

Influence of Classroom Ergonomics on Students' Academic Productivity and Emotional Disposition

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Abstract -The ergonomic design of learning plays a vital role in ensuring students' comfort, safety, and educational engagement. Inadequate ergonomic conditions may result in physical discomfort and inefficient learning motivation. Environmental factors such as lighting and air quality can also influence emotional health. Given students' ongoing interaction with their physical learning environment, this research explored how classroom ergonomics relate to academic productivity and emotional wellbeing. Using a descriptive-correlational method, the study gathered data from 179 junior and senior high school students. The results revealed that students generally rated classroom ergonomics, academic performance, and emotional wellbeing, including valence and activation, at high levels. Strong positive correlations were found among these variables. Notably, the comfort of classroom furniture emerged as a significant predictor, explaining 39.5% of academic productivity variance. It also predicted 26.2% of activation, while lighting conditions accounted for 30.8% of valence. The study emphasizes the importance of well-designed classrooms in promoting better academic outcomes and emotional wellbeing. Future research is encouraged to explore these dynamics using broader participant samples and considering variations across school types, age, and gender.

Keywords: classroom ergonomics, academic productivity, emotional disposition

I. INTRODUCTION

Students in ergonomically designed classrooms have 25% higher motivation than those in traditional setups (Soltaninejad, 2021). This highlights the role of classroom design in education, suggesting that investing in ergonomic features can significantly enhance student engagement. Ergonomics focuses on the design and arrangement of tools and equipment to ensure that people use them in the safest and most effective way. In a classroom, ergonomics are applied to improve the learning environments of students and maximize their comfort and safety (Utku et al., 2021).

A well-designed learning environment is essential for academic success. While a student's productivity and well-being are often prioritized, the impact of the classroom ergonomics is frequently overlooked. It is a prerequisite for good health, motivation improvement and learning of students (Alibegović et al., 2020). Similarly, Latip (2023) says that one crucial element that often goes overlooked in educational settings is the impact of ergonomics on student performance.

Classroom ergonomics is essential for creating an environment that supports student learning and well-being. Proper ergonomic practices ensure safety and health (Jabeen & Hussain, 2022). Additionally, it reduces stress and anxiety (Soltaninejad, 2021). Key factors of

classroom ergonomics include student safety, lighting, indoor environmental quality, and noise levels. Poor ergonomic conditions can lead to physical discomfort, distractions, and stress. Furniture that does not meet the needs of students contributes to poor posture and health problems (Alibegović et al., 2020). Moreover, when ergonomic conditions in educational workplaces are inadequate, the risk of musculoskeletal and visual disorders in adolescents increases (Ablyaeva, 2020).

Furthermore, a sense of safety significantly impacts academic performance, students who feel unsafe tend to engage less and achieve lower (Lacoe, 2020). Thus, effective school ergonomics must address both physical and psychological safety to foster a comfortable learning atmosphere. Indoor environmental quality, particularly air quality, temperature, and lighting, greatly affects students' health and academic success. Poor ventilation and uncomfortable temperatures can lead to cognitive fatigue and absenteeism (Toyinbo, 2023). Meanwhile, optimal lighting conditions enhance concentration (Mogas-Recalde & Palau, 2020). Moreover, noise levels can hinder comprehension and reducing noise improves emotional stability and academic performance (Visentin et al., 2023).

Over the recent years, there has been a rise in the studies about the design of learning environments. Problems such as postural behavior and back pain may worsen in a school setting. Recent studies like Alibegović et al. (2020) and Mazina et al. (2021) indicate that school ergonomics has a large role in students' growth and development, both academically and health-wise. School ergonomics have also been modified with the pandemic policies in mind, taking into consideration the health, safety, and well-being of the students (Incekara, 2022).

Classroom design also influences motivation. Proper application of ergonomic principles promote collaboration and enhance student involvement in activities (González-Zamar et al., 2020). This suggests that classrooms with proper application of ergonomic principles can increase student motivation. A well-designed classroom that prioritizes comfort is vital for improving student engagement and emotional well-being (Brink et al., 2023; Shi, 2021; Byers et al., 2018; Karadağ, 2018). This suggests that classrooms with adequate ergonomics can influence the emotional disposition of students. Emotional disposition has two key aspects, valence, which describes whether an emotion is pleasant or unpleasant, and activation, which indicates the energy level of that emotion, ranging from high to low.

