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	Bauke Meijer
Student number	4722906

Studio		
Name / Theme	Value and Valuation	
Main mentor	Monique Arkesteijn	Real Estate Management
Second mentor	Vitalija Danivska	Real Estate Business
Argumentation of choice of the studio	Of the different labs available in the graduation programme of Management and the Built Environment, value and valuation aligned the most with my interests.	

Graduation project	
Title of the graduation project	Stress in the Learning Environment
Goal	
Location:	A Dutch University
The posed problem,	University students often experience high levels of stress, which can negatively impact their academic performance and well-being (Kessler, 2007); Auerberg et al, 2016). The physical learning environments in which they study and engage in educational activities play a significant role in influencing this stress. However, the relationship between these environments, particularly newly designed spaces, and student stress remains underexplored. Understanding this relationship is essential for designing and managing university spaces that promote student well-being and academic success.
research questions and	Main Research Question: “What is the relationship between (new) physical learning environments and stress among students at Dutch Universities?”

	Sub Question 1: “What defines a (new) university learning environment?” Sub Question 2: “What are the different types of stress relevant to university students in learning environments?” Sub Question 3: “How can different types of stress in university students be measured?” Sub Question 4: “What is known about the relationship between university learning environments and stress among students?” Sub Question 5: “Do new university learning environments influence stress among students differently than traditional learning environments? Sub Question 6: “What observable characteristics of (new) university learning environment influence stress among university students?”
design assignment in which these result.	What is the ‘design’ of the physical university learning environment and how it is Influencing stress in students.

Process

Method description

This study employs an exploratory mixed-methods approach to investigate the relationship between physical university learning environments and students' perceived stress. The research combines desk research and empirical experimentation, integrating theoretical insights with real-world observations to provide a comprehensive understanding of how learning spaces influence stress-related outcomes.

Desk Research

The desk research phase establishes the theoretical foundation by systematically reviewing existing literature on physical learning environments, student stress types, and stress measurement methods. It addresses research questions related to defining modern university learning spaces, understanding stress types, and exploring the relationship between these environments and student stress. Academic journals, reports, and peer-reviewed studies are analyzed to synthesize current knowledge and identify gaps that guide the empirical phase.

Empirical Research

The empirical phase explores whether modern university learning environments influence stress differently than traditional spaces and identifies observable characteristics of these environments affecting stress. A real-world A/B case study will be conducted, where participants engage in self-directed study sessions in both traditional (older) and modern (newer) learning spaces. Tasks include

a cognitive stress-inducing test (e.g., the Stroop Test) and self-reported stress surveys. Random assignment ensures balanced conditions across groups, and environmental variables such as noise and lighting will be controlled as much as possible.

Data Collection
To comprehensively assess stress responses, data will be collected across three domains:
- Psychological Data: Self-reported stress levels will be measured using the Perceived Stress Scale (PSS), a validated instrument providing insights into participants' subjective stress perceptions.
- Physiological Data: Electrodermal activity (EDA) will be monitored using Moodmetric stress rings, which require a 24-hour calibration period. Data will be processed using Python and cleaned with software like Kubios to remove artefacts.
- Cognitive Data: The Stroop Test, or a similar test, which measures cognitive performance under stress, will provide quantitative insights into executive functioning in the two environments.

The study will involve 20 participants, consistent with guidelines for exploratory studies (Johanson & Brooks, 2009). To balance naturalistic conditions with experimental control: Participants will be organized into groups of five per session. Each group will complete identical tasks in both old and new environments on separate days. Four sessions per environment type will be conducted, with a total data collection period of two weeks. This arrangement ensures that external influences, such as academic pressure and peer dynamics, are minimized while simulating realistic study conditions. The within-subject design allows direct comparisons across the two environments.

By doing this research the sub questions will be answered and an answer to the main research question can be formulated, hopefully resulting into added knowledge on how to add value to the real estate of Dutch Universities.

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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)?

After following the master track Management in the Built Environment (MBE), I have gained a comprehensive understanding of the intersection between management, real estate, and processes within the built environment. This track has equipped me with knowledge in managing real estate portfolios, understanding user needs, as well as organizational objectives. Key aspects such as building performance, the financial implications of construction and real estate decisions, and the adaptive reuse of the existing building stock have been integral to my studies.

In the context of my graduation project, the focus on university learning environments aligns perfectly with the emphasis on user-centered approaches and the strategic management of real estate taught in MBE. Universities, as institutions, operate complex portfolios of real estate, and understanding the evolving needs of their users, students, is crucial for ensuring that their spaces remain relevant, effective, and supportive of well-being and performance. The project is a natural extension of MBE, combining evidence-based research with real-world applications to explore how physical spaces impact users' experiences and outcomes.

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

The outcome of this research holds relevance in the broader social, professional, and scientific contexts. From a social perspective, universities are not just educational institutions but also spaces where students spend a substantial portion of their time. Ensuring these environments are conducive to learning and well-being is essential for fostering positive educational experiences and supporting students' mental health. By examining the relationship between physical learning environments and stress, this research addresses a critical issue that impacts student performance, satisfaction, and overall success.

Professionally, the findings of this study could provide valuable insights for university real estate managers, architects, and facility planners. As universities continuously seek to adapt to changing pedagogical needs and growing student populations, understanding how physical spaces affect their users becomes crucial. The results of this research can serve as a tool for assessing whether newly designed spaces effectively meet user needs, while also offering guidelines for enhancing existing buildings. This could inform decisions regarding renovations, retrofitting projects, or even strategic investments in real estate portfolios to optimize space utilization and user satisfaction.

In the scientific domain, this study contributes to the growing body of knowledge on the impact of built environments on human behavior and well-being. By focusing on stress as a measurable outcome, it bridges the gap between environmental psychology, and real estate management. The use of mixed-methods research, combining psychological, physiological, and cognitive measurements, provides a robust framework for future studies to explore similar topics. Furthermore, this research could inspire interdisciplinary collaboration, bringing together expertise from design, management, and behavioral sciences to create more human-centered and evidence-based approaches to campus planning.