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The nuts and bolts of design and construction

By *Heather A. Davis*

Every two weeks, high school students don hard hats for a construction site tour, pour over blueprints to a building, or fashion an architectural model out of gumdrops and uncooked spaghetti.

These students are learning about the nuts and bolts of design and construction through the ACE Mentor Program, which stands for Architecture, Construction, and Engineering. In the nationally run program, which reaches more than 8,000 students annually, students are grouped into small teams and are mentored by industry experts.

The [University](#) is sponsoring two teams in the 2014-15 school year—one in the [Division of Facilities and Real Estate Services](#) (FRES) and another in [Penn Medicine](#).



“We started talking about this in terms of economic inclusion. Penn is a big player,” says Marilyn Jost, executive director of finance and administration for FRES who also serves on ACE’s board. “The goal from ACE’s point of view is to educate high school students about what opportunities are in construction mainly to get [young people] more interested in the industry, but specifically around minorities and woman, and to get those kinds of resources into the opportunity stream.”

Usually, teams are led through a mock design project from start to finish with guidance from industry mentors. At Penn, however, the process is different. Teams are using actual ongoing construction projects as their ACE classrooms: the [New College House](#) and South Perelman expansion projects.

The staffers in charge of both the real-life projects and the ACE teams have designed the lessons to give the students insider knowledge of all of the planning and preparation that goes into the building process.

Mariette J. Buchman, a director at FRES and the Division’s ACE affiliate, sat down at the end of the summer with Larry Bell, a senior project manager at Penn Medicine who is running the Penn Med ACE group, and decided to create two teams. Students on the FRES team have gotten introductions to general contracting and

lessons in design and scale, and the Penn Medicine crew has been instructed in site engineering, mechanical/HVAC/plumbing, and the architectural design process.

Ultimately, students will be exposed to all of the nuances that go into a project. Buchman and Dave Dunn, a FRES senior project manager who is also working with ACE, took students to Hill House to show the team what a dorm looks like—which is important to know when constructing a new one. Students have also travelled to the offices of BCJ, the project designer, so they could see the environment of an architectural firm.

“We’re really trying to concentrate on giving them an exposure to the profession—what are the different roles that different entities have in putting together a building,” Buchman says. “What are some of the steps that you take within that ... so you have to think about what you want to build before you can just start building it.”

Dunn notes that the students seemed surprised by the amount of detailed work that must be done before ground is broken—a prospect that appeals to some, though not all, students.

“If it’s only one that’s piqued their interest and decided they’ll go that way, that’s probably what it’s all about,” Dunn says.

Bell, who was a novice to mentoring before this experience, says he’s called on colleagues in the ACE fields to volunteer their time to talk about the architectural process, structural engineering, or some other critical component of a project. In each session, there’s always an active learning component; in one lesson, students were asked to design a pedestrian bridge that connects HUP to the Perelman Center.

“We have the engineers in and say, ‘We want you to design the bridge. What would it look like?’ We let them use their creativity. The purpose of course is to get them thinking,” Bell says. “It really is a great program and it really falls within the arc of the mission of the University and Penn Medicine in terms of reaching out to the community.”

About a dozen students show up for each class, and most are from schools in the city, including Mastery Charter Shoemaker Campus, Motivation High School, and Science Leadership Academy.

Emani Majors, a senior at Ridley High School, which is outside of the city, is part of the Penn Medicine team. An aspiring architect who was recently accepted into the five-year bachelor's-plus-master's program at Morgan State University, Majors says she appreciates the broad overview of the program.

“Not only do they tell you about the field but the people you work with. ... They’ll tell you about the classes that go into the field. They’re just so helpful,” Majors says. “Even if you’re not sure that’s the field that you would like to go into, it doesn’t hurt to try. ... You get to experience new things, and girls definitely need to join the STEM fields.”

At the end of the program, students will make a presentation to the other members of their cohort. They are also eligible for scholarships: Last May, the ACE Mentor Program in Eastern Pennsylvania awarded a total of \$62,000 in scholarships to 17 students.

Tiffany Millner, the affiliate director for the ACE Mentor Program in Eastern Pennsylvania, says that the program allows students to explore a field before they commit to a course of study in college. It also champions diversity in these fields.

“The purpose is actually to create a pipeline and allow students a more hands-on experience in the architecture, construction, and engineering fields,” says Millner. “These aren’t career fields that are touched upon much in high school. ... We just want them to make a better educated guess.”

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