Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

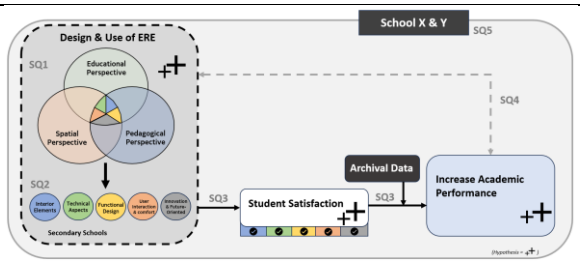
The graduation plan consists of at least the following data/segments:

Personal information	
Name	**Beyza Tokyay**
Student number	5235464

Studio		
Name / Theme	Theme 7A Valuation and Value	
Main mentor	Dr. M.H. Arkesteijn	Architecture and the Built Environment, Real Estate Management
Second mentor	Dr. Ir. S. Zijlstra	Architecture and the Built Environment, Real Estate Management
Argumentation of choice of the studio	The graduation topic aligns with the theme of 'Valuation and Value' studio by exploring how ERE contributes to societal value through improved student satisfaction and learning outcomes. This connection is rooted in the studio's focus on understanding the interplay between built environments and their value to users and stakeholders.	

Graduation project	
Title of the graduation project	**The Impact of Educational Real Estate on Enhancing Academic Performance**
Goal	
Location:	Delft
The posed problem,	In secondary education, the quality of the physical learning environment plays a crucial yet underexplored role in its relation to academic success. Existing research has predominantly focused on factors such as curriculum design, teaching quality, and indoor environmental quality (IEQ), **often neglecting the broader relationship between the design and use of educational real estate (ERE) and its influence on academic performance.**

	Current studies frequently approach this topic from an organizational perspective, examining how schools operate as institutions. However, the focus leaves a critical gap in understanding how students – the primary users of educational spaces – perceive and interact with their learning environments. There is a lack of insights into how ERE characteristics, such as spatial flexibility, user control, and functional design, influence student satisfaction and, in its turn, academic performance. This research seeks to address this gap by focusing on how the **design and use of ERE can enhance academic performance** through improved student satisfaction by secondary school students. By identifying and quantifying the characteristics of ERE that are most relevant to students' experiences, this study aims to provide actionable insights that go beyond traditional metrics, offering a new lens to evaluate and optimize educational spaces within secondary schools.
research questions and	Main research question: **"How can the design and use of educational real estate enhance academic performance by increasing student satisfaction in secondary schools?"** Sub-questions: 1- How do different perspectives, such as pedagogical, educational, and spatial perspectives, translate into design requirements for educational learning environments? 2- Which real estate characteristics are identified in the literature as essential for improving the learning environment and learning outcomes? 3- How do secondary school students experience their current learning environment, and how does this influence their satisfaction and performance? 4- What role does the use and design of educational real estate play in academic performance? 5- How can insights into design and use be translated into concrete recommendations for the future management of educational real estate?

	
design assignment in which these result.	The findings aim to provide school boards, architects, and policy makers with a practical framework that can help design spaces that actively support learning and academic performance within school buildings.

By integrating different perspectives on education - such as pedagogical, educational, and spatial perspectives - into concrete design principles, this research establishes a clear set of ERE-characteristics, including aspects such as spatial flexibility, functionality, and user control. These principles will be used to capture students' perceptions of their current learning environments through surveys, assessing their satisfaction and exploring how this correlates with their academic achievements. By analyzing patterns across different cases, the research seeks to deliver evidence-based, practical guidelines that enable school boards, architects, and policy makers to optimize existing facilities and inform the design of future educational environments in secondary schools.

