

The Relationship Between Teaching Space Design and Learning Outcomes

Mengdi Zhang

Nanjing Normal University of Special Education, Nanjing, China

This article focuses on the connection between classroom design and learning outcomes. It discusses how different spatial arrangements, sounds, lights, and furniture affect engagement, motivation, and attention. Good classroom design supports various classroom activities, encouraging group work and individual tasks. The flexible layouts encourage Interaction and engagement while sound management minimizes interruptions that support focus. On top of that, the use of general and task-oriented lighting enhances mood and alertness, thereby increasing grades. Also, comfortable furniture helps in achieving attention, hence improving learning. Thus, this holistic perspective indicates that purposeful space designs are important in enhancing students' academic performance and well-being.

Keywords: classroom design, learning outcomes, flexible layouts, acoustics, lighting, ergonomics, cognitive engagement, student motivation

Introduction

There is a drastic transformation in education with regards to how people learn, or in this case, how students learn as they shift from the traditional lectures to models which allow for active and collaborative learning, thus creating the need to assess learning environments. The way in which the layout, the lighting, the acoustics, and the ergonomic attributes of a classroom are designed directly affects the learners' cognitive engagement and the academic outcomes as well. There are various research studies that point out the importance of well-planned and designed teaching space to take into account different learning activities for the enhancement of effectiveness (Fardlillah & Suryono, 2019; Chan-Anteza, 2020). This paper focuses on the effective components of classroom design and their correlation with focus, engagement, and knowledge retention.

Flexible Layouts Encourages Interaction and Engagement

Research has revealed that learning space layout can either support or hinder social communication and interaction as well as group learning (Baum, 2018; de Borba et al., 2020). According to Saggars and Ashburner (2019), fixed and rigid rows of desks have been confirmed to hinder social interaction and collaborative learning, which is essential for academic success. In this regard, dynamic layouts, which allow for rearrangement and movement of furniture, facilitate a variety of activities, such that the students transition effortlessly from working alone to working in groups (Vercellotti, 2018). Such changes also allow for multiple ways of teaching, which

helps in keeping the students active, thus helping to develop their problem solving skills (Kariippanon et al., 2019). The arrangements also benefit the teachers in that they allow the management and student engagement in class to be more effective (Saggers & Ashburner, 2019). Students' active engagement in the learning process is nevertheless greatly aided by the availability of such reconfigurable spaces, which seems to heighten the students' feeling of ownership and control over their own learning. This is important because, research indicates that such a feeling is likely to increase motivation among the learners (Vercellotti, 2018).

Acoustics, Noise Control, and Light Reduces Distractions

Researchers have established that noise distractions contribute significantly to students' attention and stress (Tomek & Urhahne, 2022). An appropriate sound environment can enhance communication between students and teachers, which in turn helps in focusing and understanding. Research also shows that schools providing controlled noise levels enhance classroom performance in particular where complex learning takes place (Caviola et al., 2021). A classroom design which includes the use of acoustic panels, carpets and sound absorbent curtains helps in reducing noise pollution from other activities (Mealings, 2022). Also, the presence of soundproofing increases speech intelligibility, which is more important for young children, learners of a foreign language who require audio support to facilitate understanding speech.

According to Baeza Moyano et al. (2020), natural light enhances the mood of students, reduces their fatigue, and makes them more active. Night classes can be very effective if the students have a source of high-quality artificial lights to keep them awake and comfortable by preventing tension in their eyes (Dong & Zhang, 2021). Research shows that students are able to perform better in standardized test when placed in a classroom that has natural light as opposed to another one which is poorly lit (Manca et al., 2020). Effective lighting design considers light's energy placement and its sources as well in order to achieve comfort. Baeza Moyano et al. (2020), posit that to support action oriented activities, task lighting is strategically positioned and it is known that this contributes in managing energy as focus on such activities can be draining as the day progresses.

