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Determining Environmental Factors Affecting Academic Performance of 4th Year Industrial Engineering Students: An Experimental Student

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Abstract

Amongst academics and academic institutions comes the awareness of how environmental factors can affect students' academic performance, in and out of the comfort of their homes. As explained by Hoang, Samara, Solina, et al. (2022), an environment plays a critical role in how people can absorb information and various environmental factors can aid in that such as lighting, temperature, and sound can affect one's learning ability. This study provides a closer look into the use of those factors and how it can affect different aspects of a student's academic performance by looking at key aspects of their behavior, generally weighted grades, and the measurement of their environmental factors. With accumulated respondents of 77, 4th year Industrial Engineering Students, the study utilized the statistical tool of multiple linear regression (MLR) to measure the before and after results of the two deployed surveys, with the researchers providing a guide on the median conditions of each environmental factor before the deployment of the 2nd survey. Results showed statistical significance and correlation for both surveys between GWA to Sound & Sex, both Hours studied & Academic Assessment behavior between temperature. These findings are shown to cement the factors' ability to affect academic performance as well as be the key to modifying these conditions to bring out optimum performance in students. Additional research is recommended as well as a larger sample size and selection in order to create a universal/broader approach to modifying and studying the environmental factors.

Keywords
Academic Performance, Environment, Academics, Learning Ability, Universal

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1. Introduction

An environment is crucial in how effectively a person can learn and absorb new information. Various factors such as lighting, temperature, and sound can affect one's learning ability (Hoang, Samara, Solina, et al. 2022). Learning is especially important for students to be equipped with the necessary skills and knowledge to thrive in their future endeavors and reach their fullest potential as lifelong learners (McClaskey 2016). However, research conducted by Vakalies et al. (2021), Magulod, Jr. (2017), and Obispo Magulod Jr. and Tindowen (2021) indicate a correlation between academic performance, student well-being, and the overall school environment. If students experience poor ventilation, extreme temperatures, or excessive noise (even in a supposedly quiet environment), their academic performance and attendance in classrooms may suffer. Apart from the previously mentioned adverse effects on academic performance, students participating in online or virtual classes may also find themselves in uncomfortable and potentially unsafe situations especially since all students were mandated to transition to online courses and adopt a new learning modality in their environments as the World Health Organization (WHO) officially declared a pandemic during 2020. And as the post-pandemic era has approached, numerous universities and colleges have embraced the hybrid or blended modes of education, which incorporate a combination of face-to-face classes on campus and flexible online learning (Singh et al. 2021).

As new learning methods were necessitated by the pandemic, numerous studies have already examined the impact of online learning on students' academic performance, as evidenced by research conducted by Han and Ellis (2021), Mandasari (2020), and Oducado and Estoque (2021). However, only a few studies have taken into account the environmental factors of lighting, temperature, and sound, as significant factors in students' cognitive development during virtual learning. Thus, there is a crucial need for studies that explore the effects of these aforementioned variables on students' academic performance, particularly since many universities and colleges still continue to utilize online modalities as part of learners' experiences even after the pandemic. Vision is considered the most prevalent sense in humans for gathering information. Therefore, in order to function effectively and efficiently, humans must have the ability to clearly see and visually perceive objects. The significance of visual perception in human activities makes lighting a crucial aspect of everyday life. According to the Illumination Engineering Society of North America (IESNA)(n.d.), light refers to electromagnetic radiation in the form of radiant energy that produces a visual sensation by stimulating the retina. Light is a small component of the electromagnetic spectrum, situated between ultraviolet and infrared radiation. The visible range of the electromagnetic spectrum spans from 380 to approximately 780 nanometers (Edvard 2011).

There are two types of lighting: Natural light and Artificial light. However, this study will focus on artificial light. Artificial light is emitted by man-made devices that consist of visible light and some ultraviolet (UV) and infrared (IR) radiation, and there are concerns that the radiation levels of light-emitting devices can produce adverse effects on the eyes. There are 3 common colors used in artificial lighting, namely, Warm White, Bright/Cool White, and Daylight which is represented by the Kelvin unit of absolute temperature, denoted by the letter K, wherein the higher the Kelvin number, the whiter the color temperature. Although the whiter lights will look "brighter" to the Additionally, sound levels can also have an impact on the academic performance of students. Excessive noise in learning environments or study places can cause distractions and raise cognitive stress. When exposed to excessive amounts of noise, the human brain has difficulty filtering out extraneous information, resulting in decreased concentration and focus on academic tasks. Background noise can impair speech intelligibility, making it harder for students to follow directions, lectures,

or discussions. Noise can impair learning efficiency, retention of knowledge, and engagement in educational activities. Prolonged exposure to excessive levels of noise can cause tension and mental exhaustion. Stress can impede brain function, retention of memories, as well as information processing, resulting in poor academic achievement. Furthermore, noise-induced weariness can lead to decreased motivation and increased irritation, impairing students' capacity to engage in educational endeavors even further. A study published by Arzi Adbi, Pulak Ghosh et al (2018) examines the relationship between noise and learning. The research, which looked at the regional and temporal variations between noise pollution and the academic performance of students, demonstrates the importance of noise pollution by showing a relationship between it and declining academic performance.

