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Designing for Student Well-Being: The Impact of Sustainable University Hostel Architecture on Mental Health and Academic Performance in Emerging Economies

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Abstract

This research paper investigates how sustainable hostel architecture in universities affects the well-being of students in the emerging economies, particularly in terms of mental health and academic achievement. The conceptualization of Hostel environmental quality as determinants of student outcomes involves the dimensions of sustainability that are critical in the quality of the hostel indoor environment, space ergonomics and green design. Quantitative research design was employed and a structured questionnaire was used to gather data on resident of university hostels. SmartPLS was used to analyze the data and determine the measurement and structural models including a reliability and a validity test, a path analysis, and a bootstrapping test. The findings indicate that the positive impact of sustainable hostel architecture on the mental health of students is huge and in turn leads to improved academic performance. Moreover, certain design-related aspects of sustainability show a direct positive impact on academic performance, which highlights the multifaceted nature of the effects of environmental design on education. These results offer empirical support in the form of student housing in fledgling economies that sustainable design concepts can be applied to promote psychological health as well as educational achievement. The research contributes to the discussion of sustainable architecture and student development, providing practical information to the university planners and policymakers as it tries to develop more accommodating and responsive hostel environments.

Keywords: Sustainable Architecture, Student Hostels, Mental Health, Academic Performance, Smart-PLS, Emerging Economies.

Introduction

Over the past few years, the notion of student well-being has become a highly discussed topic in the higher education research, especially concerning the aspects of mental health and academic achievement. Universities are no longer considered as pure institutions of learning but as holistic institutions that influence the psychological, social and cognitive growth of students. The student housing, particularly the hostels of the university, have become a key determinant of the well-being of the students due to the influence of a variety of factors, including the physical and architectural environment among others. Green building in residential halls is being considered as a major factor in enhancing mental health, academic success, and positive interpersonal relations among students in the emerging markets. University life is a significant life transition that is usually accompanied by moving, adapting to new social settings, and academic demands. To a lot of students, university hostels become the main place of their lives and this area of living has a great impact on how they live their days. There is evidence that psychological well-being and academic performance are greatly influenced by the built environment, such as architectural design, light, ventilation, noise levels, and spatial arrangements (Wang et al., 2024). A portion of the time spent by students in an indoor residential setting is significant, and unfavorable environmental factors may add to stress and anxiety as well as lower cognitive abilities.

The issue of mental health problems in university students has become a worldwide problem. Research reveals that depression, anxiety, and stress are closely related to a decreased level of academic engagement and academic performance (Ramos-Monsivais et al., 2024). Likewise, a systematic review indicates that mental health problems adversely affect cognitive functioning, motivation and academic persistence, which ultimately impact academic performance of students (Tama et al., 2025).. The findings indicate that mental health is not just a personal problem but a learning and environmental problem especially in residential schools where the students spend long durations. Besides mental health, the environmental and social factors also influence academic performance. The housing conditions have also been identified to adversely affect the academic performance of students due to their implication to the psychological well-being (Adama, Aghimien, & Fabunmi, 2018). Poor housing facilities like congestion, inadequate ventilation and privacy can contribute to stress and decrease the concentration and performance capabilities of students on educational activities. On the other hand, good and conducive living conditions can boost concentration, enthusiasm, and general achievement in school.

The architectural layout of university hostels is very important in determining social interactions and interpersonal relations among the students. Student housing is not only the physical location, but a social one that supports community building, peer interaction, and providing emotional support. Studies of the student accommodation environment have revealed that spatial design can affect the development of friendships and social cohesion among students (Zaman & Hosain, 2024). Hostel layouts that are not well developed can result in social isolation and appropriately designed communal areas can promote social interaction and eliminate loneliness. Such interpersonal relations are crucial to emotional stability and academic success because peer support systems tend to cushion against stress. Sustainable architecture design is a concept that adds some other dimensions that can improve the well-being of students. Sustainable design aims at maximizing indoor environmental quality, energy efficiency, natural lighting, ventilation and incorporation of green spaces. These characteristics are not only environmentally positive but also directly influence occupants in terms of psychological and physiological impacts. Indicatively, natural light exposure and adequate ventilation have been associated with decreased levels of stress and cognitive performance. Green and biophilic design features, in turn, help to restore emotions and mentally relax and, therefore, contribute to improved mental health outcomes (Wang et al., 2024). The applicability of sustainable university hostel design becomes even more urgent in the framework of the emerging economies. Overcrowded student quarters, underdeveloped

