

IEQ OF STUDIO ENVIRONMENT ON ACADEMIC PERFORMANCE OF ARCHITECTURAL STUDENTS AT CALEB UNIVERSITY, LAGOS, NIGERIA

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ABSTRACT

Architectural students' second bedroom is their studios as they spend a high percentage of their time daily in these spaces. Their main and major courses are studio work taking between 6 to 16 hours out of the 24 hours of their day especially when school is in session. The indoor environmental quality (IEQ) of these studios hence contributes to the product presented by students as a conducive environment might likely help the students in their thinking process as against a harsh one. To this end, this study examines the impact of IEQ in a studio environment on the academic performance of 175 architecture students at Caleb University, Lagos, Nigeria. The objectives of this study identified the demographical characteristics of the architectural students, assessed the IEQ with the highest impact in the studio environment, and also examined whether the identified IEQ with the highest impact has any significance on gender academic performance over the others. A quantitative method was adopted in the form of a structured questionnaire for data collection. This was administered through the Google form to the architectural students at all levels and analyzed with IBM SPSS (Statistical Package for Social Sciences). The result revealed a strong relationship between a good studio IEQ and architectural students' academic performance concerning the season. It is recommended that a good IEQ should be provided for better academic performance.

INTRODUCTION

Academic performance is the key measure of success for all students concerning the kind, of course, being studied. Victor & Babatunde (2014) expressed it as a measure of how well a student, lecturer, or institution has accomplished its educational objectives. According to them, different factors contribute to academic performance. They however stressed motivation as a key

alongside strong support to lecturers by the provision of facilities institutional to support efficient knowledge transmission and instruction as it enhances academic performance. There is evidence that some extracurricular activities have an impact on kids' academic performance. Urgelles & Frick (2022) identified numerous ways these extracurricular activities might improve a teen's academic performance. Lamberti et al. (2021) on their part identified classrooms to be climate-responsive and structured to enhance concentration and the learning process. A climate-responsive classroom must hence consider the indoor environment as a key determinant of academic performance. Poor environmental conditions have been proven to affect students learning and performance in addition to health concerns (Adewale et al., 2021). Temperature, ventilation rate, and the cleanliness of high-contact surfaces were identified by Haverinen-Shaughnessy et al, (2013) as significant IEQ elements in schools that may have an impact on student's health and academic performance (Vilcekova et al., 2017).

LITERATURE REVIEW

Students' Academic Performance

An individual's level of education as determined by a test or a sequence of courses is known as their academic qualification (Kapur, 2018). It alludes to one's understanding of a certain subject or field, both generally and in detail. Although the word "qualification" has many various meanings, it is most frequently used to describe a level of education that aids in obtaining employment or advancing in a particular career. Steinmayr et al., (2014) addressed that qualifications are typically acquired through secondary school, university, or vocational training programs. They can be general and unrelated to any specific job (for example, a university degree) or very specific (for example, certification in Microsoft Word). The acquisition of academic qualifications usually involves some form of testing and assessment, either as a result (e.g., A levels) or as part of a process leading to a result (e.g., degree programs).

According to studies, social factors like love relationships, membership in clubs and organizations, and sports participation may impact students' academic performance because these factors have a long-term effect on academic performance in terms of time demands and psychological imbalance (Abomaye-nimenibo et al., n.d.). They also opined that environmental factors may also have an impact on student academic performance, every institution expects to monitor students' academic performance which is greatly affected by several factors including indoor environmental quality (IEQ).

Studio environment and Indoor environmental quality

Indoor environmental quality is defined by ASHRAE TC 1.6 (Terminology) as a perceived inside experience of the building's indoor environment that comprises elements of energy-efficient, healthy, and comfortable buildings' design, analysis, and operation. Architecture, HVAC design, thermal comfort, and indoor air quality are among the specialized fields (Heinzerling et al., 2013). Given that internal conditions have a significant impact on occupants' well-being, productivity, health, and safety, Indoor Environmental Quality (IEQ) is recognized as a critical component in the design and construction of buildings (Leccese et al., 2021). Adegun & Adedeji (2017) opined that people usually spend about 90% of their time in enclosed spaces, especially in moderate to cold climates, making IEQ a crucial factor in well-being (Rivera, 2019). Elnaklah et al. (2020) opined that "The quality of a building's environment about the health and welfare of persons who occupy space within it" is how IEQ is defined. It primarily relates to four factors: thermal, visual, and auditory comfort, as well as indoor air quality (IAQ) (Standard, 2017). The perception of the environment includes not only thermal comfort but also indoor air quality, acoustic quality, and visual quality. It is important to evaluate how these factors affect the student's health and academic performance (Lamberti et al., 2021).

