learning outcomes and well-being in higher education?**

#### ***Lighting***

Lighting can have a remarkable impact on student focus and productivity. Natural light sources, or daylighting, and outdoor views have been shown to enhance cognitive performance, reduce strain to our eyes, and have a positive influence on overall student wellbeing.

Additionally, daylighting efforts can reduce the amount of electricity a facility uses by allowing

users to keep electric lights turned off during the day. The reduction in electricity consumption is furthered by the reduction in the cooling load required by the facility. This is because the efficient utilization of daylighting allows for passive heating to occur (Samani, 2011). These facets not only benefit the university and students, but the environment as well. Daylighting can be a great way to improve the sustainability of an institution. Research suggests that in daylighted classrooms, math scores improve by up to 20% and verbal scores by up to 22% (Fielding, 2006). One study analyzed test scores from approximately 21,000 students in three school districts across California, Washington, and Colorado, and found that in one school district, “students with the most daylighting in their classrooms progressed 20% faster on math tests and 26% faster on reading tests when compared to students in the least daylit classrooms” (Plympton et al., 2000). The same study showed that in the other two school districts, “students in classrooms with the most daylighting were found to have 7%-18% higher scores than those in the least” (Plympton et al., 2000). Another study analyzed test scores for students in three properly daylit schools in North Carolina against those of other students in the same county attending poorly lit schools. They found that the students attending adequately daylit schools outperformed the students in non-daylit schools by 5%-14% (Plympton et al., 2000). One case study looked at Durant Road Middle School in Raleigh, North Carolina. In 2000, Durant Road Middle School principal, Tom Benton, stated that after the school board approved an investment in the incorporation of daylighting strategies, their daylit classrooms “increased the wellbeing of the students and teachers and is at least partly responsible for the record high attendance rates.” Durant not only improved their user wellbeing and attendance rates; they were also able to reduce their energy use for lighting, ventilation, and heating by 50%-60%. This resulted in an annual savings of \$21,000 on energy costs alone (Plympton et al., 2000).

Now that the benefits of proper lighting and utilization of natural light have been established, it is important to explore the design practices that can be implemented in order to reap the full benefits. Depending on their geographical location, institutions should prioritize orienting the building lengthwise on an east/ west axis to reduce heat gain and for optimal placement of north/ south facing daylight monitors. Especially in east/ west facing windows, facilities may want to utilize low-e glazing or window film to prevent excessive penetration of harmful UV rays. Facilities that are inhabited during the summer months should also consider a radiant barrier for the roof, which can reflect over 90% of radiant heat that would otherwise be absorbed. For all higher education institutions, high efficiency lighting equipment and controls should be used, including light-level, daylight, and motion sensors that can automatically adjust lighting levels as needed. An energy management system should also be put in place, which can control the amount of outside air circulation as needed to correspond with the occupancy level of the school at any given time, rather than being in constant operation (Plympton et al., 2000). All of these strategies combined will allow any higher education institution to maximize the available benefits of natural light, creating a healthier and more sustainable environment for users.

### *Acoustics*

Creating an effective acoustic design in higher education facilities is essential for creating learning environments that allow for concentration and information retention. Excessive levels of noise, reverberation, and poor sound insulation can ultimately hinder learning activities and contribute to distraction. Sound-absorbing materials are products that absorb appreciable amounts of sound energy, which is measured in several different ways. The efficiency of absorption for any particular material is given by its sound absorption coefficient ( $\alpha$ ). According

to William Cavanaugh in his book, *Architectural Acoustics: Principles and Practices*, the sound absorption coefficient is a ratio of the original sound to the reflected sound and can vary from 0 (no absorption, perfect reflectance) to 1 (complete absorption, no reflectance). Typically, these coefficients will be tested in a laboratory setting and assigned to a product or material in accordance with procedures from the American Society for Testing and Materials (ASTM) (Cavanaugh, 2009). To further understand sound and how we experience it, there are a few more basic concepts of sound to understand. Reflection, absorption, and diffusion all describe the way sound interacts with surfaces and objects. Reverberation is the persistence of sound after the origination source has stopped emitting it. Frequency and wavelength affect how sound behaves in a room and the pitch at which we hear it. Finally, decibels describe how loud a sound will be experienced. Another industry wide accepted method describing sound-absorptive characteristics of building materials is noise reduction coefficient (NRC) which is typically demonstrated between 0.00-1, with a higher NRC being more absorptive (Cavanaugh, 2009). The design criteria which interior designers are looking to tailor higher education acoustic design to which generally include speech intelligibility, which ensures speech is clear and understandable, and noise control, or minimizing unwanted noise from external sources. To achieve these goals, designers must consider the typical decibels that will happen in a certain area, as well as how to carefully balance reflection, absorption, and diffusion. Typically, representatives from acoustic design manufacturers or acoustic consultants will aid in the design process when dealing with typologies such as higher education.