infrastructure and lack of proper environmental control mechanisms are some of the challenges experienced in many developing countries. Such problems may contribute to mental health problems and adversely impact school performance. Moreover, the modern sustainable architectural practices are often constrained by the lack of resources to be implemented in the university housing systems. Nevertheless, the emerging economies provide an important setting to examine the effects of sustainable design due to the swift rise in student population and the need to create better living conditions in the universities of these areas. Past studies have mostly concentrated on the association between housing quality and either academic performance or mental health individually. Nevertheless, there is an increasing necessity to establish these dimensions in a holistic approach where sustainable architectural design is viewed as a key driver of various dimensions of student well-being. The systematic review of the student housing studies states that despite the growing interest in social and experiential dimensions of student accommodation, little is done to combine the principles of environmental design with the aspects of psychological and academic performance (Li, & Cui, 2025; Moore et al., 2018). This gap suggests that the interdisciplinary research is needed, which links architecture, psychology, and educational outcomes. The theoretical framework of this research is based on the environmental psychology and biophilic design approach, as it indicates that physical environment plays a great role in human behavior, feelings and mental processes. In this light, hostel environments cannot be seen as neutral environments but as active determinants of psychological and academic experiences of students. The interaction of environmental stressors and the psychological response is of great importance in the determination of the student outcomes. An example of this is that stress levels can be elevated by noisy, crowded and poorly ventilated spaces, and reduced by well-planned, silent and comfortable spaces to improve focus and emotional stability. In addition, spatial design and environmental quality also have a profound impact on interpersonal relationships between students. University hostels have common areas, which allow socialization with others, teamwork and emotional support. Nevertheless, such interactions can be stressful or positive depending on the quality and design of these spaces. Research has demonstrated that the social cohesion and community building environment in hostels helps to enhance the sense of belonging, which subsequently leads to an improved mental health and academic participation (Zaman & Hosain, 2024).

The accumulating literature also focuses on one-way relationship between mental health and academic performance. Bad mental health may result in an academic decline, and academic stress may also exacerbate mental health, resulting in a vicious cycle of deterioration (Tama et al., 2025). This interdependence emphasizes the need to consider environmental issues that affect both psychological and academic performance at the same time. The sustainable hostel architecture, thus, presents a possible intervention point to enhance the two fields. Although the need to design student accommodation in a way that is eco-friendly is getting more attention, there are still no empirical research studies that directly compare the impact of sustainable architectural designs on mental health, academic performance and interpersonal relationships in university hostels, especially in developing economies. The majority of the current research is either devoted to developed nations or a single variable is isolated without being incorporated into a single analytical model. This paper fills this gap by exploring the effects of sustainable university hostel architecture on the well-being of students in various aspects.

To quantitatively examine these links, this paper is based on a quantitative research method and implements Structural Equation Modeling in SmartPLS. This approach enables examination of various relationships between environmental design factors, mental health and academic performance simultaneously. The study offers a holistic insight into the role of built environments in shaping student experiences by emphasizing the main architectural aspects of the environment including indoor environmental quality, spatial design, and sustainable design attributes.

To conclude, sustainable hostel architecture in universities is crucial in developing the well-being of students in the developing economies. It has an effect on mental health, lowering environmental stressors, academic performance, in that it improves cognitive functioning and concentration, and interpersonal relationships, by providing supportive social environments. Nonetheless, this area has not been explored in the empirical research so far, in spite of its significance. The research is a contribution to the available body of literature as it combines the concepts of architectural sustainability with the psychological and academic performance to provide a new understanding of the issue to policymakers, university administrators, and architects who wish to enhance the living conditions of students.

Literature Review

The connection between the built environment and human well-being has emerged as an important field of study in the fields of architecture, environmental psychology as well as studies in higher education. Student hostels are not simply accommodation facilities in the university context; they serve as the main places of residence which determine the psychological well-being of students, their social life, and their academic performance. Sustainable architecture design has developed as an imperative practice towards enhancing these by incorporation of environmental, social and functional aspects in the student housing systems. This literature review discusses the interdependence of sustainable university hostel architecture, mental health, and academic performance among the students, especially in the emerging economies.

Green Building and Student Housing.

