

Building Performance Assessments at the Living Lab NRW as an Educational Resource

While building performance simulation (BPS) is becoming increasingly vital for sustainable building design, in alignment with the net zero carbon by 2050 target, under growing climate and regulatory pressures, its pedagogical integration faces challenges such as students' limited knowledge in building physics and overreliance on simulation outputs, therefore difficulty in understanding abstract simulation models.

This study focuses on the integrated adoption of building performance assessment methods, such as BPS, monitoring, testing, and measurements in order to create teaching materials to promote building performance learning in architectural and engineering education. The research is structured on the thesis that providing real performance data obtained from existing buildings as a reference point in simulation studies can reduce the level of abstractness of BPS and thus increase the effectiveness of the building performance learning experience.

The Living Lab NRW, hosted by the University of Wuppertal, serves as a research, education, and public knowledge center for a sustainable built environment. It consists of eight solar-powered experimental houses designed and constructed during the Solar Decathlon Europe 21/22. Utilizing these houses as case studies, the development of teaching materials is structured in five phases:

- (I) Planning and setting up monitoring systems, measurements, and tests,
- (II) Collection of real performance data,
- (III) Creation and calibration of BPS models using the data,
- (IV) Processing data into educational materials, and
- (V) Use of it in building performance teaching.

This paper presents results from the first three phases, focusing on energy and daylighting models of selected Living Lab houses. Two main assessments are highlighted: thermal and daylight performance comparisons via measurements, tests, calculations, and simulations.

This study not only contributes to the development of educational materials on building performance but also shares experiences from the data collection and processing phases, offering key insights and practical recommendations for educators in building science.

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