The study produced findings that support the cognitive load theory. Given its detrimental effect on attention, noise pollution can harm academic achievement when the cognitive load is high. Schools are one type of establishment where various human activities take place, including classes, laboratories, libraries, offices, cafeterias, and even gymnasiums. Educational establishments fulfill a unique role in society; as places of learning, belonging, and community cohesion where proper lighting (mostly using artificial lights) plays a huge role. The Canadian Centre for Occupational Health and Safety (CCOHS) suggests that inadequate or inappropriate lighting (according to standards) in workplaces (in this case schools) or other human activity areas may cause eye strain, reduced productivity, and potential accidents. Over the past century, human societies have increased exposure to artificial lighting, resulting in changes in the light/dark cycle, light wavelength, and intensity. Conversely, excessive lighting can lead to other safety and health concerns such as glares and headaches.

Thus, it is important to study the effect of artificial lighting on students' academic performance, especially with the 28 million enrolled students in public and private schools nationwide based on the data from DepEd (Hernando-Malipot, 2022), and that most students in the Philippines spend about 7-8 hours inside the classroom per day (in an artificially lit environment)(five days a week), so this is pretty intense (Nes, 2022). The researchers used data from a similar study due to the lack of information and data regarding improper lighting within the schools in the Philippines. A study entitled, "Lighting affects students' Concentration Positively: Findings from Three Dutch studies (2012) conducted three experiments, wherein they examined the effect of lighting conditions (with vertical illuminances ranging from 350 to 1000 lux and correlated color temperatures ranging from 3000 to 12 000 K) on the concentration of elementary school children and showed significant results which indicated a positive impact of the lighting system on student concentration.

The results highlight the importance of lighting for learning. Contrary, research by Wilkins and Winterbottom (2008), showed that among the 90 classrooms examined in the UK, results showed that 80% of classrooms use lighting with 100 Hz/lux, which can lead to headaches and affect vision (short time and long-term). Furthermore, in 88% of the classrooms, the average amount of lighting, which includes both natural and artificial lighting sources, exceeded the recommended illumination level. In 84% of classrooms, the lighting levels surpassed the threshold at which visual comfort decreases. In fact, regarding the Occupational Safety and Health (OSH) standards in the Philippines, the Department of Labor and Employment (DOLE) stated in rule 1075.04 that a minimum of 300 lux (30-foot candles) shall be provided where close discrimination of details is essential such as for medium bench and machine work, medium inspection, fine testing, flour grading, leather finishing and weaving cotton goods or light colored cloth/goods or for office desk work with intermittent reading and writing for filing and mail sorting.

Additionally, a minimum of 500 to 1,000 lux (50 to 100-foot candles) shall be provided where discrimination of fine details is involved under conditions of a fair degree of contrasts for long assembling, fine bench and machine work, fine inspection, fine polishing and beveling of glass, fine woodworking and weaving dark colored cloth/goods, or for accounting, bookkeeping, drafting, stenographic work, typing or other prolonged close office desk work. These are some of the rules for the intensity of illumination within a given workspace which would be followed for OSH as amended in 1989 by DOLE that some schools are not following the standards. Thus, the researchers will be studying the academic effects (in terms of performance) of the illumination level, sound levels, and temperature to the students within the National Capital Region. Moreover, understanding the relationship between light and the environment can provide greater insight into facilities planning for schools and universities who are hoping to boost productivity and efficiency of their students through design. Additionally, the objective of this study is to see the extensive effects of exposure from colored temperature artificial lighting which causes both fatigue and nearsightedness (Zhao 2018). As for the methodology of the study, the researchers will distribute a survey questionnaire to the said participants

regarding their illumination level, temperature, and sound levels in doing academic acts. The results of this research will be correlated and interpreted using statistical tools in order to prove that there is such a difference within academic performance.