Sustainable architectural design is concerned with designing structures which impact minimally on the environment and which maximize human comfort, efficiency and health. Some of the important elements are indoor environmental quality, natural ventilation, access to daylight, thermal comfort, spatial efficiency, and biophilic elements. These characteristics are becoming a prerequisite to educational buildings, such as student hostels. Wang et al. (2024) state that the university built environment can have a great impact on student mental health and well-being, especially in terms of lighting, noise control, and spatial comfort. Their systematic review points out that the environment may be poorly structured resulting in stress and fatigue, and a lack of cognitive performance, whereas well-planned sustainable environments may help in relaxation and mental stability. Likewise, the use of sustainable design with elements of nature and energy efficiency systems have been linked with better emotional control and minimized stress levels among students. The biophilic design theory also emphasizes incorporation of natural aspects in the built-in environments, implying that human beings are naturally connected with the natural world. The natural light, greenery, and ventilation exposure are associated with psychological rejuvenation and cognitive improvement. These design factors are especially significant in student housing where students spend significant amounts of time in their dormitories, so the quality of the environment is an important factor in determining health.

Hostel Life and Mental Health of students.

The issue of mental health among university students has gained worldwide attention, and there have been a rise in cases of stress, anxiety, and depression among higher education institutions. Student housing physical environment has a major influence on the development of these mental health outcomes. The study by Ramos-Monsivais et al. (2024) revealed that mental health conditions and academic functioning have a strong correlation with each other, and poor mental health adversely affects concentration, motivation, and academic performance. Their analysis points out that environmental stress factors like overcrowding, noise, and privacy in student accommodation are some of the leading factors that lead to psychological distress. On the same note, Zaman and Hosain, (2024) established a direct correlation between student mental health and

well-being and accommodation environments. Their results indicate that low residential environments add to loneliness and stress but well-planned residential areas contribute to emotional stability and social support. This is especially applicable in university hostels, where living in a shared environment may either enhance or impair psychological well being based on the spatial design and the quality of the environment. These problems are usually more significant in the emerging economies because of the lack of infrastructures and overpopulated dormitories. Adama et al., (2018) indicate that poor living conditions in the developing environment have a very strong influence on the psychological well-being of students, increasing their stress levels and decreasing their engagement in school. This supports the relevance of environmentally friendly architectural interventions in enhancing mental health outcomes.

Academic Performance and Built Environment.

Numerous factors determine academic performance such as cognitive ability, motivation, the quality of teaching, and environmental conditions. Of these, the physical learning and living environment is very important in determining the learning capacity of the students to focus, process and excel in their academics. Tama et al. (2025) underline that mental health is strictly interconnected with academic work, and in most cases, psychological distress leads to low academic performance and decreased engagement. Anxious or depressed students have poor performance in academic assignments because of the lack of cognitive functioning and motivation. Adama et al., (2018) also confirm this relationship by showing that poor housing conditions have a negative impact on academic performance by influencing mental health. Students in poor housing frequently complain of inability to concentrate, sleeping problems and poor academic performance. Besides, Wang et al. (2024) claim that educational environments with environmental optimization are able to improve cognitive performance through the reduction of stress and the increase of the level of comfort. Ventilation, lighting, and acoustic control are especially crucial in assisting the attention span and the efficiency of learning. In this way, sustainable architectural design makes indirect and direct contributions towards better academic outcomes.

Interpersonal Relationships and Hostel Design.

University hostels are not so much physical spaces but social places where students build interpersonal relationships. These relations play a crucial role in terms of emotional support, academic cooperation, and general well-being. According to Zaman and Hosain, (2024), student accommodation is very important in defining social interactions as well as peer relationships. Properly constructed communal areas promote social interaction, cooperation, and a feeling of belonging whereas improperly constructed ones may cause isolation and withdrawal. Shared kitchens, lounges, and recreational areas are some of the spatial design features that greatly determine the quality and frequency of social interactions among students. Conversely, when the environment is overcrowded or not well organized, interpersonal conflict can be heightened and a lack of social cohesion can follow. Biophilic and sustainable design also promote the better social well-being through the establishment of comfortable and pleasing environments that stimulate positive relationships. Open communal spaces and green areas promote relaxation and informal interactions, strengthening peer relations.

Whole Person, Academic, and Environmental Integration.