Process

Method description

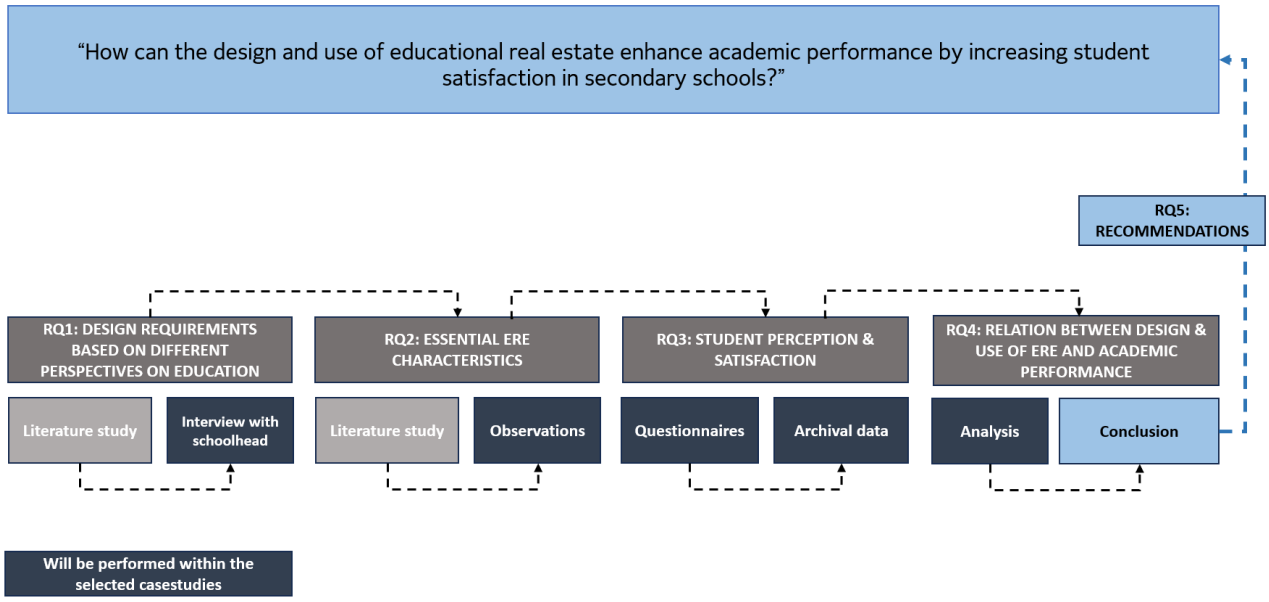
To answer the main research question, this study adopts a mixed-methods approach. This method combines qualitative and quantitative data collection to gain an in-depth understanding of the impact of ERE on student satisfaction and academic performance of secondary school students. The research methodology includes a combination of literature review, case studies, surveys and interviews. The use of multiple data collection methods ensures triangulation, enhancing the reliability and validity of the research findings.

The case studies form the core of this research. Two schools within the same school board will be selected, with significant differences in real estate characteristics serving as the basis for a comprehensive analysis. This approach enables an examination of the influence of specific real estate characteristics on student performance and satisfaction while the vision towards education remains the same.

Through literature review the diverse perspectives on education, such as educational, pedagogical and spatial perspectives, will be explored and translated into real estate specifications. The literature review provides an initial foundation for understanding, while qualitative tools, such as interviews with school boards / school principals, about their view on education and the performance of their students, and observations within the case studies, in which I will focus on space usage, flexibility of the layout, presence of essential design features, etc., are used to deepen these insights. These interviews and

observations will be conducted at the selected schools and aim to answer the first two sub-questions (for details about the case selection see below).

Based on the insights derived from SQ1 and SQ2, a survey will be developed as a quantitative instrument to measure student's perceptions of specific real estate characteristics. The survey will be focused on analyzing student satisfaction within their learning environment and the perceived impact on their motivation and concentration. The survey will be distributed to students in the selected case study schools, providing a standardized method for capturing these aspects. It will be distributed among upper-grade students from the same level of education (mavo, havo or vwo) that have classes in the selected classroom/study spaces. By combining their output with archival data – grades and performances – provided by the schools, the relationship between satisfaction with the learning environment and academic performance will be analyzed (SQ3). Based on the analysis, I will try to determine how real estate characteristics and student satisfaction influence their academic outcomes (SQ4). These insights will contribute to answering the main research question. Finally, the findings will form the basis for concrete recommendations (SQ5) for architects, school boards, and other stakeholders, with the aim of managing and designing future educational real estate more effectively.