1.1 Objectives

The environment plays an important role in determining an individual's ability to grasp and learn new information effectively. Thus, this study focuses on investigating the interplay between environmental factors and the academic performance of 4th-year Industrial Engineering college students. The goal of the study also extends to providing practical recommendations for optimizing these environmental conditions to enhance overall academic achievement. Several things must be done in this study to achieve this goal, these are:

1. Identify whether lighting, temperature, and sound have a significant effect on academic performance
2. Evaluate the correlation of the effects by utilizing statistical models and tools to delve deeper into the quantitative relationships between environmental factors and academic outcomes
3. Provide recommendations to the students regarding the optimum environmental conditions that would aid in their academic endeavors.

2. Literature Review

Recent studies have brought forth compelling insights into the intricate interplay between environmental factors and academic performance, as well as workplace efficiency. Oribo and Wanami's (2020) study underscored the pivotal role of quality lighting in secondary school classrooms, revealing a positive correlation with academic success. The study highlighted the urgent need for standardized lighting in Kenyan secondary schools, where suboptimal artificial lighting detrimentally affected academic outcomes. Building on this, Rouck's (1997) investigation in middle schools affirmed the positive impact of full-spectrum lighting on attendance and academic performance. While acknowledging that lighting alone cannot comprehensively address all academic success variables, the study accentuated its pronounced role in augmenting students' comfort—an aspect consistently echoed in subsequent studies conducted by Rouck.

Contrastingly, Katabaro and Yan (2019) delved into Tanzanian office environments, revealing pervasive worker dissatisfaction with lighting conditions, ultimately affecting concentration and overall health. Recommendations encompassed the improvement of lighting efficiency and adherence to lighting codes, underscoring the vital connection between a conducive work environment and heightened productivity. Additionally, Zhu's (2019) exploration of color temperature's effects on cognitive performance and mood elucidated that bright light reduced sleepiness, while warm lighting yielded slower responses. The manipulation of color temperature also demonstrated its impact on hormone secretion, necessitating further research into its long-term effects.

Brink et al. (2020) and Wargocki et al. (2019) unearthed valuable insights in the realm of temperature's influence on academic settings. Optimal temperature ranges were identified for cognitive performance, with deviations directly affecting students' test scores. Notably, the research suggested that lowering classroom temperatures from 30°C to 20°C resulted in a remarkable 20% increase in psychological test and school task performance, solidifying the intrinsic link between temperature and optimal student outcomes. Additionally, a significant study by Chung and Kajackaite (2019) examined gender differences in the impact of temperature on academic performance. The research discovered that the effects of temperature varied significantly across men and women, particularly in math and verbal tasks. Higher temperatures were associated with improved performance in women, while the reverse effect was observed in men. The findings suggested potential productivity gains in gender-mixed workplaces by setting the thermostat higher than current standards.

In the context of workplace efficiency, Butorina et al. (2019) strategically employed noise data in building information models to implement soundproof barriers, markedly enhancing overall workplace efficiency. Furthermore, Muir's (2022) study on designated spaces for reflection among nurses shed light on the positive influence of sound in a healthcare setting. The outcomes indicated increased overall performance and satisfaction among healthcare professionals, emphasizing the nuanced ways in which sound can positively impact work environments.

A systematic literature review delving into indoor environmental quality (IEQ) further affirmed its pivotal role in shaping academic settings. Zhang & Bluyssen's (2019) survey-based research shed light on teachers' initiatives in improving IEQ, raising pertinent questions about their direct impact on students' comfort and performance.

Collectively, these comprehensive studies show the profound significance of indoor environmental factors in shaping academic and workplace performance. Adequate lighting, meticulous control of color temperature, effective noise management, and maintenance of optimal thermal conditions emerged as crucial contributors to positive outcomes. Conversely, inadequate conditions were linked to health issues and decreased productivity. These findings highlight the pressing need for meticulous environmental design and management strategies to optimize conditions for improved well-being and performance. Notably, the literature underscores the holistic impact of the indoor environment, emphasizing the need for future research to adopt comprehensive approaches that consider multiple factors to create environments fostering both physical and psychological well-being for optimal academic and professional outcomes.

