



Before: A view of the west CAPLA Building entrance area showing pre-existing conditions. (Photo by Chris Trumble, Professor, College of Architecture Planning, and Landscape Architecture, University of Arizona)



Creating Value Through Student En



The end result, an attractive shaded space at the conjunction of several footpaths. (Photo by Mark Marikos, Program Coordinator, Facilities Management, University of Arizona)

The University of Arizona Facilities Management Department (UAFM) recently had the opportunity to directly contribute to the student educational experience by lending our knowledge and skills during a collaborative project with the university's College of Architecture, Planning, and Landscape Architecture (CAPLA). CAPLA invited UAFM to interact with a Design Studio class on a recent student design-build project, an improvement of the west approach to the College's building. The area, though adjacent to a major pedestrian thoroughfare and bike path, was a "bleak and barren" landscape of brick, concrete, and gravel that was heated by the afternoon sun and gave no hint of the creativity and imagination practiced within the building's walls. The scale of the proposed project, and the fact that it comprised a permanent campus structure, made

Completed project from approximately the same perspective as the Before pic. (Photo by Mark Marikos)

Engagement

By Mark Marikos

UAFM's participation critical to its successful integration into the campus's landscape.

A few years ago, the University of Arizona (UA) instituted the "100% Engagement Initiative," a commitment to offer every student the opportunity for extracurricular experience related to their field of study before they graduate. The Student Engagement website states:

"The 100% Engagement Initiative at the University of Arizona is based on our recognition that experiences beyond the classroom provide a framework for our students to enrich their professional and personal growth, and the importance of those experiences is reflected by an Engaged Learning Notation on our students' transcripts."

CAPLA has long taught courses with that aim. Design Studio classes offer students practical experience including not just design activities, but hands-on experience actually building something they have designed. The class offers them an opportunity to experience real-world situations, including all of the challenges that arise when translating drawings into actual structures. According to Professor Robert Miller, UA School of Architecture director,

"Design/build is a way of teaching architecture that not only gives students a better understanding of practice by having to deal with actual construction, but makes them better designers by allowing their designs to change in response to fabrication discoveries."

THE REALITY FACTOR

The goal is to create better designers that are able to include practical constraints in their designs. CAPLA professor Christopher Trumble describes it this way: "Reality introduces conditions, constraints and opportunities comprising people, materials, fabrication processes, environmental conditions, gravity, and use." Of the student experience he goes on to say: "Participating students have a better understanding how design ideas are challenged, shaped, destroyed, survive, and thrive in the translation to reality."

UAFM had already been involved with CAPLA students, giving regular tours of building and HVAC plant utility systems as part of their course on environmental control systems, so they were aware of our commitment to help them educate future architects and planners on the practicalities of building and campus-wide utility system function and maintenance.

The joint project's centerpiece is an innovative structure known as a "gridshell," an arched dome entirely supported by a grid-work of structural elements that is loosely assembled

at grade, and then raised from the center to form a dome with a three-dimensional catenary surface. Once raised, the grid elements are permanently bound to each other so that the structure retains its shape when the temporary support is removed. The CAPLA Gridshell uses half-inch steel rods as the structural elements, has a finished footprint diameter of about 40 ft., and a height of about 15.5 ft. Serving as a shade pavilion, it creates an attractive multipurpose outdoor meeting space. (Note: Shade is a precious commodity in Southern Arizona!)

Professor Miller explains the larger context of the project,

"The UA Gridshell is one of four gridshell projects being built in North America under the auspices of 'Thinking While Doing: Connecting Insight to Innovations in the Construction Sector,' a Partnership Grant totaling \$2,483,150 from the Social Sciences and Humanities Research Council of Canada. Thus, this structure not only contributes to our campus, but is part of an international research project. As a set, each gridshell offers a unique response to climate, location, and purpose, and each has been delivered under the singular design/build pedagogy of the host school."

What makes our gridshell, the 'Pentapus,' unique, is more

than its setting and situation; it is singular in its having been taught, not only by Architecture faculty, but by many experts and craftsmen from UA Facilities Management.”

In addition to the Gridshell, the project included a complete renovation of the CAPLA west entrance landscape and hardscape, preserving an existing large olive tree as the central landscape element. The design opened the area for handicapped access and reincorporated “donor bricks” from a demolished wall. Broken concrete from the wall was used to line a formerly paved drainage channel through the area, decreasing runoff velocity and increasing infiltration. Additional plantings enriched the previously barren landscape.

Assistant Vice President for Facilities Management Christopher Kopach saw participation as an opportunity for UAFM to demonstrate our commitment to the university’s educational mission, particularly student engagement. He also recognized the positive effect on employee morale and the infusion of new ideas that had resulted when UAFM employees worked alongside students in the past, including several campus water-harvesting projects.



During the first large concrete pour, UAFM staff worked alongside the students, teaching them proper technique for placing and finishing concrete. During the second pour, students performed most of the labor with supervision by UAFM staff. During the third pour, the students worked with minimal supervision by UAFM staff. (Photo by Mark Marikos)

ENGAGEMENT FOR ALL

UAFM’s role involved employees from several shops working alongside the students and the professor in almost all phases of the construction project. Regular meetings were held at the site to plan and schedule execution of the various phases, and to discuss expected and unexpected challenges. The project design was reviewed by the university’s Risk Management Services (RMS) and Planning, Design and Construction (PDC) departments, as well as by UAFM leadership.