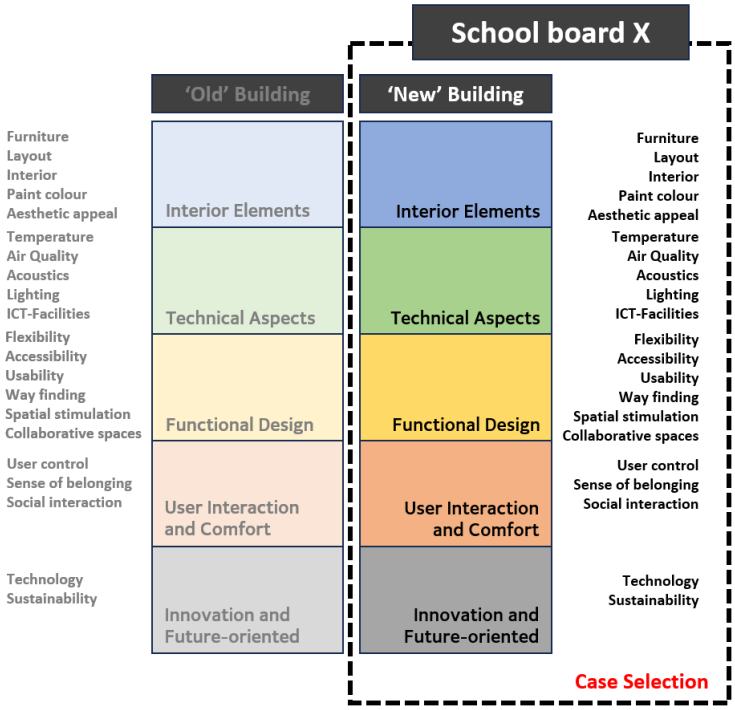
Case selection criteria

The case selection is a critical step in this research, as it determines the validity and relevance of the findings. The selection process has been designed to include two 'newly-built' schools, from the same school board to keep the same educational perspective, with modern designs but different architectural features, which are constructed within the last 10 years. This approach allows for a nuanced comparison, ensuring that the analysis captures the impact of varying real estate attributes within a controlled timeframe and context.

The selection of cases will follow a structured process designed to ensure consistency and relevance:

1- Location: schools must be located in the same or similar (sub)urban neighbourhoods with similar SES-indicators (socio-economic status), ensuring that external environmental factors remain comparable.
2- Architectural design: both schools must represent modern, newly constructed facilities that reflect contemporary principles of flexibility, sustainability, and student-centred design. Additionally, they must differ from each other in ERE characteristics (see figure below).
3- Operational period: schools must have been operational for at least one year, allowing users to adapt to the environment and provide meaningful feedback.
4- Building age: the buildings must not be older than 10 years, to set a clear standard of quality.
5- Focus on learning spaces: the analysis will focus on study rooms / classrooms, as these are core spaces directly influencing the educational experience.
6- Perspective on education: both schools need to be from the same school board.

This structured selection process, coupled with the inclusion of SES as a control variable, ensures that the study examines the influence of ERE design in a fair and consistent context. This will strengthen the reliability and relevance of the findings.



Literature and general practical references

1. Athiyaman, A. (1997). Linking student satisfactio and service quality perceptions: the case of university education. *European Journal of Marketing, 31 (7)*, pp. 528-540. doi:10.1108/03090569710176655
2. Baarda, B., Bakker, E., Fischer, T., Julsing, M., Peters, V., van der Velden, T., & de Goede, M. (2013). *Basisboek Kwalitatief onderzoek: Handleiding voor het opzetten en uitvoeren van kwalitatief onderzoek.* The Netherlands, Groningen: Noordhoff Uitgevers.
3. Babin, B., & Griffin, M. (1998). The nature of satisfaction: an updated examination and analysis. *Journal of Business Research, 41 (2)*, pp. 127-136. doi:10.1016/S0148-2963(97)00001-5
4. Barrett, P., & Zhang, Y. (2009). *Optimal Learning Spaces Design Implications for Primary Schools.* England, Salford: University of Salford.
5. Barrett, P., Zhang, Y., Moffat, J., & Kobbacy, K. (2013). A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning. In *Building an Environment, 59* (pp. 678-689). Salford, UK: Maxwell Building. doi:https://doi.org/10.1016/j.buildenv.2015.02.013
6. Birtish Council For School Environments . (2010). *School environments charter: A blueprint for British Schools.* London: BSCE.
7. Bluyssen, M., Kim, D., Eijkelenboom, A., & Ortiz-Sanchez, M. (2020). *Workshop with 335 primary school children in The Netherlands What is needed to improve the IEQ in their classrooms?* Delft: Delft University of Technology.
8. Bowen, G. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal, 9 (2)*, pp. 27-40.
9. Dahlan, S. (2013). The Study of Buildings Design Elements and Users Satisfaction: Students Satisfaction on Educational Buildings Design Elements in Comparison to their Academic Productivity. *Env. Design Sci., Vol 7*, pp. 237-254. doi:10.4197/ Env. 7.7
10. de Vries, J. (2007). *Prestaties van vastgoed: Sturen op de toegevoegde waarde van vastgoed.* Delft: Delft University Press.
11. den Heijer, A. (2011). *Managing the university campus: Information to support real estate decisions.* Delft: Eburon Academic Publishers.
12. Dewulf, G., Krumm, P., & de Jonge, H. (20000). *Successful corporate real estate strategies.* The Netherlands, Nieuwegein: Arko Publishers.
13. Elliott, K. (2003). *Key determinants of student satisfaction.* Mankato: Minnesota State University.
14. Goodman, L. (1961). Snowball sampling. *The Annals of Mathematical Statistics, 32 (1)*, pp. 148-170.
15. Hämäläinen, R., & Vähäsantanen, K. (2011, august 17). Theoretical and pedagogical perspectives on orchestrating creativity and collaborative learning. *Educational Reseach Review*, pp. 169-184.
16. Haynes, B. (2000). An evaluation of the impact of the office environment on productivity. *Journal of Facilities Management, 1(1)*, pp. 21-36.
17. Higgins, S., Hall, E., Wall, K., Woolner, P., & McCaughey, C. (2005). *The impact of school environments: A literature review.* UK: University of Newcastle.
18. Hossain, S., Nurunnabi, M., & Anwar, B. (2022). Sustainable academic performance in higher education: a mixed-method approach. *Interactive Learning Environments, Vol. 30, NO. 4*, pp. 707-720. doi:https://doi.org/10.1080/10494820.2019.1680392
19. Jalali, S., & Wohlin, C. (2012). Systematic Literature Studies: Database searches vs backward snowballing. *Systematic Literature Studies: Database Searches vs. Backward Snowballing* (pp. 29-38). Sweden, Lund: Association for Computing Machinery (ACM). doi:10.1145/2372251.2372257
20. Joroff, M. (1993). *Strategic management of the fifth resource: corporate real estate.* Industrial Development Research Foundation.
21. Leaman, A. (2002). *User Needs and Expectations.* Blackwell Publishing.
22. Levin, H. (2003). *Designing for people: What do building occupants really want?* 2003: Building Ecology Research Group.