3. Methods

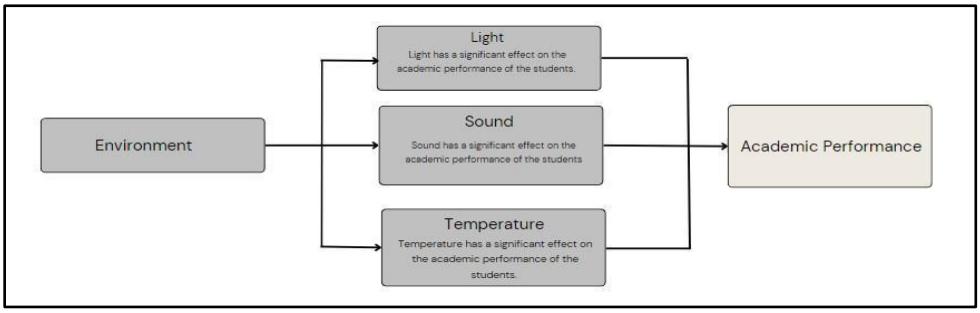


Figure 1. Conceptual Framework of the Study

The research methodology employed in this study is intricately interwoven with the Input-Process-Output (IPO) conceptual framework, as shown in Figure 1. This conceptual framework serves as the study's guiding structure, emphasizing important environmental factors—namely lighting, temperature, and sound—as integral inputs. These inputs, representative of the different environmental conditions, are systematically introduced into the study environment, embodying the processing phase of the IPO framework. This methodology involves the collection and analysis of numerical data to discern patterns, relationships, and correlations among the selected variables.

To meticulously investigate and quantify the effects of these environmental inputs on academic performance, a comprehensive data collection approach is adopted. The online survey questionnaire, a prominent instrument within the theoretical framework, has been strategically incorporated to collect quantitative insights and data from the respondents. Derived from a pertinent prior study, this survey aligns with the IPO framework's processing phase and functions as a key mechanism for systematically gathering participants' perceptions of the prevailing environmental conditions in their various study environments. The survey design allows for a standardized and structured collection of responses, facilitating a nuanced understanding of how lighting, temperature, and sound collectively shape the participants' academic experiences.

The processing phase introduces the application of multiple linear regression (MLR) analysis to strengthen the reliability and interpretability of the study's outcomes. Multiple Linear Regression is a statistical modeling technique that allows the examination of relationships among multiple independent variables and a dependent variable. In this case, lighting, temperature, and sound serve as the independent variables, while academic performance is the dependent variable. The MLR analysis facilitated through the Statistical Package for the Social Sciences (SPSS), will enable the researchers to quantify and assess the extent to which each environmental factor contributes to variations in academic performance.

Overall, this quantitative approach provides a structured and rigorous framework for investigating the hypothesized relationships, offering statistical insights that can inform evidence-based decision-making. The findings from this research are anticipated to contribute valuable insights into the nuanced dynamics between environmental conditions

and academic outcomes, thereby enhancing the study's understanding of the factors influencing student performance in educational settings.

4. Data Collection

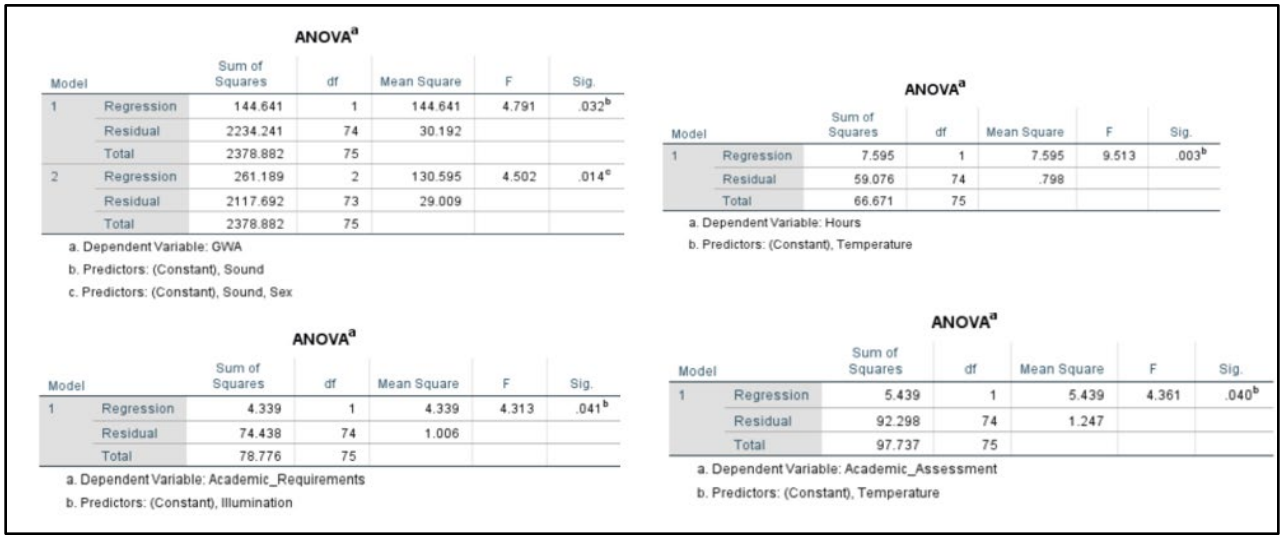
In gathering the necessary data with regard the several conditions pertaining to illumination, thermal, and sound, the proponents will significantly utilize a standardized survey through Google Forms that will serve as a digital self-administered questionnaire in which the respondents can perform at ease. In addition, the survey questionnaire will be composed of profiling questions to be further used in performing the study. In order for the proponents to determine the academic performance, a question tackling if the student is academic status (honor student), and General Weighted Average (GWA) will be asked as well on different situations regarding their study habits and how they would act in those situations. Furthermore, the survey questionnaire will be distributed to various social media platforms, including Google Mail, Facebook, and Instagram alongside in-campus surveys. Additionally, various methods of measurement alongside with the survey questionnaire will be utilized pertaining to photone for illumination level, label for light type, and lastly NIOSH Sound level and decibel X specific for the measurement of the sound condition.

