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Impact of Classroom Aspect Ratios on Spatial Flexibility and Utilization Efficiency: A Comparative Analysis

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Abstract:

The study examines the impact of classroom aspect ratios on spatial flexibility and efficiency by comparing the dominant rectangular classrooms in Egypt with the more semi-square configurations found in England. The research explores how these differing geometries affect the adaptability of teaching spaces, circulation patterns, and the implementation of contemporary, student-centered pedagogies. Through document analysis, evaluation of international case studies, and a practical redesign experiment, the study assesses classroom performance in terms of spatial organization, movement efficiency, and flexibility. Findings reveal that semi-square classrooms offer notable advantages, including enhanced re-configurability of student groups, equitable access to instructional zones, and improved movement dynamics. Quantitatively, redesigned semi-square layouts reduce corridor travel distances and minimize wasted transitional space of total area. These configurations promote inclusive learning by eliminating marginal "shadow zones" and expanding golden and semi-golden zones that facilitate student-teacher contact for optimal interaction and engagement. The study underscores the long-term economic and functional benefits of adaptable classroom designs, particularly in resource-constrained environments. By facilitating modular furnishings and flexible spatial arrangements, semi-square classrooms support diverse teaching styles, improve student interaction, and align with modern educational goals. This research contributes original insights into school design by linking spatial geometry with pedagogical outcomes, offering a practical framework for future educational architecture that prioritizes inclusivity, adaptability, and spatial efficiency.

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Classroom Aspect Ratio, Efficient Space, Flexible Learning Environments, Pedagogical Adaptability, Educational Space Optimization.

References:

1- Author. (2024). Unpublished field data collected during research on Helwan Metro Station Relocation.
2- Baepler, P. W. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. Computers & Education, 78, 227–236. doi:10.1016/j.compedu.2014.06.006
3- Barrett, P. Z. (2013). A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning. Building and Environment., 59, 678-689. doi:10.1016/j.buildenv.2012.09.018
4- Barrett, P. Z. (2019). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. Building and Environment., 89, 118-133.
5- Beichner, R. J. (2014). History and Evolution of Active Learning Spaces. New Directions for Teaching and Learning(137), 9-16. doi:10.1002/tl.20081
6- Blackmore, J. B. (2011). Research into the Connection between Built Learning Spaces and Student Outcomes. Department of Education and Early Childhood Development of victoria state.
7- Cheryan, S. Z. (2014). Designing classrooms to maximize student achievement. Policy Insights from the Behavioral and Brain Sciences., 1(1), 4-12.
8- Cleveland, B. &. (2014). The evaluation of physical learning environments: A critical review of the literature. Learning Environments Research, 17(1), Learning Environments Research.
9- Dudek, M. (2015). Schools and Kindergartens: A Design Manual. Birkhäuser.
10- Durán-Narucki, V. (2008). School building condition, school climate, and academic performance. Journal of Environmental Psychology., 28(4), 201-214. doi:10.1016/j.jenvp.2008.01.003
11- Education, D. f. (2014, March 11). Baseline designs: 630 place primary school. Retrieved from GOV.UK: https://www.gov.uk/government/publications/baseline-designs-630-place-primary-school
12- Elshater, A. (2017). Classroom design and pedagogical approaches in Egyptian schools. Egyptian

Journal of Education., 45(2), 89-104.
13- El-Zeiny, Y. (2003). Educational Facilities in Egypt Throughout the Ages. Cairo: General Authority for Educational Buildings.
14- Fisher, K. (2005). Research into Identifying Effective Learning Environments.Evaluating Quality in Educational Facilities. OECD.
15- Henshaw, R. C. (2011). The impact of flexible classroom environments on student engagement. Journal of Learning Spaces., 3(2), 45-60.
16- Ibrahim, N. &. (2013). Post-occupancy evaluation of school classrooms: Case study of primary schools in Malaysia. Journal of Asian Architecture and Building Engineering., 12(1), 23-29.
17- Irmgard Fuchs, R. D. (2024). Designing Active Learning Spaces:what to consider? Utrecht: Utrecht University.
18- Leiringer, R. &. (2011). Schools for the twenty-first century: School design and educational transformation. British Educational Research Journal., 37(6), 915-934.
19- Montello, D. R. (2007). The contribution of space syntax to a comprehensive theory of environmental psychology. 6th International Space Syntax Symposium.
20- Montgomery, T. (2008). Space matters: The impact of classroom design on student learning. Oxford University Press. Retrieved from DesignShare Journal.
21- Park, Y. &. (2014). Movable seating and classroom dynamics: A study on active learning environments. Educational Design Review., 12(1), 75-89.
22- Park, Y. &. (2014). The effects of classroom seating location on student learning: A study in higher education. International Journal of Educational Development., 34(1), 22-31.
23- Talbert, R. &.-A. (2019). Active learning classrooms: History, research, and practice. International Journal of Educational Technology in Higher Education., 16(1), 1-13.
24- University., U. (2024). A Report on Flexible Learning Spaces and Student Engagement. Utrecht University Press.
25- Veloso, L. A. (2021). Learning Spaces and Educational Transformation: Policies, Practices, and the Material Conditions of Schooling. Springer.
26- Woolner, P. H. (2007). A sound foundation? What we know about the impact of environments on learning and the implications for Building Schools for the Future. Oxford Review of Education., 33(1), 47-70.

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