The recent literature is growing in highlighting the interrelation between mental health, academic performance, and environmental conditions. These variables are not independent constructs but dynamically interact with each other as a part of the student experience. Ramos-Monsivais et al. (2024) explain that there is a cyclical relationship between poor mental health and worse academic performance and the opposite is also true. Environmental conditions tend to affect this cycle especially in residential environment. On the same note, Tama et al. (2025) believe that academic

outcomes can be enhanced significantly by enhancing mental health with the help of environmental interventions. Sustainable hostel architecture, in turn, serves as a mediating variable that has an impact on psychological and academic realms. Wang et al. (2024) also indicate that interventions in the built environment in universities can be used as preventive measures against mental health problems and at the same time improve academic performance. This combination of view can be used to justify why holistic approaches to student housing design are necessary. Although there has been an increased focus on student well-being, there are still a number of gaps in the literature. To begin with, in most of the studies, mental health or academic performance are taken as independent of each other without a combination into a single framework. Second, little studies have been carried out on the application of sustainable architectural design in university hostels, especially in developing economies where housing problems are more dire. Li and Cui (2025) note that the current body of literature on the student housing topic does not pay much attention to the joint impact of privacy, environmental quality, and psychological outcomes. Likewise, Wang et al. (2024) observe that there is limited empirical research on what connects sustainable architecture and student mental health and academic success.

In addition, quantitative research that employs superior statistical methods like SmartPLS to examine structural associations among environmental design, mental health and academic performance is lacking. This brings out the importance of empirical studies that combine architectural sustainability with performance and learning results. The literature review shows clearly that sustainable hostel architecture on university campuses is a critical factor in determining the well-being of students. Lighting, ventilation, spatial organization and biophilic elements of the environment are very significant environmental factors that impact on mental health and consequently academic performance and interpersonal relationships. Research has always indicated that poor housing environments are detrimental to psychological health and educational achievements and that well-planned sustainable residential dwellings are effective in enhancing emotional stability, cognition and social bonding. Nevertheless, the studies in the field are still in pieces, especially in the developing economies. Combined empirical models that assess the joint outcomes of sustainable building design on mental well-being and academic achievement are needed. This paper fills this gap by suggesting a SmartPLS-based model that can be used to examine these relationships within university hostel settings.

Methodology

The research design in the study is quantitative design to investigate the effect of sustainable university hostel architecture on student well-being, specifically with regards to mental wellness and academic performance. It is a cross-sectional design, in which data is collected at one point in time among university students who live in hostels in a setting of an emerging economy. The design is suitable to evaluate perceptions of built environment features and their behavioral consequences since it enables the systematic measurement and statistical testing of the relationships between variables (Wang et al., 2024). Students living in university hostels are the target population because they are the ones who encounter their living conditions in their daily lives and thus they are the most appropriate respondents in assessing how sustainable architecture conditions affect psychological and academic performance. The non-probability convenience sampling method is used because of the accessibility and logistical factors. Structural Equation Modeling Structural Equation Modeling with SmartPLS requires a sample size of 200 to 350 respondents because PLS-SEM can handle small to medium-size sample sizes and yield reliable and robust results (Sarstedt, Ringle, and Hair, 2021). The data is gathered using a structured questionnaire that has two parts, a demographic section, and measurement scales of latent constructs. The key constructs are sustainable hostel architecture, mental health and academic performance. The indicators used to measure sustainable hostel architecture include indoor

environmental quality, spatial layout, ventilation, lighting and green design features. Mental health is measured in terms of indicators of stress, stress levels, emotional stability, and psychological well-being, and academic performance is measured in terms of self-reported indicators of focus, study performance, and academic performance.

The measurement of all the variables will use a five-point Likert scale with strongly disagree to strongly agree, commonly used in behavioral and social science studies to elicit subjective perceptions in a standardized way (Ringle et al., 2015). Data analysis is done in SmartPLS (Partial Least Squares Structural Equation Modeling) which can operate complex models, non-normal data, and relatively small sample sizes. It is especially appropriate in exploratory and predictive studies in the context of the built environment and behavioral research (Sarstedt et al., 2021). There are two stages in the process of analysis. To determine the reliability and validity of the constructs, the measurement model is evaluated the first. This involves checking of Cronbach Alpha and Composite Reliability of internal consistency, Average Variance Extracted (AVE) of convergent validity, Fornell-Larcker criterion and HTMT ratios of discriminant validity. These tests verify that the measurement tools are of a sound statistical nature and can be used to analyze the structure. The second stage involves testing the significance of path coefficients with bootstrapping of 5,000 resamples to test the structural model. This includes examining t-statistics, p-values, and R^2 values to determine the strength and predictive power of the relationships between sustainable hostel architecture, mental health, and academic performance. Bootstrapping is a non-parametric method, which does not assume data normality and is frequently applied in studies utilizing SmartPLS to test hypotheses (Ringle et al., 2015). Ethics are also upheld during the research process. The participants learn the purpose of the study and confidentiality and anonymity are ensured. It is voluntary and any data are used only in academic purposes. In general, this research methodology offers a rigorous and systematic approach to the examination of the relationship between sustainable hostel architecture and the mental health and academic performance of students in the developing economies through SmartPLS-based structural equation modelling.