5. Results and Discussion

A total sum of 77 respondents participated in the study were all current-year Industrial Engineering students who were administered the initial survey evaluating their current academic performance through academic standing as well as their habits with regards to studying. Upon the initial evaluation, the data gathered from the students were used and analyzed to create a common optimum standard for the environmental conditions they should be placed in from their given information on light, sound, and temperature in the initial survey administered. This was then given to the students for them to be followed and to monitor any possible effects that may sprout through the given environmental conditions by the researchers. The same 77 students were administered a post-survey to give their recent assessment towards their academic performance, habits, and the environmental conditions they stayed under if it is close or directly following the suggested conditions by the researchers. Upon completion of both survey questionnaires alongside the recommendations given to the respondents on how they should control their environmental factors to give the optimum results of their overall academic performance. Sound, sex, and temperature all showed consistency in garnering positive change towards the respondents' performance.

5.1 Numerical Results

Through the use of the IBM SPSS statistical software, the researchers were able to thoroughly analyze the independent variables and their statistical significance in influencing the results of the dependent variables such as the general weighted average (GWA) and the other academic performance factors and habits. Multiple linear analysis was performed between each independent variable to all the dependent variables.



ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	144.641	1	144.641	4.791	.032[b]
	Residual	2234.241	74	30.192		
	Total	2378.882	75			
2	Regression	261.189	2	130.595	4.502	.014[c]
	Residual	2117.692	73	29.009		
	Total	2378.882	75			

a. Dependent Variable: GWA
b. Predictors: (Constant), Sound
c. Predictors: (Constant), Sound, Sex

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.595	1	7.595	9.513	.003[b]
	Residual	59.076	74	.798		
	Total	66.671	75			

a. Dependent Variable: Hours
b. Predictors: (Constant), Temperature

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.339	1	4.339	4.313	.041[b]
	Residual	74.438	74	1.006		
	Total	78.776	75			

a. Dependent Variable: Academic_Requirements
b. Predictors: (Constant), Illumination

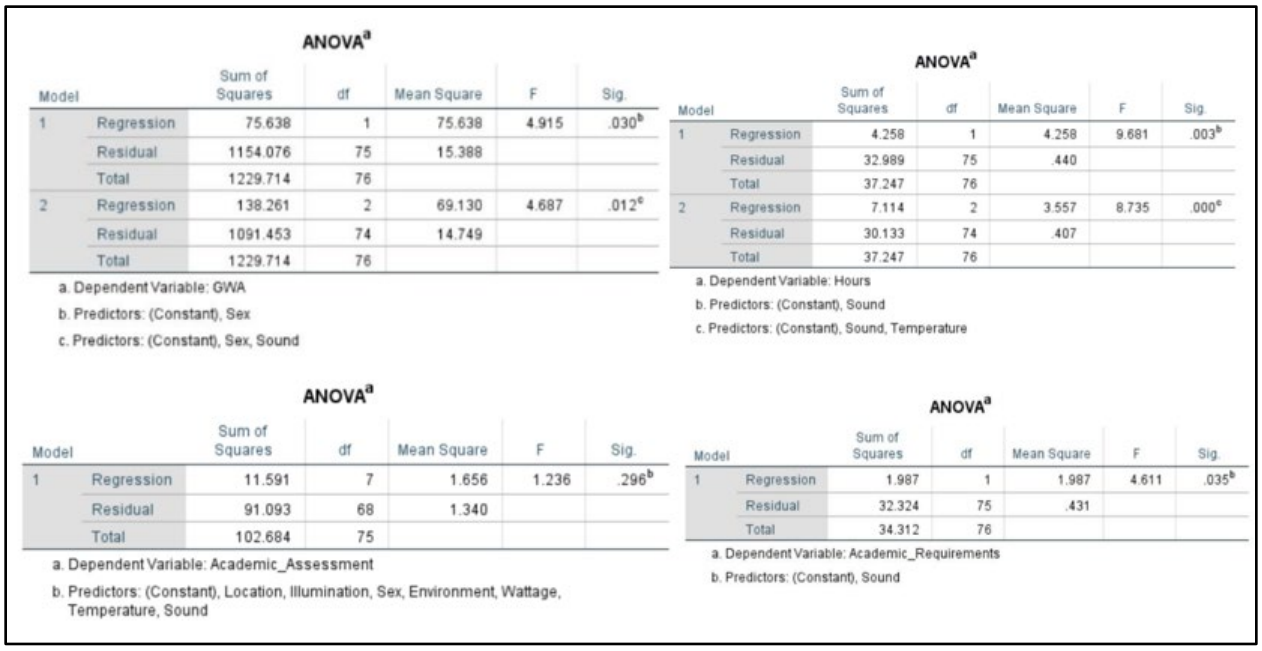
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.439	1	5.439	4.361	.040[b]
	Residual	92.298	74	1.247		
	Total	97.737	75			