A good studio environment is key to the success of students that uses the space. an architecture studio should be able to accommodate the comfort and activities within existing facilities to meet the needs of learning (Kallio et al., 2020). Indoor Environmental Quality (IEQ) has a significant impact on how well students learn in the architectural studio. Weather conditions have a significant impact on how comfortable indoor environments are (Nasir et al., 2011). Ali, (2018) reiterated that higher academic performance among students and their professors could be achieved by improving IEQ in university facilities. Students spend a significant portion of their day in school, it is important to thoroughly examine the relationships between classroom characteristics and comfort (Leccese et al., 2021).

Thermal comfort

Designing a building with a comfortable thermal climate in mind is one of the most important considerations (Bachrun et al., 2019) as any building's functionality is significantly influenced by the thermal comfort within. The combination of various meteorological conditions, building physical qualities, and spatial elements creates the indoor thermal environment (Adunola & Ajibola, 2016). Katić et al. (2016) opined that the body's thermal homeostasis and comfort are influenced by regional environmental conditions and particular physiological characteristics. Inputs to the model include environmental factors like air temperature, mean radiant temperature, air velocity, and relative humidity as well as physiological information about humans, such as metabolic rate, height, weight, fat percentage, blood flow rate, gender, and skin surface area. Buildings' indoor environments take on their current condition as a result of heat and mass transfers between elements with various energy potentials (Kraus & Senitkova, 2020).

Visual Comfort

Walter Grondzik described visual comfort as "that state of mind that communicates happiness with the visual environment," which is attained when illumination quantity and quality as well as the environment's quality of vision are balanced well (Ali, 2018). Realyvásquez-Vargas et al. (2020) opined that lighting directly affects a student's performance, pointing to classroom lighting as a significant factor in how well they succeed academically. Lighting is very important to architecture students' studios as they are always drawing which involves different grades of lines and pencil assignments. The ease with which reading, writing, drawing, and laboratory work can be done on the horizontal (student desks), vertical (whiteboards), and occasionally intermediate planes is a necessity for visual comfort in learning spaces (inclined drawing tables). When the amount and uniformity of light, as well as glare perception and visibility to the outside world, are optimized, these objectives are met (Ali, 2018). Poor visibility, which is correlated with the kind of lighting, is the lighting situation that can induce visual discomfort in the most visible way (Boyce & Wilkins, 2018).

Indoor Air Quality

"Indoor Air Quality (IAQ) refers to the quality of air within, and around buildings and structures, especially as it relates to the health and comfort of building occupants" United States Environmental Protection Agency (Tran et al., n.d.). The indoor air quality of any building is determined by the outdoor environment and other factors like proximity to industries, highways, waste disposal yards, construction sites, and parking lots among others (Capolongo et al., n.d.). Numerous indoor pollution sources were identified by (Nik Lah et al., 2015) and can be divided into the following groups: - Outside sources (industry and traffic), Construction materials and furniture, such as plywood, paint, furniture, and floor/wall coverings; products and activities related to inhabitants (tobacco smoke, cleaning products, personal care products, printers, etc.); and components of the ventilation system (filters, ducts, humidifiers, etc.).

Acoustic Comfort

Orola & David (2019) outlined acoustic comfort to be characterized by the absence of distracting noise, the right loudness and quality of desirable sounds, and the availability of opportunities for acoustic activities. Also, Benjamin & Alibaba (2018) also identify acoustics in design involves fostering or amplifying beneficial sound while repressing undesirable noise that can be dangerous to the occupants. They went on to say that several factors can affect how noise affects a specific person. One's attitude and sensitivity, knowledge of the sound's contents, controllability, predictability and familiarity of the sound, and need for the sound are a few of these. The acoustic comfort of a room has an impact on its occupants' health, productivity, and comfort (Orola, 2020). Even though residents want their surroundings to be as quiet as possible so that they can work as efficiently as possible, this is impossible because nobody wants to live in a completely silent environment (Systems, n.d.). How enjoyable it is to hear a place depends on the amount and nature of sound that is present there.