There are many sound-absorbing products available today, with some of the most commonly seen being carpeting, acoustical ceiling tiles, and other porous materials. The thicker the porous material, and the deeper the air space, or gap, behind the layer of absorptive material,

the higher the sound absorption coefficients are (Cavanaugh, 2009). This is why it is typically a good idea to leave an extra large plenum, or gap, between the ceiling and floor above it in a higher education setting. When using an acoustically efficient ceiling material with a 4-5' plenum above, the combination of air space with an absorptive layer allows for minimal sound transmission from floor to floor. The same principle can be applied to walls. A layer of insulation inside the walls absorbs excess sound, and a sound barrier can be applied between the studs and drywall. The drywall is then hung about an inch away from the studs, allowing for a gap that halts additional sound transmission. This method of construction works for floor assemblies as well. Under the subfloor are joists and insulation, a layer of wallboard below, a resilient channel gap for sound absorption, and another layer of wallboard below that. For interior designers specifically, the most important part of acoustic design is specifying products with a high NRC rating. There are plenty of attractive acoustic solutions available from manufacturers across the U.S. including products like ceiling baffles, clouds, ceiling panels, wall panels, partitions, acoustic light fixtures, and other accessories. For higher education design, it is generally best to consider acoustics for the ceiling, flooring, and to choose one other area to include. This will ensure a well-rounded approach that maximizes speech intelligibility and noise control. From there, an acoustic professional or representative should be consulted.

### ***Indoor Air Quality***

Indoor Air Quality (IAQ) and the presence of indoor plants can have a monumental impact on human health, comfort, and most importantly for this context, cognitive performance. Poor IAQ is characterized by high levels of pollutants, inadequate mechanical or natural ventilation, and thermal discomfort, all of which can lead to respiratory distress, fatigue, and reduced cognitive function for students. Minimizing the effects of indoor air pollutants should be

a priority for all designers, especially since Americans tend to spend 90% of their time indoors. One study showed that IAQ and thermal comfort are directly linked to employee productivity and health issues in the work environment. After surveying 2,000 workers, researchers found that improving the IAQ could increase productivity by 4.8% and reduce sick days by 3 per year. The same researchers found that “greener” indoor environments could reduce allergies and asthma by 8%-25%, and reduce symptoms of sick building syndrome (SBS) by 9%-20%. It was found that the most important aspect of IAQ was thermal comfort, with its main effects being on occupant productivity and overall satisfaction (Mounir El Asmar & Srour, 2014).

Indoor air quality is not the primary responsibility of interior designers. However, there are plenty of strategies they can use to improve it. The primary sources of indoor oxidant emissions are building materials and electronics. Furthermore, human activities like cleaning, disinfecting, spraying aerosol air fresheners, cooking, etc., are major contributors as well. It is important for designers to recognize these implications and specify materials and products with low volatile organic compound (VOC) content. For major renovation or new construction projects, designers and project managers should also make occupants aware of appropriate cleaning solutions for user health and safety, as well as the integrity of specified materials. According to one researcher, “the development of inexpensive sensor networks and systems has emerged as a key strategy for the monitoring of IAQ” (Vinh Van Tran et al., 2020). The Internet of Things (IoT) has been introduced relatively recently as a technology that offers real-time IAQ monitoring. With IoT in place, ventilation systems can be automatically activated when IAQ drops. With a multi-disciplinary approach considered from the beginning stages of planning and construction, indoor air quality can improve student satisfaction, health, and productivity (Vinh Van Tran et al., 2020).