a. Dependent Variable: Academic_Assessment
b. Predictors: (Constant), Temperature

Figure 2. SPSS Analysis of Variance Initial Survey Results

Figure 2. Shown above lays the analysis of variance out for the independent variables with their interaction and effects towards the dependent variables such as the respondents' behavioral habits such as the number of hours studied, current GWA, and how their habits changed for dealing with academic requirements and assessments. These SPSS outputs showed the initial results that were gathered by the survey which had no interference with the environmental factors. As can be seen in the sig value of each test, GWA, number of hours spent studying, academic requirements, and academic assessment habits all have a value of below the p-value of 0.05 making each of their corresponding independent variables statistically significant.



ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75.638	1	75.638	4.915	.030[b]
	Residual	1154.076	75	15.388		
	Total	1229.714	76			
2	Regression	138.261	2	69.130	4.687	.012[c]
	Residual	1091.453	74	14.749		
	Total	1229.714	76			

a. Dependent Variable: GWA

b. Predictors: (Constant), Sex

c. Predictors: (Constant), Sex, Sound

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.258	1	4.258	9.681	.003[b]
	Residual	32.989	75	.440		
	Total	37.247	76			
2	Regression	7.114	2	3.557	8.735	.000[c]
	Residual	30.133	74	.407		
	Total	37.247	76			

a. Dependent Variable: Hours

b. Predictors: (Constant), Sound

c. Predictors: (Constant), Sound, Temperature

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.591	7	1.656	1.236	.296[b]
	Residual	91.093	68	1.340		
	Total	102.684	75			

a. Dependent Variable: Academic_Assessment

b. Predictors: (Constant), Location, Illumination, Sex, Environment, Wattage, Temperature, Sound

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.987	1	1.987	4.611	.035[b]
	Residual	32.324	75	.431		
	Total	34.312	76			

a. Dependent Variable: Academic_Requirements

b. Predictors: (Constant), Sound

a

Figure 3. SPSS Analysis of Variance Secondary Survey Results

The image shown above at Figure 3 showcases the SPSS analysis of variance for the secondary survey results that were conducted after the researchers gave the suggested optimal environmental conditions from the previous information given and the results produced showed consistency in the Independent variables being able to influence the dependent variables of the respondent. The variables of sound, sex, and temperature showed consistency in their statistical significance in both the surveys conducted and how they were able to positively influence the respondents' academic performance.

5.2 Graphical Results

The researchers were able to ascertain the hours of studying, honor student status, academic requirement behavior, academic assessment behavior and current GWA of the students through a questionnaire that contains the questions needed to collect the data necessary for the study.