Valence and activation, key aspects of emotional disposition, are shaped by learning conditions. While many countries have integrated ergonomics into educational reform (Wang et al., 2020), research in Metro Manila, Philippines highlights ongoing issues in classroom design (Gumasing and Espejo, 2020). However, few studies directly examine ergonomics' effects on academic productivity and emotional disposition (Loredan et al., 2022; Jabeen and Hussain, 2022; Khalid et al., 2020). Thus, this study was conducted to address the research gap by examining students' perceptions of furniture comfort, lighting conditions, ventilation, temperature, and noise. It also measured their academic productivity and emotional disposition in terms of valence and activation. Furthermore, the influence of classroom ergonomic towards academic productivity and emotional disposition was also determined.

II. LITERATURE REVIEW

This study is guided by Apter's Reversal Theory (2014), the Dimensions of Classroom Ergonomics by Latip and Tamrin (2023), and Russell's Circumplex Model of Affect (1980). Latip and Tamrin emphasized five core elements of ergonomic classroom design such as

temperature, lighting, noise, ventilation, and furniture comfort. These factors collectively contribute to creating a learning environment that supports both academic and emotional development. Meanwhile, Russell's model identifies two key components of emotional experience, valence (the pleasantness of emotion) and activation (the intensity of emotional energy).

Classroom Ergonomics

Ergonomics, as defined by the International Ergonomics Association (2001), refers to the scientific field focused on optimizing interactions between humans and their environment. In educational settings, this means arranging classroom features in ways that promote student safety, comfort, and effective learning. Teachers who are mindful of ergonomic principles help ensure that students work in conditions that reduce health risks and enhance learning. The main areas of concern in classroom ergonomics include seating comfort, air quality, lighting, temperature, and ambient noise.

Brink et al. (2023) highlighted that poor environmental factor, such as lighting, temperature, and noise can negatively affect students' concentration and academic engagement. In classrooms lacking proper ergonomic adjustments, both teachers and students often experience discomfort that hinders learning outcomes. Their findings stress that improving physical conditions in classrooms leads to fewer distractions and a more productive learning space.

Academic Productivity

Academic productivity refers to how efficiently and effectively students carry out their academic responsibilities. It is closely connected to cognitive engagement, mental efforts like critical thinking, problem-solving, and memory retention. Shi (2021) emphasized that higher cognitive involvement leads to better academic outcomes. Supporting this, Khan et al. (2023) discovered a strong positive relationship between cognitive engagement and students' academic success. González-Zamar et al. (2020) further asserted that adaptable, functional learning environments promote collaboration and raise student involvement. Additionally, Bashir et al. (2024) demonstrated that ergonomic classroom features such as flexible furniture and proper lighting improve focus, thereby enhancing academic output.

Emotional Disposition

Emotional disposition refers to a student's typical emotional response across various situations. It encompasses both the valence, how positive or negative the emotion is and activation, the level of emotional intensity. For example, happiness reflects high valence and high activation, while sadness reflects low scores in both dimensions. Emotions such as fear and anger feature high activation but low valence. In contrast, contentment involves high valence with low activation, generating calm but positive feelings (Posner et al., 2005). These emotional tendencies influence behavior, focus, social interaction, and learning motivation (Scherer, 2021).

Additionally, it has two main dimensions valence such as pleasantness of the emotion and activation which means intensity of emotion. Each emotion can be understood as a combination of these two dimensions, reflecting distinct degrees of both valence and activation. For instance, joy is characterized by high valence and high activation, embodying feelings of happiness, elation, excitement, and alertness, making it one of the most positive and energizing emotions.

In contrast, sadness features low valence and low activation, often leading to feelings of depression, lethargy, and fatigue. Fear, with low valence but high activation, results in anxiety and a sense of urgency to escape perceived threats. Similarly, anger is marked by low valence and high activation, provoking feelings of frustration and a drive to confront or challenge. Disgust is also marked with relatively low valence and high activation; it arouses unpleasant feelings possibly leading to avoidance or rejection. Meanwhile, contentment exhibits high valence but low activation, promoting a sense of peace and satisfaction without the high energy associated with joy (Posner et al., 2005).

III. MATERIALS AND METHODS

Research Design: This study used a descriptive-correlational approach to describe the influence of classroom ergonomics on students' academic productivity and emotional disposition without establishing a causality. According to Lappe (2000), descriptive-correlational research aims to describe relationships rather than establish cause and effect.

Participants/Data Sources: The respondents of the study were 179 junior and senior high school students from a private secondary institution during the second semester of SY 2024-2025. Simple random sampling was employed to select the respondents from grades 7 to 12.