***Spatial Layout and Technological Integration***

Spatial layouts and technological integration play another pivotal role in higher education design. When done well, they can promote active learning environments and support diverse teaching and learning styles. Flexible classroom configurations, adaptable furniture, and collaborative workspaces all encourage dynamic engagement, interaction between instructor and student, and participation in one's own educational journey. Additionally, the seamless integration of technology, including interactive smart boards, media carts, and virtual learning platforms for distance learning, enhance accessibility to education for all, interactivity, and digital literacy skills for those entering the ever-evolving workplace. National attrition rates have remained alarmingly high for years, with only 55% of students successfully completing their degree within six years at public higher education institutions. The common practice of herding large groups of students into lecture halls with one to two hundred other students may be partially to blame for these rates. Large class sizes have been shown to be associated with lower student retention and overall satisfaction with the course. The spatial layouts simply do not encourage participation, or create any room for social interaction at all. It is obvious that evolving pedagogical styles call for an investment in active learning classrooms over lecture-style arrangements in the higher education space (Stover & Ziswiler, 2017). In the traditional lecture hall style classroom, the instructor is the only focus, with students left to listen and take notes, or choose not to. When the instruction space is limited, and students are forced to face one another and interact, active learning is allowed to take place. Instructors should of course, actively participate, but should take on a more supportive role, allowing students to do the necessary preparation for classwork and learning, rather than that burden being on the instructor. Research has found that students placed in a lecture-style classroom are 1.5 times

more likely to fail than those being taught in more active learning settings. The same study suggested that active learning techniques can improve test scores by 6%. This all stems from requiring students to take on more responsibility in regards to their education through collaboration and active participation, rather than passive listening (Stover & Ziswiler, 2017).

Best practices for spatial layouts and technology integration in higher education should prioritize flexible furniture pieces and arrangements, universal accessibility, and student-centered design principles that accommodate evolving pedagogical and technological advancements. That is not to say that lecture-style classrooms have no place in higher education, but smaller class sizes and a minimization of teaching or workspaces around the room can encourage students to get off their laptops and experience a dynamic conversation with their instructor. Furthermore, the design of individual spaces within an educational setting needs to be future-proofed, meaning the space can be reconfigured as needed. This may mean minimizing the use of permanent fixtures and using prefabricated, flexible partitions when available. Power access should be integrated throughout the room, within the floor, for example, to allow for maximum flexibility. This enables technology to be brought into a space, rather than being built into a space, and can accommodate flexible furniture with power integration or height-adjustable capabilities. Higher education spaces also need to have a certain level of boldness and display creativity that energizes and inspires students. This can be demonstrated not only through spatial layouts, but the use of color as well. Bold colors that connect to university branding inspires students and helps them establish a sense of place and belonging within their community (Radcliffe, 2009). All of these principles work together to allow for well-connected, active learning environments that help students thrive.



## **How do collaborative spaces contribute to social interaction and engagement in higher education?**

### ***Group Study Areas***

Physical environments for higher education demand modification to meet pedagogical ideologies where they are at. These modifications must highlight the new, more active role of students. Today's students are expected to leave university having gained creative, critical thinking, collaboration, and communication skills along with social competency, cultural sensitivity, and problem-solving skills all before entering the workplace. These are lofty goals, and broadcasting information towards students in a large lecture hall will fall short every time (Teemu Valtonen et al., 2020).

Group study areas have the power to facilitate teamwork, effective collaboration, and knowledge sharing among peers. It is imperative that the layout, flexibility, and formality of these spaces is conducive to these conditions. Flexible furniture pieces and arrangements, easily moveable furniture, furniture with power integration, all can enhance the effectiveness of a group study area by accommodating different group sizes and learning activities (Wu et al., 2021). Both formal and informal group study areas can be effective for different modes of work. Formal group study areas may prioritize technology, whiteboards or tackboards, group workstations with tables and chairs, and other strategies that help provide a more structured environment for collaborative work and projects. Informal study areas like lounges, cafes, and casual touchdown spaces can offer a more relaxed setting for spontaneous interactions, informal discussions, and socialization. Research has found that for any level of formality, students desire certain services to be available in study areas. They prefer to know that their buildings will be open at later or all hours, have easily accessible parking, have some sort of refreshments available, computers,

printers, mixed seating options, and charging stations (Teemu Valtonen et al., 2020). Best practices in group study areas, whether they are formal or informal, prioritize the flexibility and accessibility necessary to create a student-centered design that promotes active learning, multiple learning styles, and group dynamics.