Furniture and Ergonomics Support Physical Comfort and Focus

The type of furniture in a classroom is important not only in ensuring comfort for students but also in enhancing their scholastic performance (Widiastuti et al., 2020). When students are provided with ergonomic chairs and desks that are height adjustable, they are able to stay on task for extended periods of time thus improving concentration while minimizing the risk of physical injuries (Salary et al., 2018). Classrooms that have seating which encourages movement may reduce the impact of such constraints on students' development since hyperactive or restless children would not have to sit still for long (Baafi, 2020). Studies show that in addition to improving comfort, furniture designed to maintain certain postures often aiding attentiveness and cognitive abilities (Widiastuti et al., 2020). For instance, in schools where children are allowed to choose their seating position comfort levels have gone up with the reports indicating that this has more to do with engagement of the students in the class.

Classroom Decor and Environment: Creating an Inviting Space

The design and adornment of a classroom plays a major role in the emotional health and studying of the children (Ghaziani, 2021). Cozy and friendly environments, characterized by educational materials, students' drawings, or even plants, give children a feeling of acceptance and possession. Van Dijk-Wesselius et al. (2018) suggest that such natural aspects may be of side effects, however, they may promote learning interest by reducing stress and distracting ability (Lindemann-Matthies et al., 2021). Studies in environmental psychology show that such students in classrooms furnished with outdoor features tend to be attentive and involved due to the de-stressing features of the elements that encourage a restful environment appropriate for learning (Marcarini, 2021). Engaging in enhancing the classroom environment encourages an active learning space which translates to the students' lowered anxiety and readiness to learn.

Conclusion

Designing classrooms efficiently is the cornerstone of promoting a learning friendly atmosphere. Social interaction is encouraged in flexible layouts while optimal acoustics help to eliminate distractions. Correct lighting and ergonomic furniture strategies improve focus and comfort such that students can actively participate. Also, a decor that makes students relaxed and feeling appreciated can go a long way in increasing motivation and cognitive engagement. Thus, combining all these aspects makes it possible for schools to build spaces that work towards student academic achievement and health. As education remains dynamic, the practice of building adaptive, appropriate learning settings will be imperative for the coming generations. Further studies could aim at longitudinal studies investigating the effects of refurbished classrooms on the performance of the target children over time, in order to support the significance of space in education.

References

- Baafi, R. K. A. (2020). School physical environment and student academic performance. *Advances in Physical Education*, 10(2), 121-137. <https://doi.org/10.4236/ape.2020.102012>
- Baeza Moyano, D., San Juan Fernandez, M., & Gonzalez Lezcano, R. A. (2020). Towards a sustainable indoor lighting design: Effects of artificial light on the emotional state of adolescents in the classroom. *Sustainability*, 12(10), 4263. <https://doi.org/10.3390/su12104263>
- Baum, E. J. (2018). Learning space design and classroom behavior. *International Journal of Learning, Teaching and Educational Research*, 17(9), 34-54. <https://doi.org/10.26803/ijlter.17.9.3>
- Caviola, S., Visentin, C., Borella, E., Mammarella, I., & Prodi, N. (2021). Out of the noise: Effects of sound environment on maths performance in middle-school students. *Journal of Environmental Psychology*, 73, 101552. <https://doi.org/10.1016/j.jenvp.2021.101552>
- Chan-Anteza, T. K. (2020). Management of a conducive classroom environment: A meta-synthesis. *Management*, 11(26), 54-70. <http://dx.doi.org/10.7176/JEP/11-26-06>
- de Borba, G. S., Alves, I. M., & Campagnolo, P. D. B. (2020). How learning spaces can collaborate with student engagement and enhance student-faculty interaction in higher education. *Innovative Higher Education*, 45(1), 51-63. <https://doi.org/10.1007/s10755-019-09483-9>
- Dong, Y., & Zhang, X. (2021). Study on the effect of awakening daylight in dormitories on morning alertness, mood, fatigue and sleep quality of college students. *Building and Environment*, 203, 108060. <https://doi.org/10.1016/j.buildenv.2021.108060>
- Fardlillah, Q., & Suryono, Y. (2019, April). Physical environment classroom: Principles and design elements of classroom in early childhood education. *International Conference on Special and Inclusive Education (ICSIE 2018)* (pp. 120-127). Atlantis Press. <https://doi.org/10.2991/icsie-18.2019.23>