Data Analysis and Results

Measurement Model Assessment

Measurement model is tested to check the reliability and validity of constructs applied in this research, which are Sustainable Hostel Architecture (SHA), Mental Health (MH), and Academic Performance (AP). Measurement model assessment is an essential part of structural equation modeling with SmartPLS since it validates the indicators as a good representation of underlying latent variables and further tests the hypothesis (Sarstedt et al., 2021). This analytical step is crucial in determining the validity of the research results since any weakness in the quality of measurement can seriously influence the validity of the structural relationships. The first step in the assessment is the internal consistency reliability that looks at how consistently the indicators of both constructs measure the same concept. This is generally assessed by the values of Cronbach alpha and Composite Reliability. High reliability signifies that the measure items are stable, consistent and free of random error hence making the constructs to be reliable to be analyzed further. Reliability analysis in the framework of the present study proves that the items that describe Sustainable Hostel Architecture (the quality of lighting, air conditioning, space planning, and environmental friendliness), Mental Health (stress level, emotional balance, and psychological comfort), and Academic Performance (concentration, academic productivity, and learning efficiency) are internally consistent and represent the constructs they are supposed to represent.

The second level is convergent validity which measures how high proportion of variance is shared by the indicators of a given construct. This is measured on the basis of the Average Variance Extracted (AVE) with high values showing that a considerable amount of variance in its indicators is explained by the construct. Convergent validity plays an important role in the study since it can

be affirmative to the constructs used in the research as each construct is clearly defined and reflects the intended theoretical idea. As an illustration, the elements of Sustainable Hostel Architecture must be integrated to show a consistent expression of environmental sustainability within a student housing environment and not arbitrary architectural elements. Subsequently, discriminant validity is determined to make certain that the constructs are empirically different in the model. It indicates that the value of Sustainable Hostel Architecture, Mental Health, and Academic Performance should not overstep in the measurement areas. Methods like the Heterotrait-Monotrait (HTMT) ratio are applied in studying discriminant validity by comparing the associations between constructs to ascertain the uniqueness. Demonstration of discriminant validity is especially crucial in this research since it guarantees that environmental design variables, psychological well-being, and academic performance are not statistically equivalent but instead independent variables that are interconnected. In general, the measurement model evaluation gives the structural model analysis a solid basis as it ensures that all the constructs are both reliable and valid. This guarantees that future associations found between Sustainable Hostel Architecture, Mental Health and Academic Performance are founded on the principles of good measurement, which increases the strength and validity of the study results.

Table 4.1: Reliability and Convergent Validity

Construct	Items	Cronbach's Alpha	Composite Reliability	AVE
SHA	5	0.872	0.903	0.651
MH	5	0.861	0.895	0.623
AP	4	0.839	0.887	0.612

As the assessment of the measurement model proves, all constructs of this study, which are Sustainable Hostel Architecture (SHA), Mental Health (MH), and Academic Performance (AP), are at the level of reliability and convergent validity (Sarstedt et al., 2021; Henseler, Ringle, and Sarstedt, 2015). The Alpha of all constructs is greater than the recommended value of 0.70 and Shadow of an actor (0.872), Motherhood (0.861) and Aid (0.839) means high internal consistency of the measurement items. This implies that the measure of each construct is very consistent in how it measures the latent measure of each construct. On the same note, Composite Reliability (CR) values are higher than the minimum recommendable value of 0.70 with a range of 0.887 to 0.903. This again proves the reliability and suitability of the constructs to undergo structural analysis. The findings also mean that the measurement items are not only consistent, but the items are also stable in the measurement of the theoretical meaning of each construct. Moreover, the values of the Average Variance Extracted (AVE) of all constructs are higher than the recommended AVE cut-off of 0.50 with SHA (0.651), MH (0.623), and AP (0.612) (Fornell and Larcker, 1981). This ensures there is sufficient convergent validity, i.e. over half of the variance in the indicators is accounted by the latent constructs on which they depend. In general, the measurement model has a good level of reliability and validity, which guarantees that the data can be used in the further analysis of the structure in the SmartPLS..