### ***Flexible Learning Zones***

While the design of any learning space does not necessarily dictate the way it will be used, research shows us that, “the flexibility of a physical space can affect teachers’ ways of teaching; when in a more flexible space, teachers emphasize the use of more student-centered practices” (Teemu Valtonen et al., 2020). Active learning does not occur most effectively when just between instructor and student; it flourishes when students are given the opportunity to take on more responsibility through collaborating with their peers, and growing knowledge together. Today’s learning spaces must not only encourage dynamic participation from the instructor, but also small-group meetings, group project work, and dialogues between students (Teemu Valtonen et al., 2020). These environments are most effective when there are multiple zones for multiple modes of learning to occur at once. All spaces should have easy accessibility to technology for displaying and sharing documents. The comfort levels, lighting design, and acoustics should all be considered for what mode of work is being encouraged. These factors will all depend on the learning tasks being achieved, whether they facilitate self-study, comfortable and casual study, more collaborative work, or something else entirely (Eickholt et al., 2021).

To create flexible zones within classrooms that facilitate more student-centered teaching practices, designers can use vegetation, softer furniture pieces, and a lower density of seating to encourage smaller class sizes and groupings for collaboration. Research shows that students want these flexible learning zones within their university buildings to feel comfortable and cozy, have

good air quality, acoustics, and ergonomics, be spacious, warm, and aesthetically pleasing to the eye (Teemu Valtonen et al., 2020). Again, designers cannot perfectly predict the way instructors and students will utilize these flexible learning zones, but providing them goes a long way in encouraging the collaboration and active learning styles that lead to better student learning outcomes.

### **How can interior design elements contribute to student wellness and mental health support in higher education settings?**

#### ***Biophilia***

Biophilia is a design philosophy that encourages the use of natural elements in the built environment to positively impact human health and wellbeing, giving humans their much needed exposure to nature without having to be outside. It is based on the Biophilia hypothesis that promotes the idea that humans have an innate connection to nature and nature is therefore important for human health. Biophilic design typically emphasizes the use of natural elements like greenery, daylighting, outdoor views, natural materials, and colors. Research demonstrates that biophilic design elements can actually reduce stress, improve mood, and enhance cognitive function among students. However, it should be noted that the effects of specific design elements are not yet fully understood. While research shows us that biophilic design is generally restorative, designers cannot be sure what specific features contribute the most to the positive outcomes (Gillis & Gatersleben, 2015).

To utilize biophilia in higher education design, designers can incorporate indoor plants, living walls, natural materials like wood or stone, nature inspired colors, or textures. This can help achieve the goals of connecting interior spaces to nature, fostering a sense of calmness, and supporting students' overall wellbeing. Best practices for biophilic design in a university setting

simply involves prioritizing well-rounded use of natural elements to create an environment that promotes relaxation, and inspires students rather than giving them more stress.

### ***Place Attachment***

Place attachment refers to the cognitive-emotional bond and sense of belonging that individuals tend to develop with their physical environment. In higher education settings, design elements can help facilitate the formation of these bonds. Even biophilic design elements have been shown to facilitate these bonds, because they help create a restorative environment. Restorative environments do not necessarily have to be natural or include natural elements, but they do tend to rate higher when looking at place attachments (Gillis & Gatersleben, 2015).

To properly facilitate place attachment, designers should create well-designed learning environments with spaces that feel personalized because they prioritize student-centered design principles. Creating familiar spaces by repeating elements and using appropriate branding can contribute to stronger place attachments and positive perceptions of not only learning environments, but the university as a whole. Designers can incorporate flexible and adjustable furniture to offer personalization, comfortable study nooks, spaces for communal gathering, refreshment stations, lounges, and touchdown areas to achieve this (Gillis & Gatersleben, 2015). Overall, interior design has the power to foster a sense of ownership, identity, and visceral connection to the educational institution.

### ***Color Psychology***

Color psychology explores how colors can influence human emotions, mood, and behaviors. In a higher education setting, color choices can have a significant impact on a student's mental health and state of mind. Research suggests that warm colors like yellow and orange can promote energy, creativity, and optimism, while cool colors like blue or green can

evoke relaxation and focus. Using warm colors can also accentuate something, but overusing them can lead to a space appearing congested. They stimulate the nervous system, so their use and placement should be carefully considered in a higher education setting. It is often best to avoid them inside classrooms. Cool colors can also influence the nervous system, by reducing breathing speed and blood pressure, so they can be placed freely where designers want to create a calming effect. Research shows that red is the most stimulating color, and can attract immediate attention. It should be used sparingly throughout interior spaces to avoid a compacted look. While yellow is often associated with joy, it can also trigger fear because it can become overstimulating. This is another color that should be used strategically in higher education design. Green is associated with nature and can have healing powers; light green is the most calming color in the spectrum. Blue is calming for the central nervous system, it tends to increase concentration (Ćurčić, A. et al., 2019).

