PennState College of Engineering
ARCHITECTURAL ENGINEERING

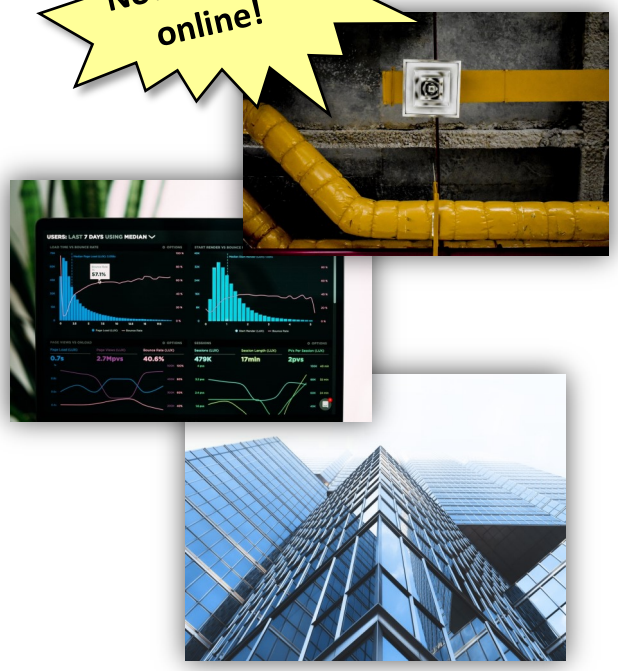
PennState College of Education

CSATS Center for Science and the Schools

Building Education Research Experience for Teachers

Virtual program: June 15 — July 31, 2020

Now offered online!



During this 7-week full-time, **at home research experience**, **teachers will work virtually** with a faculty member to design sustainable building systems that promote environmental health and energy efficiency for existing structures. **The research will take place in participants' homes using materials provided by the research lab.** Research topics include: indoor air quality, lighting effectiveness, thermal comfort, and energy efficiency. Teachers will use their research experience to co-design a unit of study to enhance their current curriculum using their schools as "living laboratories" once in-person meetings can resume. ***Check out sample research placements on the next page!***

Target Audience: Secondary science, technology, engineering, or math teachers with at least 3 years of teaching experience.

Teacher Benefits:

- Teachers will receive a $5,000 stipend for completing their summer research experience.
- Opportunity to receive up to 3 graduate credits (SCIED 597) from Penn State University.
- Teachers will receive up to $1,000 for materials to implement their classroom research project.
- Teachers will receive a $1,500 stipend for implementation of their classroom research project. Online follow up and support will be provided during the academic year.
- Teachers will have the opportunity for a 3-day in-person experience during Summer 2021.
- Teachers will have the opportunity to present their research at the 2021 MJ Murdock Partners in Science conference in San Diego, CA. Some travel expenses will be provided to attend.

To apply visit csats.psu.edu

For more information, contact: Matt Johnson at mmj125@psu.edu

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Sample Lab Placements for Building Education Research Experience for Teachers

June 15-July 31, 2020

RICHARD MISTRICK'S LAB

The teachers will study the performance of day-lighting systems and electric lighting systems for the purpose of computing both energy savings and circadian light exposure of different daylighting, shading, photocontrol, and spectral control strategies. The teachers will develop models in CAD, run daylighting simulations, and develop computer code and/or spreadsheet solutions to study different lighting, shading, and control scenarios. These studies will involve a study of their school classroom and/or other workspaces.

GREG PAVLAK'S LAB

The teachers will develop computational models that link smart building control technologies with energy, economic, and environmental performance indicators. The models will be applied to quantify energy, economic and environmental benefits and trade-offs that might exist in designing and deploying smart building control systems. Teachers will model a variety of building types using detailed physics-based energy modeling software EnergyPlus. Building models will be coupled with mathematical optimization routines written in MATLAB or Python to control the energy systems within the building(s).

JULIAN WANG'S LAB

The teachers will understand the main strategies of passive solar design for buildings, in terms of solar energy features, solar heat utilization, climate and site, etc. Based on the knowledge learned, they will focus on efficiency of windows. The teachers will know the basic window optical and thermal properties and their functions for potential building energy savings. In the last session of this project, they will develop a simple Arduino-based sensor module which can be used to measure the window properties on-site. Through this project, the teachers will gain the basic knowledge of solar energy, passive design strategies, Arduino sensor fabrication, in situ measurement method for windows, and window energy impacts, which they can apply and promote in their classrooms and in their daily lives.

NATHAN BROWN'S LAB

Participants in this project will assist in a study that considers how architects and engineers interact with computational design software to make design decisions. Increasingly, architectural engineers are using computer code to generate different options for a potential building (or building component), and then compare these options quantitatively. During this project, teachers will help set up building performance models, run simulations of building geometry, and analyze the resulting data to determine trends and desired outcomes. Teachers will gain valuable skills in a visual programming platform that layers onto typical Computer-Aided Drawing (CAD) software and is used for design optimization in various fields, which can be a gateway to other forms of coding.