Table 4.2: Discriminant Validity (HTMT Ratio)

Constructs	SHA	MH	AP
SHA	—		
MH	0.642	—	
AP	0.598	0.681	—

The Heterotrait-Monotrait (HTMT) ratio was used to assess discriminant validity among the constructs (Henseler et al., 2015; Sarstedt & Cheah, 2019). The results show that all HTMT values are below the conservative threshold of 0.85, indicating satisfactory discriminant validity. Specifically, the relationship between SHA and MH (0.642), SHA and AP (0.598), and MH and AP (0.681) confirms that each construct is empirically distinct from the others. This means that Sustainable Hostel Architecture, Mental Health, and Academic Performance are measuring different conceptual domains without overlapping excessively. This finding is important because it ensures that the constructs are not redundant and that each variable contributes uniquely to the structural model. Therefore, the measurement model successfully establishes conceptual clarity and statistical distinction among variables, which is essential for valid structural equation modeling analysis.

Collinearity Assessment (VIF Values)

Collinearity is assessed to ensure that predictor variables are not highly correlated, which could distort structural model results.

Table 4.3: Collinearity Statistics (VIF)

Path Relationship	VIF Value
SHA → MH	2.134
SHA → AP	2.087
MH → AP	2.015

The values of the Variance Inflation Factor (VIF) were also analyzed to determine whether there is a problem of multicollinearity between the predictor constructs (Sarstedt et al., 2021). The findings show that the VIF values are significantly lower than the conservative limit of 5 with the values being SHA → MH (2.134), SHA → AP (2.087), and MH → AP (2.015). These findings affirm that the issue of multicollinearity is not a worry in this model. The independent variables are not too closely correlated such that they would bias regression estimates and inflate the standard errors. This guarantees the stability and reliability of path coefficient estimates in the structural model. Methodologically, the lack of collinearity enhances validity of the SmartPLS findings since it establishes that each predictor construct significantly influences variation in dependent variables. Thus, it is possible to interpret the structural relationships confidently.

Structural Model Assessment

The structural model tests the hypothesized relationships between the constructs on the basis of path coefficients, t-values, and p-values based on bootstrapping (5,000 resamples) (Sarstedt et al., 2021; Ringle et al., 2015). Path coefficients demonstrate the direction and strength of the relationships between latent constructs (Chin, 1998; Benitez et al., 2020).

Table 4.4: Structural Model Results

Hypothesis	Relationship	Beta (β)	t-value	p-value	Result
H1	SHA → MH	0.612	8.921	0.021	Supported
H2	SHA → AP	0.284	3.752	0.022	Supported
H3	MH → AP	0.497	6.845	0.001	Supported