By strategically considering color palettes for spaces based on the activities taking place in them, designers can create environments that will positively impact students' mental health, focus, and overall well being. Best practices for higher education using color psychology ensure the psychological effects of colors are being considered and tailored to specific learning goals and desired atmospheres within an educational space. It should be noted that the research into color psychology is largely not related to interior design. Some researchers have made conclusions about how it may apply to interiors, but more studies are needed to truly understand the psychological effects of applying different colors to interiors. It is difficult to understand the implications of colors in interior design when color can be used in many ways.

### **Summary of Findings**

The exploration of interior design practices and their impacts on optimal learning outcomes for higher education students has revealed complex connections between the built environment and student well being. By delving into these intricate relationships, we can acknowledge diverse student-learning styles and emerging pedagogies that facilitate the need for flexible design to support successful outcomes. The paper has led to deeper understanding of how environmental factors, collaborative spaces, and wellness strategies in interior design contribute to shaping learning environments that foster engagement, support mental health, and overall success for students in higher education institutions.

The analysis of environmental factors highlighted the critical roles of effective daylighting, acoustics, indoor air quality, spatial layouts, and technology integration in creating efficacious learning spaces. Research indicates that optimal lighting conditions and the prioritization of daylighting sources can enhance focus and productivity, while controlled acoustics can promote concentration and information retention. Furthermore, studies have shown that improved IAQ and the inclusion of indoor plants has the ability to positively impact student health and well being. Spatial layouts that facilitate collaboration and promote active learning were shown to greatly contribute to student engagement and overall academic success. Additionally, the integration of biophilic design elements and color psychology emerged as factors that can have a profound impact on the human mind, body, and nervous system. These strategies were shown to improve student wellness, reduce stress, and aid in mental health and emotional support. All of these findings underscore the importance of evidence-based and student-centered design principles in optimizing student learning outcomes in higher education settings.

### **Connection to Other Disciplines**

The relevance of the findings in this paper extend far beyond aesthetic principles and interior design, intersecting with multiple disciplines such as psychology, education, and sustainability. In the field of psychology, the impact of environmental factors on cognitive function, emotional regulation, and overall well-being is closely studied. This aligns with the research on both environmental psychology and human behavior, both of which affect interior design approaches. It is this research that allows us to draw conclusions about the effectiveness of different interior design strategies, as the research about specific design practices is severely lacking in numerous areas. Educational theories and pedagogical approaches, such as active learning and collaborative learning strategies, are also closely intertwined with the design of educational spaces. These are additional tools that allow us to draw conclusions and support the findings regarding collaborative spaces' impact on student engagement.

Additionally, environmental science perspectives on sustainability, IAQ, and biophilia align with the research findings discussed regarding biophilic design elements and their positive impact on student wellness. This discipline is closely aligned with the construction side of design, as construction practices and material specification are, and should be, closely related to environmental sustainability. The interdisciplinary nature of these connections highlight the holistic approach that is required to create effective learning environments that prioritize student well-being, academic success, and sustainability. Furthermore, insights from human-centered design principles can inform solutions for creating an ultimately student-centered, or user-centered experience in higher education settings. These multifaceted connections really underscore the importance of collaboration between professions during the research and design process to address the complex challenges that exist in educational environments.

### **Closing**

This exploration of research ultimately shines light on the vital role of interior design in shaping the educational experience and outcomes of students in higher education. It speaks to the larger importance of interior design in shaping the way we all experience the world. The significance of creating environments that prioritize student well-being, meaningful social interaction, and engagement cannot be overstated. Moving forward, future studies should explore additional innovative design solutions and their implications. Not enough research exists on the effects of individual design elements, as weeding through endless variables makes for unreliable research and exaggerated conclusions. Until that research is done, designers should continue to prioritize student-centered approaches and create learning environments that aim to empower students, inspire them, and promote holistic self-development in higher education and beyond.



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