Design-Build: A Real-World Experimental Pedagogy for Architectural Education

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In 2016, Team WashU was awarded a $50,000 teaching grant from the Prestress/Precast Concrete Institute (PCI) and a $300,000 start-up grant from the Office of Chancellor Mark S. Wrighton of Washington University in St. Louis to develop a two-year design studio and seminar courses based on the U.S. Solar Decathlon student competition. The Solar Decathlon series of architectural design studios were part of an academic program closely collaborated with building industry sponsors. This program created new learning networks that combine education and research activities into a holistic, valuable hands-on student design experience. More than 100 WashU architectural students were involved at different stages, including the collaborative design and building process of a solar decathlon house. The project provided our students’ unique opportunities for explorations of high-performance precast concrete designs at an advanced level of creative inquiry, design integration, and technical resolution through a systematic approach. In Fall 2017 we delivered one of the most visually appealing, affordable, comfortable, sustainable, and energy-efficient homes for the Solar Decathlon competition. This project was an excellent demonstration of how prefabricated, self-sufficient, and resilient houses can mitigate climate change. The Solar Decathlon house of Team WashU, the Crete House, was awarded the second place in architectural design in the 2017 U.S. Solar Decathlon competition.
107th ACSA Annual Meeting Project  
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Crete House: Solar Decathlon 2017 Team WashU

The Crete House studio is part of the Solar Decathlon 2017 competition. The studio took place in Fall of 2016 and Spring of 2017. The studio aimed to develop an integrated architecture solution for a solar-powered house. The studio was focused on BIM and the design and development that help the residents exhibit resilience. Our house produced its occupants’ food and energy through innovative passive design. The Crete House is designed to adapt to the changing needs of the household over the lifetime of its residents. The unique design of the Crete House is based on the principles of Universal Design. The house was designed to be affordable, efficient, and adaptable.

Pedagogy - Construction design

University-wide Education Integration

The Solar Decathlon project creates many opportunities for education exper-  
ences and multidisciplinary project-based laboratories. We host an  
annual event with presentations and roundtable discussions throughout different colleges and departments in the university. Student learning in the studio was primarily driven by the design process of the projects and the unique architecture design that was created by the students. In the  
process of the project, the design-build process was integrated with the  
students' academic programs and syllabus. The studio focused on the integration of the academic and the learning environment was created for training future leaders in the building industry.

Fabrication - Student Rubber Mold Making

Resilience and Sustainability

Solar Decathlon Competition

Construction Process

The solar house is designed to be resilient and sustainable. During the design-build process, the students took six days to finish the specific components. The team took four days to finish the assembly of precast structural components on the site and six weeks to finish the construction of the entire project.

Production - Fabrication in Factory

Team WashU has developed supports from building industry and engineering universities, and will launch new businesses. These supports provided us with a robust system to ensure the building process. The support was focused on affordability, feasibility, attractiveness, mass production, and social impact. Students constructed and operated a dry panel connection system that uses embedded threads and bolts. The movable building service core was designed to accommodate families and older adults best. The house could be expanded and contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple. The house could be expanded to accommodate a young couple, and could be contracted with each stage of a couple.