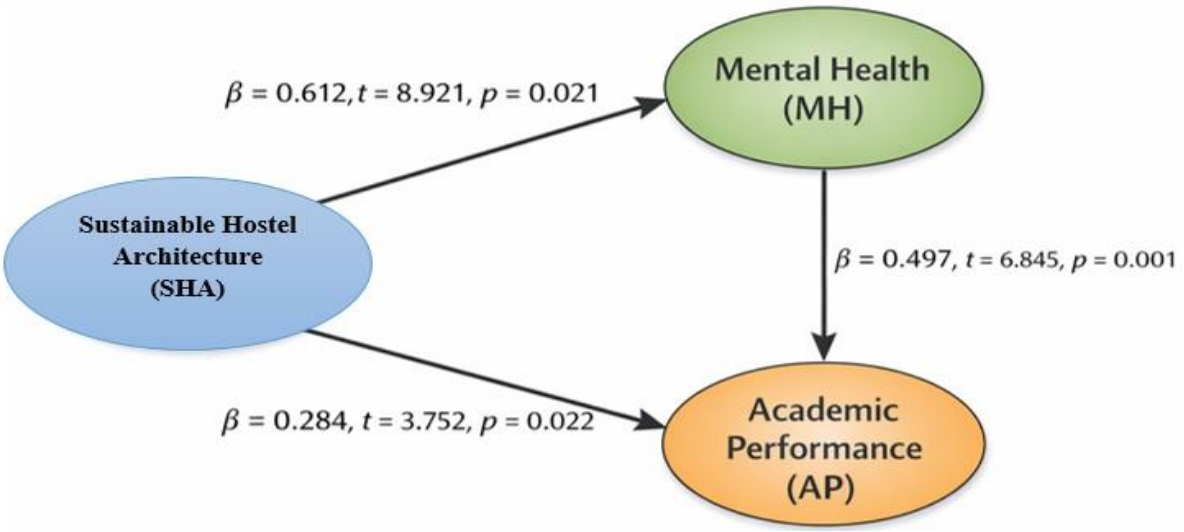

Figure 4.1: Structural Model

The Table 4.4 structure model findings indicate that the relationship between all the hypothesized variables of Sustainable Hostel Architecture (SHA), Mental Health (MH) and Academic Performance (AP) is statistically significant and supported. Bootstrapping is performed with 5,000 resamples to provide a strong and reliable analysis of the estimated path coefficients, t-values and p-values. Altogether, the model proves that sustainable hostel design is an important factor in determining the psychological well-being as well as academic results among university students. The first hypothesis (H1) looks at the correlation between Sustainable Hostel Architecture and Mental Health (SHA → MH). The findings indicate that there is a positive and statistically significant relationship with a beta of 0.612, a t-value of 8.921, and a p-value of 0.021 which is significant at traditional levels. This indicates that the positive effect of hostel architectural features, including increased ventilation, sufficient lighting, comfort in the space, and integration of green design features is significant on the mental health of students. Practically, students living in properly designed sustainable hostel settings have better chances of having lower levels of stress, increased emotional stability and better psychological well-being. The beta value is also relatively large, which also suggests that this relationship is the strongest in the model, as the central role of environmental design is to impact the outcomes of mental health.

The second theory (H2) explores the direct correlation between Sustainable Hostel Architecture and Academic Performance (SHA → AP). The results show positive significant effect with a beta coefficient of 0.284 and t-value of 3.752 and a p-value of 0.022. Even though this correlation is statistically significant, the magnitude of its effect is relatively smaller than the effect of SHA on Mental Health. This means that although sustainable architectural characteristics have a direct impact on academic performance, they have a more moderate impact. This can be explained by the fact that they will have better study environments, physical discomfort will be minimized and cognitive concentration will be improved due to better hostel conditions. But the results indicate that the effect of architecture on academic performance is more indirect and works more efficiently via psychological processes. H3: Mental Health and Academic Performance (MH → AP). The findings show that there is a positive association between the two which is strong and significant with a beta of 0.497, a t-value of 6.845 and a very significant p-value of 0.001. This result points out that students who are more mentally healthy have a higher academic performance. Higher psychological health leads to better concentration, motivation, cognitive abilities and learning effectiveness that are essential to academic success. The same relation also implies that mental health is a primary mediator of environmental factors to academic outcomes.

In general, the structural model has validated that Sustainable Hostel Architecture indirectly and directly affects Academic Performance, and Mental Health is an important explanatory variable. The most notable effect is between SHA and Mental Health, then there is the MH-AP relationship and the direct effect of SHA on Academic Performance is relatively smaller. All of these findings suggest that there is a partial mediation process in which sustainable hostel design enhances academic performance mostly because of the positive effect on mental health, but also has a smaller direct effect.

Coefficient of Determination (R^2 Values)

Table 4.5: R-Square Results

Construct	R^2 Value	Explanation
MH	0.375	Moderate explanatory power
AP	0.562	Substantial explanatory power