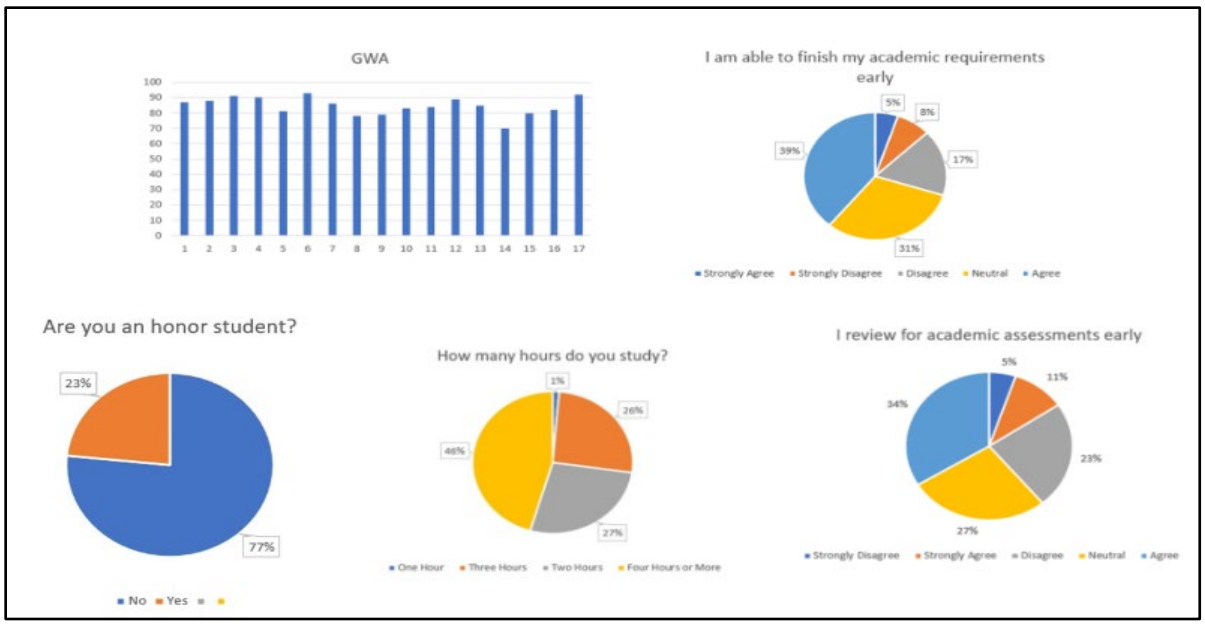


Figure 4. Graphical representation of Hours of studying, Honor student status, Academic Requirement Behavior, Academic Assessment Behavior and current GWA of the students

Figure 4 shows the results of the questionnaire provided for the students to answer. It was found that The majority of respondents (46%), including 77 participants, dedicate 4 hours or more to their studies. Only 23% identify as honor students, highlighting the diversity of academic backgrounds. Additionally, a significant group (39%), agreed that they could not complete tasks early. On the other hand, a smaller group (5%) strongly agreed that they could complete requirements ahead of schedule. Lastly, out of 77 respondents, 34% agreed, 27% neutralized, and 23% said they weren't studying early.

5.3 Proposed Improvements

In light of the study, the following improvements were proposed to improve the classroom setting and encourage student achievement. First is providing study spaces with features that are specifically needed by fourth-year industrial engineering students. These elements should include temperature control, ergonomic furniture, quiet zones, focused and collaborative layouts, and soundproofing. Establish quiet zones with signage and manage ambient noise levels by using carpets, acoustic panels, and other sound-absorbing materials. To minimize eye strain, provide enough illumination, ergonomic features, and comfortable furniture. Additionally, programs for academic support should be designed to take into account how temperature, sex, and sound affect study hours. This can be accomplished through offering options for noise-canceling headphones, working with technology suppliers, launching awareness campaigns, and holding teacher and student training sessions. Moreover, sustained investigation and observation are essential for successful tactics. Obtaining additional insights requires regular surveys, data analytics, and research grants. Acknowledging individual differences and providing students with personalized consultations enables customized interventions, cultivates a culture of continuous improvement, and attends to a variety of student needs. Lastly, the learning environment for Industrial Engineering students can be maximized by improving the infrastructure of study areas, working with facilities management, and making sure HVAC systems are maintained on a regular basis. Even if lighting is not statistically significant, understanding its impact can improve attention when studying. Regular reassessments and creative lighting solutions in line with circadian rhythms are advised. By taking a proactive stance, schools can adapt and give students the best learning environment possible.

5.4 Validation

All the dependent variables in the data set are continuous which includes the general weighted average (GWA), academic assessment, academic requirements, and hours spent studying. Additionally, the independent variables used in the data set were either all continuous or dichotomous variables.