23. McGrath, K., McGrath, K., Wang, B., Jackson, B., Kämpf-Dern, A., Malone, K., Geurts, T. (2021). The Future of Real Estate Education: A Multi-faceted Perspective. *Joural of Real Estate Practice and Education*, pp. 40-55.
24. Rivlin, L., & Weinstein, C. (1984). Educational settings as contexts for learning: An ecological analysis. *Review of Educational Research, 54(3)*, pp. 546-571.
25. Sawyer, R. (2004). Creative teaching: Collaborative discussion as disciplined improvisation. *Educational Researcher, 33(2)*, pp. 12-20.
26. Szymanski, D., & Henard, D. (2001). Customer satisfactio: A meta-analysis of the empirical evidence. *Journal of the Academy of Marketing Science, 29(1)*, pp. 16-35. doi:10.1177/0092070301291002
27. Temple, P. (2008). Learning spaces in higher education: An under-researched topic. *London Review of Education, 6(3)*, pp. 229-241.
28. Thomas, J. (2012). Creating Effective Learning Environments. In K. Alexander, & I. Price, *Managing organisational ecologies* (pp. pp. 212-221). London: Routledge.
29. van Vliet, E. (2007). *Flexibele leeromgevingen en hun impact op onderwijsorganisaties.* Amsterdam: Vrije Universiteit.
30. Yang, Z., Becerik-Gerber, B., & Mino, L. (2013). A study on student perceptions of higher education classrooms: impact of classroom attributes on student satisfaction and performance. *Building and Environment, 70*, pp. 171-188. doi:10.1016/j.buildenv.2013.08.030

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

The graduation topic aligns with the theme of 'Valuation and Value' studio by exploring how ERE contributes to societal value through improved student satisfaction and learning outcomes. This connection is rooted in the studio's focus on understanding the interplay between built environments and their value to users and stakeholders.

Within the Management in the Built Environment (MBE) track, this research contributes to the strategic and operational dimensions of real estate management. By examining how specific real estate characteristics influence student experiences and academic achievements, the projects advances the MBE track´s mission to create efficient, user-centred, and sustainable real estate solutions. Furthermore, the project integrates theoretical insights from architecture, education, and psychology, showcasing the multidisciplinary nature of MSc. Architecture, Urbanism, and Building sciences programme.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

This research addresses a critical and underexplored gap by focusing on how educational real estate directly impacts student satisfaction and academic performance. While existing studies often prioritize organizational or technical factors, this project emphasizes the perspectives of students—the primary users of these spaces. By doing so, it provides actionable insights to optimize the design and

management of educational environments, ensuring they are not only functional but also enhance academic performance by students.

The findings have significant societal relevance, as improved learning environments contribute to equitable education, better student well-being, and long-term academic success. Professionally, the research equips architects, school boards, and policymakers with evidence-based guidelines to create future-ready educational facilities. Scientifically, it introduces a new perspective by demonstrating how user-centred design in real estate can directly support educational achievement and societal progress.