Tools and Instruments: Survey tools were adapted from established instruments: The Classroom Ergonomics Questionnaire (CEQ) (Ahmad et al., 2015) assessed perceptions of furniture comfort, lighting, ventilation, temperature, and noise using a 5-point Likert scale. The Academic Productivity Questionnaire (APQ), based on PUP's scale (2024), measured students' productivity across 17 items. The Emotional Disposition Questionnaire (EDQ) adapted PANAS scales (Watson et al., 1988) to assess both valence and activation.

Reliability checks showed all subscales had strong internal consistency, with Cronbach's Alpha ranging from 0.82 to 0.93. These results show that the measurement tools are consistent and suitable for assessing their respective constructs.

Table 1. Reliability Result of the Research Instrument

Variables	Number of Items	Cronbach Scale	Interpretation
Classroom Ergonomics			
Furniture Comfort	10	0.86	Good
Lighting Conditions	5	0.86	Good
Ventilation	5	0.85	Good
Temperature	4	0.82	Good
Noise	6	0.89	Good
Academic Productivity	17	0.93	Excellent
Emotional Disposition			
Valence	10	0.90	Excellent
Activation	10	0.92	Excellent

Procedures: After ethics clearance, the researchers obtained school-level permissions and coordinated with class advisers. Surveys were distributed via Google Forms over a two-week period. Ethical standards, including voluntary participation and confidentiality, were strictly observed.

Analysis Techniques: The researchers used Jamovi and SPSS for statistical analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, categorized respondents' demographic profiles and examined classroom ergonomics, academic productivity, and emotional disposition. Pearson's correlation coefficient and regression analysis analyzed the strength and direction of relationships between these variables.

IV. RESULT AND DISCUSSION

Perceptions of High school students toward Classroom Ergonomics

Survey responses revealed that students generally viewed the ergonomic conditions of their classrooms as favorable. With an overall mean score of 3.91, most components such as furniture comfort, lighting, ventilation, and temperature were rated high, while noise was assessed at a moderate level. This implies that most students find their classrooms comfortable and conducive to learning.

These findings echo the work of Jabeen and Hussain (2022), who emphasized the importance of ergonomics in promoting student well-being and engagement. Similarly, Brink et al. (2023) and Soltaninejad (2021) linked poor classroom environments with reduced concentration and increased stress.

Table 2. Perceptions of High School Students toward Classroom Ergonomics

	Mean	SD	Interpretation
Furniture Comfort	4.02	0.71	High
Lighting Conditions	4.29	0.72	High
Ventilation	3.86	0.82	High
Temperature	3.98	0.80	High
Noise	3.48	0.89	Moderate
Overall Mean	3.91	0.60	High

Students' Level of Academic Productivity

Students reported a high level of academic productivity ($M = 3.84$), suggesting that they are effectively completing tasks and reaching learning targets. This supports the view that cognitive engagement significantly enhances academic performance (Shi, 2021; Gumasing et al., 2023).

Table 3. Students' Level of Academic Productivity

	Mean	SD	Interpretation
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Academic Productivity	3.84	0.66	High
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Students' Emotional Disposition

Emotional disposition was also rated highly by students ($M = 3.89$). This included both high valence ($M = 4.09$), indicating generally pleasant emotional experiences, and strong activation ($M = 3.70$), reflecting alertness and energy. As Scherer (2021) and Russell (1980) explain, positive emotional disposition enhances focus and motivation, contributing to improved academic participation.

Table 4. Students' Emotional Disposition

	Mean	SD	Interpretation
Valence	4.09	0.64	High
Activation	3.70	0.77	High
Overall Mean	3.89	0.62	High

Influence of Classroom Ergonomics to Student's Academic Productivity and Emotional Disposition

Statistical analysis showed significant positive relationships among all major variables. Classroom ergonomics strongly correlated with academic productivity ($r = 0.740$) and emotional disposition ($r = 0.623$ for valence; $r = 0.617$ for activation). Furniture comfort and temperature had particularly strong associations with both productivity and emotional well-being. These results reinforce the idea that well-designed classroom environments support better academic and emotional outcomes, as also noted by Alibegović et al. (2020).

