Library Design and Academic Performance: Implications on Students' Engagement

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ABSTRACT: Libraries play a crucial role in shaping students' engagement and academic success, not only by providing access to resources but also through the quality of their physical environment. This study determined the influence of library design on students' engagement and academic performance. A total of 252 first-year students enrolled in Academic Year 2024–2025 were selected using the Taro Yamane formula and random sampling. A descriptive-correlational research design was used, and data were gathered through a structured survey questionnaire. Descriptive statistics such as frequency, percentage, mean, and standard deviation were utilized, along with multiple regression analysis to examine relationships among the variables. Findings revealed that students rated the library design—specifically in terms of physical layout and organization, lighting and acoustics, ergonomics, technology infrastructure, and green spaces—as generally very good. Academic performance, measured through GPA, and library engagement, assessed through library visits, resource utilization, facility use, and program participation, both received most of the time ratings. Regression results showed that physical layout and organization, green spaces or nature integration, and lighting and acoustics significantly influenced student engagement. However, when taken in isolation, ergonomics, technology infrastructure and GPA did not show significant influence. The positive average rating for library design and engagement suggest that librarians implement programs and activities that leverage well-rated design features to further enhance student engagement.

KEYWORDS: Academic performance, Educational spaces, Library design, Library environment, Student engagement.

INTRODUCTION

Libraries play a significant role in shaping students' academic engagement, not just through the resources they offer but also through the physical environments they create. The design of the library significantly impacts its effectiveness as a learning space, influencing how students interact, collaborate, and engage with their academic activities. As libraries evolve beyond their traditional role as information repositories, they are becoming dynamic hubs for innovation, technology, and academic exploration. A well-designed library fosters an environment conducive to both individual learning and group collaboration, promoting meaningful engagement and supporting students' academic journeys.

Academic engagement is a multifaceted concept encompassing active participation in learning activities, frequent library visits, and effective utilization of resources and facilities. Research suggests that thoughtfully designed spaces can motivate students to immerse themselves in academic tasks, thereby enhancing their engagement with learning processes (Rodrigues & Mandrekar, 2020). The relationship between library design and academic engagement highlights the importance of creating student-centered environments that meet the evolving needs of learners and foster a holistic educational experience.

According to the International Federation of Library Associations and Institutions (IFLA, 2015), the educational role of a library should be reflected in its facilities by shifting from a resource-centered model to a learner-centered one. This study aligns with Sustainable Development Goal (SDG) 4, which advocates for inclusive and equitable quality education (UN, 2015). To support student engagement, libraries must ensure accessibility, adequate lighting, noise control, proper room temperatures, and flexible layouts that accommodate diverse users and activities. By providing adaptable study areas and ensuring both physical and digital access to information, libraries can strengthen their role in enhancing academic engagement.

However, Rone et al. (2023) noted that some students experience low engagement and dissatisfaction with libraries due to factors such as inadequate space, irrelevant resources, poor connectivity, and other environmental challenges. These issues hinder students' ability to concentrate and engage meaningfully in academic activities. Addressing such challenges is essential not only to improve student satisfaction but also to support SDG 9 (Industry, Innovation, and Infrastructure), which promotes the development

of resilient and adaptive educational infrastructures. Furthermore, well-designed library spaces contribute to SDG 3 (Good Health and Well-being) by creating healthier learning environments through the minimization of stressors like excessive noise and poor ventilation, which can negatively impact students' physical and mental well-being during their academic pursuits.

Institution like Surigao Education Center, a private higher education institution that produces globally competitive professionals, recognizes the need for adequate facilities and conducive spaces for study and research. As outlined in Commission on Higher Education (CHED) Memorandum Order (CMO) No. 22, series of 2021, libraries are required to provide sufficient space and facilities for users, including dedicated areas for discussion, innovation, proper lighting and ventilation, comfortable furniture, facilities for Persons with Disabilities (PWDs), and safety measures. These requirements emphasize the importance of creating environments that encourage student engagement and support academic activities. Despite these standards, there remains a gap in empirical studies exploring the relationship between library design and students' academic engagement, particularly within the local context.