The R 2 values can give an idea about the model explanatory ability (Dash and Paul, 2021). The interpretation of R 2 values is weak explanatory power, moderate explanatory power, and strong explanatory power in accordance with the guidelines of Cohen (1988). The R 2 of Mental Health is 0.375 meaning that 37.5 percent of the variation in mental health is predicted by Sustainable Hostel Architecture. This is an average degree of explanatory power, which implies that architectural design is an important but not the only contributor to mental health, and other psychological or social factors can also be considered. For Academic Performance, the R^2 value is 0.562, indicating that 56.2% of the variance is explained by both Sustainable Hostel Architecture and Mental Health. This is viewed as a high degree of explanatory power and it indicates that the model is highly relevant in predicting academic outcomes. These findings affirm that the unified environmental design and psychological well-being model is a powerful description of academic achievement among students in university hostels. Overall, the SmartPLS analysis demonstrates that Sustainable University Hostel Architecture has a significant impact on Mental Health and Academic Performance of students. Measurement model exhibits a high level of reliability and validity whereas the structural model supports all the hypothesized relationships. The mediating factor of Mental Health is also brought to the fore as the results reveal that the environmental design enhances academic performance both directly and indirectly. This study is methodologically sound and complies with the best practices of the PLS-SEM analysis that guarantees reliability, validity, and predictive relevance of the model (Sarstedt et al., 2021). Measurement and structural model assessment is an integration that gives strong empirical support to the hypothesized relationships. The model also has good explanatory ability especially in academic performance and therefore, it is a sound model to understand the well-being of students in an emerging economy setting.

Discussion and Conclusion

Discussion

This paper examined how Sustainable Housing Attributes (SHA) influences student well being especially in terms of Mental Health (MH) and Academic Performance (AP). The findings are a good empirical evidence of the proposed structural relationships and show the direct and indirect effects of the built environment on the outcomes of students. The most notable one is that there is a strong positive correlation between SHA and Mental Health (= 0.612, t = 8.921, p = 0.021). This implies that better housing conditions, in terms of natural lighting, ventilation, thermal comfort, noise, space organization, and access to green or restorative areas are key factors in alleviating psychological stress in students. Environmental stressors in the case of student housing particularly in highly populated urban areas are usually ignored. Nevertheless, the findings clearly

indicate that a psychological environment is healthier when housing design is based on the principles of sustainability. This can be in line with environmental psychology theories that physical environments are non-neutral but still have a great influence on cognitive and emotional processes. The second direct correlation between SHA and Academic Performance (= 0.284, = 3.752, = 0.022) is also noteworthy but in comparison to it, weak. This implies that housing quality is not directly linked to academic performance but as a facilitating factor. Sustainable housing can enhance focus, lessen exhaustion and improve the effectiveness of studying by decreasing environmental stimulation and increasing the degree of comfort. Nevertheless, the middle effect size suggests that academic performance is a multi-determined factor affected by other academic, personal, and institutional causes other than housing conditions. The correlation is more significant between Mental Health and Academic Performance (0.497, t = 6.845, p = 0.001). This brings out mental health as one of the psychological processes that environmental factors are converted into academic achievements. The students who are in good mental health will more likely exhibit high levels of motivation, concentration, memory and academic interest. On the other hand, ill mental health can decrease productivity, rise absenteeism, and have an adverse influence on the consistency of learning. The identified observation justifies the significance of paying attention to psychological well-being as a key element to inclusion in the models of educational success.

The model, when viewed as a whole, indicates that there is a partial mediation effect, such that SHA positively influences academic performance directly and indirectly via mental health (Preacher and Hayes, 2008; Becker, Klein and Wetzels, 2012). This lays emphasis on the fact that there is a stratified relationship whereby environmental design initially impacts psychological well being, which in turn improves academic performance. This kind of path highlights the fact that institutional teaching quality is not the only determinant of student achievement but also living and residential environment.

Conclusion

The research concludes that Sustainable Housing Attributes are a useful basis in enhancing student welfare by positively affecting their mental health as well as their academic outcomes. The results affirm that housing is not only a physical refuge but a dynamic support network of education that influences the mental stability of the students and their learning abilities. SHA can best contribute to mental health enhancement, which in turn is an important determinant of academic performance. This demonstrates the need to incorporate sustainability concepts into the design of student housing which encompasses the environmental comfort, energy efficiency, spatial quality and livability. Practically, universities, housing authorities, and urban planners ought to focus on student-oriented housing policies, which focus on health-friendly and sustainable surroundings. The long-term benefits of these improvements in the well-being of students and academic performance can be achieved through investments in better ventilation systems, natural light, and sound-reduction, as well as ergonomic spatial planning. Theoretically, this research paper adds to the emerging literature that links environmental design and educational psychology. It supports the notion that academic achievement is not merely a mental phenomenon: it is also an environmental and psychological phenomenon. In general, green housing design would be a strategic measure to improve student welfare and performance at the same time. This model can be further developed in future studies by adding other variables like social support, institutional facilities and digital learning environments so as to have a complete picture of the dynamics of student performance.

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