- Ghaziani, R. (2021). Primary school design: Co-creation with children. *Archnet-IJAR: International Journal of Architectural Research*, 15(2), 285-299. <https://doi.org/10.1108/ARCH-07-2020-0132>
- Kariippanon, K. E., Cliff, D. P., Lancaster, S. J., Okely, A. D., & Parrish, A. M. (2019). Flexible learning spaces facilitate interaction, collaboration and behavioural engagement in secondary school. *PLoS one*, 14(10), e0223607. <https://doi.org/10.1371/journal.pone.0223607>
- Lindemann-Matthies, P., Benkowitz, D., & Hellinger, F. (2021). Associations between the naturalness of window and interior classroom views, subjective well-being of primary school children and their performance in an attention and concentration test. *Landscape and Urban Planning*, 214, 104146. <https://doi.org/10.1016/j.landurbplan.2021.104146>
- Manca, S., Cerina, V., Tobia, V., Sacchi, S., & Fornara, F. (2020). The effect of school design on users' responses: A systematic review (2008-2017). *Sustainability*, 12(8), 3453. <https://doi.org/10.3390/su12083453>
- Marcarini, M. F. (2021). Pedarchitecture: Which learning environments for the personalisation of teaching and learning? An educational architecture for the schools of the future. *Teacher Transition into Innovative Learning Environments: A Global Perspective*, 85-107. http://dx.doi.org/10.1007/978-981-15-7497-9_8
- Mealings, K. (2022). Classroom acoustics and cognition: A review of the effects of noise and reverberation on primary school children's attention and memory. *Building Acoustics*, 29(3), 401-431. <https://doi.org/10.1177/1351010X221104892>
- Saggers, B., & Ashburner, J. (2019). Creating learning spaces that promote wellbeing, participation and engagement: Implications for students on the autism spectrum. *School Spaces for Student Wellbeing and Learning: Insights from Research and Practice*, 139-156. https://doi.org/10.1007/978-981-13-6092-3_8
- Salary, S., Holliday, L., Keese, M., & Wachter, H. P. (2018). Building features in schools that influence academic performance. *Journal of Civil Engineering and Architecture*, 12(3), 163-197. <https://pdfs.semanticscholar.org/f5de/7bd136e9b082ffe16d0a00383702d37d1650.pdf>
- Tomek, R., & Urhahne, D. (2022). Effects of student noise on student teachers' stress experiences, concentration and error-correction performance. *Educational Psychology*, 42(1), 64-82. <https://doi.org/10.1080/01443410.2021.2002819>
- Van Dijk-Wesselius, J. E., Maas, J., Hovinga, D., Van Vugt, M. V. D. B. A., & Van den Berg, A. E. (2018). The impact of greening schoolyards on the appreciation, and physical, cognitive and social-emotional well-being of schoolchildren: A prospective intervention study. *Landscape and urban planning*, 180, 15-26. <https://doi.org/10.1016/j.landurbplan.2018.08.003>
- Vercellotti, M. L. (2018). Do interactive learning spaces increase student achievement? A comparison of classroom context. *Active Learning in Higher Education*, 19(3), 197-210. <https://doi.org/10.1177/1469787417735606>
- Widiastuti, K., Susilo, M. J., & Nurfinaputri, H. S. (2020). How classroom design impacts for student learning comfort: Architect perspective on designing classrooms. *International Journal of Evaluation and Research in Education*, 9(3), 469-477. <https://eric.ed.gov/?id=EJ1274718>