Furthermore, this paper hence to designed to determine the influence of library design on the influence of library design on students' academic performance and engagement in an academic library. Particularly, this study had the following research objectives: (1) to determine the participants' assessment of their library design in terms of physical layout and organization, lighting and acoustics, ergonomics of arrangements, technology infrastructure, and green spaces/nature integration; (2) to determine the participants' academic performance; (3) to determine the participants' library engagement in terms of library visits, resource utilization, facility utilization, and program participation; (4) to determine the significant influence of participants' assessment of their library design on their academic performance and engagement.

METHODS

In this study, the researcher employed a quantitative descriptive-correlational research design using survey technique. This is deemed appropriate as it aimed to determine the influence of library design on students' academic performance and engagement in the library. A total of 252 first year students enrolled in academic year 2024-2025 participated in the study and were selected using Taro Yamani and random sampling.

This study utilized a researcher-made questionnaire to gather data. The questionnaire consisted of two parts. The first part addressed how the participants perceive the library design, and the second part assessed their level of engagement in the library. A letter of permission was sent to the President of the school to conduct the study. The questionnaire was subjected to the validation by experts. It was administered in printed and online platforms where consent from the participants was also asked. Afterwards, it was retrieved, analyzed, and interpreted using statistical tools. Moreover, the study maintained ethical considerations by requesting the participants to sign informed consent and data privacy forms attached in the printed and online questionnaires. The personal information and responses collected were treated with utmost confidentiality and were only used for academic and research purposes.

To analyze the results gathered in the study, the following statistical tools were used: (1) descriptive statistics such as frequency, percentage, mean and standard deviations to describe the participants' assessment of library design, their academic performance and engagement; (2) it employed the multiple regression analysis to test the significant influence of the variables.

RESULTS AND DISCUSSIONS

Problem 1.   What is the participants' assessment of their library design in terms of:

    1.1   Physical Layout and Organization;

    1.2   Lighting and Acoustics;

    1.3   Ergonomics of Arrangements;

    1.4   Technology Infrastructure; and

    1.5   Green Spaces/Nature Integration?

Table 1 presents the *summary of the participants' assessment of library design* as generally rated *very good* (M=3.88). The results indicate that the participants perceive the overall library environment to be well-designed, functional, and conducive to

learning, with an overall mean of 3.88 (Very Good). Across all five dimensions, the majority of participants (between 62.70% and 78.97%) rated the library design aspects as either Very Good or Outstanding, demonstrating a high level of satisfaction with the key design elements. The results may indicate that the participants perceive the overall library environment to be well-designed, functional, and conducive to learning. A high mean score suggests satisfaction with key design elements such as physical layout and organization, lighting and acoustics, ergonomics of arrangements, technology infrastructure, and green spaces/nature integration, which are likely contributing to a positive user experience. Handa (2021) points out this favorable perception may reflect the library's efforts to provide a welcoming and user-centered space that supports academic activities, promotes longer stays, and encourages frequent visits.

Table 1. Summary Table of Assessment of Library Design

Dimensions of Assessment of Library Design	Mean	Interpretation	SD
Physical Layout and Organization	4.08	Very Good	0.64
Lighting and Acoustics	3.76	Very Good	0.66
Ergonomics of Arrangements	3.94	Very Good	0.70
Technology Infrastructure	3.83	Very Good	0.68
Green Spaces/Nature Integration	3.80	Very Good	0.75
Overall Assessment of Library Design	**3.88**	**Very Good**	**0.53**

As to dimension, among the variables, the *physical layout and organization rated as the highest* (M =4.08). This finding indicates that the library's physical layout and organization effectively support students ease of use of library facilities and resources. This is implied since the library strategically plans the physical facilities to support and provide a conducive learning environment to the library users. This is supported in the Library Customer Satisfaction Survey (2024), which found that users rated the library facility as excellent because its comfortable and conducive learning environment allows them to concentrate and finish their academic tasks smoothly.

On the other hand, the *lowest overall rated variable is green spaces/nature integration* (M =3.80). This means that there is a need for a slight improvement of the library's greenery. According to Cox (2022), the library shall consider incorporating natural elements, such as plants and greenery, to encourage longer periods of study by reducing stress and promoting relaxation. Furthermore, Hoan et al., 2022, with the greenery in the library, it helps the users to concentrate and feel comfortable, allowing them to be productive in their academic work.

Problem 2.   What is the participants' academic performance?