METHODOLOGY AND PROCEDURES

This study was conducted among undergraduate Architectural students in the Department of Architecture at Caleb University, Imota . A quantitative random sampling technique was used in the collection of data from 175 students using a well-structured questionnaire. The results were analyzed and reported using descriptive statistics and inferential statistical tools. This study was carried out with three distinctive objectives firstly to identify the demographical characteristics of the architectural students in Caleb University, Lagos, assess the IEQ with the highest impact in the studio environment, and also examine whether the identified IEQ with the highest impact has any significance on gender academic performance over the others.

RESULTS AND DISCUSSION

The result showed that 33.7% (55) of the respondents were female architectural students while 66.3% (120) are male architectural students. Also, 30.9% fall within the age range 15-18 years, 54.7% are within 19-22years, 7.2 between 23-26years 3.9% account for the age range above 27 years. The results also revealed 37.7% of the respondents are at the 200-level accounting for 66 respondents, 34.9% 300 level (61 respondents) and 26.5% are at the 400 level 41 respondents as shown in Table 1.

Table 1: Demographic characteristics of the respondents

Sex	Frequency	Percentage	Valid Percent	Cumulative Percent
Female	55	33.7	33.7	33.7
Male	120	66.3	66.3	100.0
Total	175	100.0	100.0	

Secondly, the study identified IEQ with the highest impact and significance on gender academic performance over the others. The result showed that studio temperature has a significant relationship with students' academic performance. 23.6% (13) females have CGPA between 4.50-5.00 (First Class division), 58.1% (32) females had between 3.50-4.49 (Second class upper division), 14.5% (8) females in the second-class lower division with CGPA which account 3.64% of the females. Whereas, 5.0% (6) males had first class, 58.3% (70) males had second class upper, 27.5% (33) range of 2.40-2.39 none in the third-class division while 2 of the females did not indicate their CGPA males had second class lower and 2.5% (3) and 6.66% (8) males respectively had between 1.50-2.39 while the later did not indicate their CGPA.

Table 2: Showing Gender and Academic Performance

Gender	Current GCPA
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	Not indicated	1.50-2.39	2.40-3.49	3.50-4.49	4.50-5.00	Total
Female	2	0	8	32	13	55
Male	8	3	33	70	6	120
Total	10	3	41	102	19	175

Lastly, the research was set out to assess the Indoor Environmental Quality with the highest impact in the studio environment, and the result showed that is a significant relationship between studio comfort without AC and Studio temperature of .236 correlation also a value of .222 significance relationship between Studio Acoustic comfort and Studio Temperature. Whereas, a negative correlation (-.036) was recorded between Studio Acoustic Comfort and Studio Comfort without AC. Also, between Studio lighting and Studio Comfort without AC (-.044) as shown in Table 2. Summarily, Studio temperature has the highest impact on the IEQ of the studio environment.

Table 3: Correlations between studio temperature and comfort

	Frequency	Percent	Valid Percent	Cumulative Percent
Level	200	66	36.5	37.7
	300	61	33.7	34.9
	400	48	26.5	27.4
	Total	175	100.0	100.0

Age range	Frequency	Per cent	Valid Percent	Cumulative Percent
15 - 18 years	56	30.9	30.9	34.3
19 - 22 years	99	54.7	54.7	89.0
23 - 26 years	13	7.2	7.2	96.1
Above 27 years	7	3.9	3.9	100.0
Total	175	100.0	100.0	

CONCLUSION AND SUGGESTION

In summary, 23.6% of females had first class while 5.0% of the male had first class, 58.1% of the females had second class upper and 58.3% of males had the same performance. For the second-class lower division, 14.5% females and 27.5% males. This is shown in Table 2. This study ended with three conclusions, that the architectural students' demographic characteristics are key in understanding the IEQ of the architectural studio environment. The demography shows different age ranges, levels and gender. Secondly, it concludes that Studio temperature have the highest impact on the IEQ of the studio environment and lastly female gender perform better academically than their male counterpart. It is recommended that studio thermal comfort be given the utmost priority for architectural students' best academic performance.

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