Table 5. Influence of Classroom Ergonomics to Student's Academic Productivity and Emotional Disposition

	Furniture	Lighting	Ventilation	Temperature	Noise	Classroom Ergonomics
Academic Productivity						
<i>Pearson's r</i>	0.629	0.468	0.477	0.600	0.594	0.740
<i>p-value</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Emotional Disposition						
Valence						
<i>Pearson's r</i>	0.522	0.555	0.443	0.505	0.397	0.623
<i>p-value</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Activation						
<i>Pearson's r</i>	0.512	0.442	0.394	0.463	0.501	0.617
<i>p-value</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Predictor of Student's Academic Productivity

Regression analysis identified furniture comfort as the strongest predictor of academic productivity, accounting for 39.5% of the variance. This confirms that ergonomically appropriate seating significantly boosts student focus and task completion. Noise and temperature also played statistically significant roles, increasing the explained variance to 51.9% and 57.3%, respectively.

These findings align with Barrett et al. (2015), who emphasized that physical classroom conditions, including acoustics and thermal comfort, substantially influence academic outcomes. Shield and Dockrell (2003) further showed that excessive noise reduces attention, while Wargocki and Wyon (2012) noted that thermal discomfort impairs mental performance.

Table 6. Predictors of Student's Academic Productivity

Predictor	Estimate	SE	t	p	R	R ²	Adj R ²	F
(Constant)	1.471	.223	6.582	.000				
Furniture	.589	.055	10.748	.000	.628	.395	.391	115.514
Noise	.294	.044	6.738	.000	.720	.519	.514	94.942
Temperature	.233	.050	4.688	.000	.757	.573	.565	78.164

Predictor of Student's Emotional Disposition in Terms of Valence

Among environmental factors, lighting quality most strongly influenced students' emotional positivity (valence), explaining 30.8% of its variance. Temperature and furniture comfort also significantly contributed to students' pleasant emotional experiences, raising the total variance explained to over 41%. These results suggest that a well-lit, thermally balanced, and ergonomically designed classroom can uplift students' emotional states. Küller et al. (2006) observed similar effects, where both natural and artificial lighting improved mood and alertness.

Table 7. Predictors of Students' Valence

Predictor	Estimate	SE	t	p	R	R ²	Adj R ²	F
(Constant)	2.032	.235	8.645	.000				
Lighting	.491	.055	8.883	.000	.555	.308	.304	78.905
Temperature	.241	.055	4.378	.000	.613	.376	.369	53.086
Furniture	.210	.067	3.152	.000	.640	.410	.400	40.500

Predictor of Student's Emotional Disposition in Terms of Activation

When it comes to emotional intensity or activation, furniture comfort again emerged as the most influential factor, accounting for 26.2% of the variance. Noise levels contributed an additional 9.5%, while temperature added modest but meaningful influence.

These patterns suggest that ergonomic seating enhances alertness and energy, while moderate noise and comfortable room temperature help maintain cognitive stimulation. This supports previous findings from Barrett et al. (2015), Shield and Dockrell (2003), and Wargocki and Wyon (2012), who emphasized the role of classroom environment in maintaining alertness and reducing fatigue.

Table 8. Predictors of Activation

Predictor	Estimate	SE	t	p	R	R ²	Adj R ²	F
(Constant)	1.471	.286	5.150	.000				
Furniture	.555	.070	7.924	.000	.512	.262	.258	62.784
Noise	.297	.058	5.100	.000	.597	.357	.350	48.835
Temperature	.179	.069	2.590	.000	.617	.381	.370	35.849

V. CONCLUSION

This study underscores the pivotal role that classroom ergonomics play in supporting both academic and emotional development among high school students. A well-structured learning environment, characterized by comfortable furniture, optimal lighting, balanced temperature, and controlled noise levels, significantly enhances students' productivity and emotional well-being. Among all ergonomic factors, overall classroom design exhibited the strongest influence across all dependent variables. These results suggest that integrating ergonomic principles into classroom design should be a key consideration in educational planning.

For future research, expanding the sample size could provide broader insights and improve the generalizability of results. It is also advisable to explore how different age groups respond to ergonomic conditions, as this could inform more customized and developmentally appropriate learning environments.

AUTHORS' CONTRIBUTIONS

The study was a collaborative effort involving five student researchers and two academic mentors. Beatrice Lorraine Salaum led the research initiative, formulating the research question, designing the proposal, overseeing communications, conducting data analysis, and ensuring consistency in reporting the findings. Jourge Charlize Castillo, Rajan Karl Falculan, Genesis Adil, and Maria Alexandria Servito contributed by compiling literature, organizing the related studies, managing data collection permits, and finalizing the research manuscript for presentation. Mercedes M. Ibanez, the research adviser, provided scholarly mentorship throughout all phases of the study and validated the research instruments and final output. Dr. Rowena Imelda A. Ramos, serving as the research consultant and methodologist, ensured the study's methodological soundness and adherence to academic standards.

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