Table 2 presents the frequency, percentage and mean distribution of the *participants' academic performance*. Data show that the participants' academic performance was generally *very good* (M=1.83). Half of the participants (50.00%) demonstrated Very Good performance. This may indicate that the participants are generally performing at high academic level, implying that they are likely well-engaged and supported in their learning process. This finding is supported by Rabelo et al. (2024), who revealed that facilities and services in library influences students' engagement, leading to achieve their academic tasks. Likewise, Scoulas and Groote (2022) indicate that most of the students frequently used the library are academic achiever.

Furthermore, the same table shows that 126 or 50 percent got very good academic performance, 70 or 27.78 percent got outstanding academic performance, 44 or 17.4 percent got outstanding academic performance, 7 or 2.78 percent got fair academic performance, 5 or 1.98 percent got poor academic performance. This may indicate that the majority of participants are achieving above-average academic results, suggesting a generally effective learning environment with minimal cases of academic difficulty.

Table 2. Frequency, Percentage and Mean Distribution of the Participants' Academic Performance

Range	Interpretation	Frequency	Percentage
1.00-1.49	Outstanding	44	17.46
1.50-1.99	Very Good	126	50.00
2.00-2.49	Good	70	27.78

2.50-2.99	Fair	5	1.98
3.0 and below	Poor	7	2.78
	Total	**252**	**100.0**
	Overall Mean	**1.83**	
	Interpretation	**Very Good**	
	SD	**0.45**	

This may be implied since the institutions objectives is to provide quality education and produce globally competitive professionals (SEC Vision, 2024). With this, instructors and supporting departments including library, strategically plan its services and facilities to support students learning process (Library Development Plan, 2024-2027).

Problem 3. **What is the participants' library engagement in terms of:**
3.1 **Library Visits;**
3.2 **Resource Utilization;**
3.3 **Facility Utilization; and**
3.4 **Program Participation?**

Table 3 presents the summary of participants' engagement. Data show that the overall participants' engagement was generally most of the time (M =3.80). Across all four dimensions, the majority of participants (between 57.54% and 80.56%) rated their library engagement as either Very Good or Outstanding, with library visits receiving the highest positive ratings (80.56%) and program participation receiving the lowest, though still substantial, positive ratings (57.54%). This finding may indicate very active involvement, consistent participation, and positive interaction with the library's services and programs among the participants. This is supported by the Library Customer Satisfaction Survey (2024), which revealed that users were highly satisfied with the library's facilities, resources, and staff assistance—further affirming the high level of engagement observed among the participants.

Table 3. Summary Table of Participants' Library Engagement

Dimensions of Participants' Library Engagement	Mean	Interpretation	SD
Library Visits	4.02	Most of the time	0.61
Resource Utilization	3.82	Most of the time	0.77
Facility Utilization	3.73	Most of the time	0.80
Program Participation	3.65	Most of the time	0.88
Overall Participants' Engagement	**3.80**	Most of the time	**0.61**

Further, the table shows that among the dimensions, *library visits* recorded the highest mean (M = 4.02). This result may indicate that students frequently utilize the library as a physical space, suggesting a high level of engagement and perceived importance of library access in their academic routines. This is evident in the study of Fagyan et al. (2023) revealed that frequent library visits are strongly correlated with improved academic performance, emphasizing the role of libraries as essential hubs for student success and learning.

On the other hand, *program participation* obtained the lowest mean (*M*=3.65), though still interpreted as *most of the time,* which might imply opportunities for improvement in increasing awareness or interest in library-hosted programs. With this, the library may need to strategically plan and strictly implement activities that encourage users to engage, which may result in increased program participation (Library Annual Operational Plan, 2025).

Problem 4. Do the participants' assessment of the library design and academic performance significantly influence their library engagement?

Ho1. The participants' assessment of the library design and academic performance does not significantly influence their library engagement.

Ho2. The participants' assessment of the library design does not significantly influence their library engagement.

Ho3. The participants' academic performance does not significantly influence their library engagement.

Regression analysis was done to determine the possible influence of the participants' assessment of the library design and academic performance of their library engagement. This tool was used after ensuring that the assumptions of regression are met such as the correlation of the variables (R=.544); the presence of homoscedasticity (Variance Inflation Factors range from 1.001 to 2.41). The normality of the residuals and the QQ plots are shown in Appendix G).