Linear

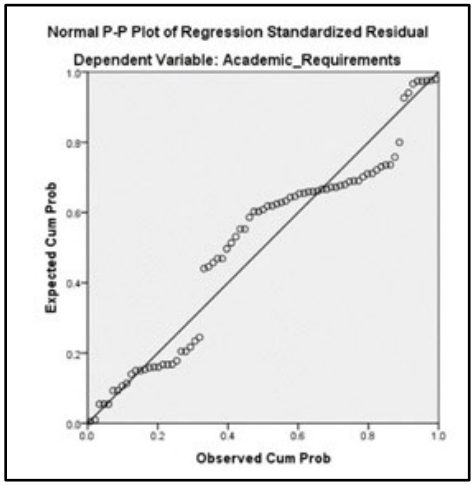


Figure 5. Linear Relationship of Sound

The relationship between each significant variable is linear during the results analysis of the data retrieved.

Independence

The respondents who participated in the data-gathering process were all different and had independence from their experiences, collection, and answers that were given to the researchers as data.

Independent Errors

For the pair observations of the entirety of the results analyzed from the data collection gathered from the respondents, it was seen that there was no correlation between them in the Durbin-Watson test which all fall into the acceptable range of their values.

No Multicollinearity

The independent variables that are used as predictors are seen as having low correlation based on the correlation statistics values of them being all lower than 5 and have values near to 1.

Homoscedasticity

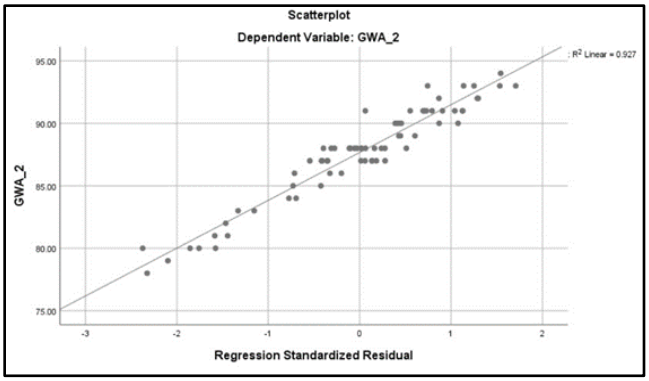


Figure 6. Test of Homoscedasticity

The variation in the distribution of these distances is essentially constant throughout each independent variable values

Normally Distributed Errors

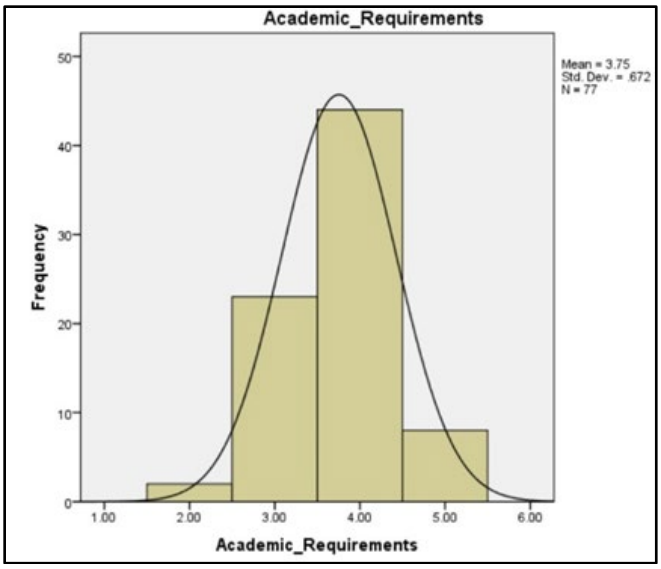


Figure 7. Normal Distribution of Academic Requirements

There is a difference between the actual value of Y and the predicted value of Y of the variables shown.

6. Conclusion

From the gathered data and analyzed results, it can be concluded that three of the independent variables had a consistently significant effect on the Industrial Engineering students as a whole. For both the initial and secondary surveys to validate the results, they were shown to have a consistent statistical significance as the dependent variables were shown to have increase in all of the dependent variables upon the assessment of the second survey. In addition, the stated variables served as significant and pertinent given the fact that they turned out to be the constant predictor value based on the conducted initial and secondary surveys, respectively. This indicates and shows the ability of sound, sex, and temperature, to positively affect students' academic performance in the different dependent variables they were briefly assessed on. On the other hand, not all of the environmental factors seem to be rendered useless as during the follow-up surveys deployed as it was observed that sound had a statistical significance with the hours the respondent spent studying compared to its high sig value from the initial survey results. To conclude, the overall results from the conducted experiment for the study offered a clear focus on sex, sound, and temperature conditions measured in degrees Celsius used in the students' study area as SPSS analysis showed a distinction with regards to their significance on the academic performance of 4th year Industrial Engineering students.

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