Data show that the model was found to be significant, $F_{(6, 245)} = 17.15^{**}$ p <.001, indicating rejection of the null hypothesis (Ho_1). This means that Library design and academic performance have a significant influence on students' library engagement. The model explains 29.65% of the variability in library engagement (R^2=.296), indicating that nearly one-third of the differences in how students engage with the library can be predicted by the combined effects of library design aspects and academic performance. This substantial percentage indicates that library design elements play an important role in encouraging library use, though the remaining 70.4% may be attributed to other factors not covered in this study such as approachability and supportiveness of library staff, students' individual motivation and study habits, peer influence, relevance and accessibility of library resources that may shape students' need to use the library. As revealed by Manguil et al. (2024), a high positive satisfaction and engagement in the library due to its accommodating library staff and relevant library resources. Dupa (2018) also emphasizes that social interaction and collaborative learning opportunities within the library also contribute significantly to user engagement.

Table 13. Regression Analysis of the Influence of Participants' Assessment of the Library Design and Academic Performance on their Library Engagement.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			Decis.
(Constant)	1.269	.283		4.48	<.001	Sig.
Library Design						
Physical Layout & Organization	.229	.062	.242	3.69	<.001	Sig.
Lighting and Acoustics	.194	.063	.210	3.09	.002	Sig
Ergonomics of Arrangements	-.068	.070	-.078	-.970	.333	Not Sig.
Technology Infrastructure	.050	.074	.057	.680	.497	Not Sig.
Green Spaces / Nature Integration	.213	.060	.263	3.57	<.001	Not Sig
Academic Performance (Grade Point Average)	.075	.072	.056	1.04	.301	Not Sig

Model Summary

R=.544 R^2 = .296   Adjusted R^2 = .278 $F_{(6, 245)} = 17.15^{**}$ p <.001

**significant at 0.01 level

A closer look at the individual predictors reveal that the *physical layout and organization* of the library came out as having the highest influence on their engagement, indicating that for every unit increase in their assessment of the library, there is a corresponding .229 increase in their engagement (B=.229, t=3.69, p<.001. This indicates that factors such as provision of clear signage, well-planned layouts, the availability of study areas, the intuitive arrangement of materials, and ease of movement within the library are critical in motivating students to engage with the library more frequently and for longer durations. Ashikuzzaman (2024) emphasizes that an organized and well-structured library enhances user engagement by improving navigation and access to resources. A thoughtfully designed layout minimizes confusion, fosters independence in resource retrieval, and encourages return visits. Consequently, the substantial impact of this variable supports the rejection of the null hypothesis and underscores the importance of spatial design in optimizing library use and engagement.

Meanwhile, *green spaces and nature* integration also had a significant impact on library engagement, with a .213 increase observed for every unit increase in students' assessment of this aspect (B = .213, t = 3.57, p < .001). This finding indicates that incorporating natural elements, such as indoor plants, greenery, or nature-inspired decor, contributes to students' comfort and emotional well-being while using the library. Sridhar (2022) highlights that the presence of greenery fosters a relaxing academic atmosphere, which in turn enhances students' comfort and focus. Nature-integrated environments have been shown to reduce stress and mental fatigue, factors that may otherwise hinder prolonged library visits. These results emphasize that biophilic design not only improves the aesthetic appeal of a space but also leads to tangible benefits, such as increased user engagement, thus supporting the rejection of the null hypothesis.

Moreover, *lighting and acoustics* were also found to have a significant positive impact on student engagement in the library, with a .194 increase in engagement for each unit rise in assessment of this factor (B = .194, t = 3.09, p = .002). The significance of this environmental factor underscores how sensory experience shapes cognitive performance. The statistical significance here suggests that lighting and acoustics should be treated as fundamental design considerations rather than aesthetic afterthoughts. The presence of adequate lighting—particularly natural light—and the control of ambient noise levels are essential components of a productive academic environment. As highlighted by Peterson (2024), students feel more focused and productive in spaces with sufficient natural lighting and minimal distractions. Appiah et al. (2020) further emphasize that poor lighting and excessive noise negatively affect concentration and satisfaction, discouraging library use. The data in this study confirms that lighting and acoustic quality directly enhance students' comfort, thereby increasing their engagement with library spaces. Consequently, the significant result for this predictor also leads to the rejection of the null hypothesis.

On the other hand, the other predictors for H_{02}, which include *ergonomics of arrangements* (B = -0.068, t = -0.970, p = .333) and *technology infrastructure* (B = -0.050, t = -0.680, p = .497), were found to have no significant influence on students' engagement, indicating the non-rejection of the null hypothesis for these predictors. The lack of significance for these variables indicates that while the overall library environment matters, not all design elements carry equal weight in determining how students engage with the library. This pattern may reflect that certain basic expectations (such as adequate technology) might be considered standard prerequisites rather than engagement drivers, while other factors (such as layout and natural elements) more actively shape students' decisions to use library spaces and services.

Furthermore, for *ergonomics*, it is possible that while comfort is appreciated, students may not strongly associate seating or furniture ergonomics with their engagement—perhaps because many prioritize access to materials and space rather than physical seating preferences. Gurumurthy and Padmamma (2023), found out that students value the available resources spaces for group and individual study more than comfort or aesthetics. Similarly, Rodrigues and Mandekar (2020) emphasized that students tend to focus more on functionality such as reliable access to computers, Wi-Fi, and study materials than ergonomic design furniture in the library. This suggests that while comfort can enhance the overall library experience, it may not be the most salient factor contributing to perceived engagement or productivity among students.

As to *technology infrastructure*, while essential, students may consider it a basic necessity rather than a motivator for engagement unless it fails. The non-significance of technology reveals a potential threshold effect: once baseline technology needs are met, additional technological enhancements may not drive proportional increases in engagement. This has important budgetary implications, suggesting that after meeting basic technology requirements, resources might be better allocated to other design elements. If the technology meets expectations, it may not stand out as a factor influencing behavior. This finding reflected on the Library Customer Satisfaction Survey (2024), which found out that a higher rating was rated by the users on library resources that

technology utilization. This indicate that the users are more engaged with other factors that may provide more for their academic needs.

Meanwhile, in relation to *academic performance*, when examining the *grade point average* (GPA) (B=-0.075, t=-1.04, p=.301), it was found to have no significant influence on students' engagement, leading to the non-rejection of the null hypothesis. This indicates that GPA may reflect a range of external and internal factors beyond the library environment. The lack of a significant relationship between GPA and library engagement challenges the common assumption that high-achieving students use the library more frequently. This finding demonstrates that libraries could design spaces and services that appeal to students across the academic performance spectrum rather than catering primarily to those with stronger academic records. Students who perform well academically may not necessarily engage more with the library, as engagement can also be driven by personality, learning style, or program requirements. As reflected in the study of Smithikrai et al. (2018) indicate that academic success is influenced by a student's level of social and academic integration into the institution, which includes factors like peer relationships, faculty interaction, and personal motivation. Moreover, study of Fasco et al. (2024) emphasizes that student engagement is shaped by a combination of institutional support, student effort, and individual attributes such as self-regulation and time management skills.

Additionally, program-specific demands can influence library use. For example, students in research-intensive programs or those requiring frequent access to scholarly resources may be more inclined to use the library, regardless of their GPA. Meanwhile, students in more practical or skill-based programs might rely on hands-on experience, thus showing lower library engagement but still maintaining strong academic performance. In this light, while the library environment plays a significant role in supporting academic work, it is important to consider it as one of many contributing factors to academic success rather than a sole determinant.

CONCLUSION AND RECOMMENDATIONS

Based on the findings, students rated the library design—particularly in terms of physical layout and organization, lighting and acoustics, ergonomics, technology infrastructure, and green spaces—as very good. Academic performance, as measured by GPA, also received a generally very good rating. Meanwhile, library engagement—evaluated through library visits, resource utilization, facility use, and program participation—was rated as occurring most of the time. Regression results showed that physical layout and organization, green spaces or nature integration, and lighting and acoustics significantly influenced student engagement. However, ergonomics, technology infrastructure and GPA did not show significant influence.

The School Administration may allocate funding for library redesign projects, develop long-term strategic plans, establish cross-functional teams for inclusive decision-making, and implement regular assessment protocols to support continuous improvement. In line with this, the Library Administration should create a design framework that balances aesthetics and functionality, gradually renovate spaces through strategic planning, partner with architectural firms specializing in educational facilities, and invest in the professional development of library staff. To further enhance the library's effectiveness, librarians might regularly collect user feedback, experiment with flexible furniture arrangements, develop programs that encourage effective space use, and collaborate with faculty to align spaces with pedagogical goals.

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