Grounds and Labor Shop equipment operators assisted students with demolition of existing landscape and hardscape features, roughing out the final grades, and crane work involved in lifting the grid into its designed shape. Landscapers from the shop provided guidance on preservation of the central olive tree, and assisted in other landscape aspects, and Grounds Shop irrigators

assisted with design and implementation of the final irrigation system. The Electrical Shop provided temporary electrical feeds to power construction equipment (welders, concrete compactors, jackhammers, temporary lighting, and various power tools) and permanent feeds for new lighting and irrigation controls. The Plumbing Shop helped in various capacities, including repair of an unmapped sewer line through the area.

There were three major concrete pours to form foundations for the Gridshell structure and retaining walls. In the first pour, Mason Shop employees worked alongside students, showing them how to place, compact, and finish the concrete, and how to resolve issues with forms, reinforcement bars, and timing of the various steps. In the second pour, the students took the lead while Mason Shop employees were present to help resolve any issues that arose. By the third pour, only UAFM’s assistant director of maintenance shops was there to observe the students and dispatch help if it were needed.

While CAPLA maintains a well-equipped, well-staffed, student-centered materials lab (construction shop) with welders and various metal-working tools, the scale of this project and safety considerations required that several students receive intensive instruction to obtain welder certification. Besides more than 4,000 welds required to tie together the Gridshell structural elements, there were numerous welding/cutting tasks to create guardrails, sheet-steel landscape retention walls, and the construction tower and forms used to raise and shape the Gridshell.

UAFM Metals Technology Shop welder James Parker had taught welding for 13 years for the UA welder’s union. When first approached about training the CAPLA students, Parker was reluctant, as it had been several years since he taught. However, once he began, he found them to be eager and enthusiastic learners. He spent several hours a week with the students, showing them proper technique and giving them practice exercises to hone their skills. It was amazing to watch the relationship of mutual respect and admiration that developed between Parker and the students. They described him as “an excellent instructor,” and he bragged about their ability to quickly master their craft. Parker’s pride and confidence in the students was well placed. Within 30 days, all six students passed their certification exams—on the first attempt!

Like James, other UAFM employees who worked with the students enjoyed the opportunity to share their knowledge and skills, and were energized by their youthful enthusiasm. (Note the smiles in the photograph on the next page.) As we have also seen in our apprenticeship program, mentors generally get as much or more out of the relationship than those being mentored, including a boost in confidence, a sense of significance, and job satisfaction. Pouring oneself into the life of another almost always enriches us, many times in unanticipated ways.

CHALLENGES AND BENEFITS

While no collaborative project of this scope comes without significant challenges, the benefits to both organizations far



All six welding students passed their certification exams on the first attempt. Here they are shown holding the coupons they welded for the exam. Their instructor, James Parker, was justifiably proud of their success. (Photo by Mark Marikos)

outweighed any difficulties encountered. Being an “experimental” student project, it caused schedules to slip as unforeseen challenges arose. Originally intended as a two-semester project (one semester in design and one in construction), it took longer than planned, and was finished over the following two semesters, after several of the original student leaders graduated.

Delays were introduced by unanticipated events, including unknown buried utilities, a storm that washed out part of the site and carried mud into a pedestrian overpass, and an unsuccessful first attempt to lift the Gridshell. But these incidents actually increased the educational value of the exercise, introducing “reality” as described by Professor Trumble above. And our involvement in the project also motivated the students to step up and go the extra mile to minimize disruptions to the university’s and UAFM’s operations. Throughout, UAFM remained available to advise and assist as needed and the project was finished in the fourth semester.

As the pictures show, the Gridshell is an iconic structure that blends well into that part of campus. It doesn’t look like a recent construction site, but looks as if it has always been there, a testimony to the value of collaboration between a university and its facilities staff.

A significant side benefit of the project is the connection that developed between CAPLA and UAFM. Our workers have “rock-star” status with the College because of the enthusiasm and dedication they showed during the project. CAPLA faculty and staff recognize the tremendous educational value contributed by UAFM employees during the project, which has opened the door for future collaborations. And hopefully, the project has created a class or two of architects who will see FM organizations as a valuable resource during their careers in the industry.

On his blog, Professor Trumble describes his perspective on the value that UAFM brought to the project:

“The benefits of our current and prospective collaborations with UAFM to CAPLA students, faculty, staff, and college as a whole are substantial. FM has been incredibly generous in its contribution of support, expertise, labor, equipment, and supervision. Having experienced projects comparable to this one but without FM’s involvement, I can say that the educational efficacy, which was already great, has been augmented exponentially. By sharing their knowledge and resources they are not only looking out for the interests of the university from a facilities standpoint, they are making an incredible direct contribution to the education of 16 architecture students who will in turn become better practicing architects, mentors, teachers, and civic leaders.”

Summarizing UAFM’s experience, AVP Kopach says:

“The overall collaboration between our UAFM Department, CAPLA, and the students was outstanding. It allowed our facilities staff to shine by sharing the wealth of knowledge they have in their respective trades. It was a truly engaging student experience, ‘harnessing and transferring knowledge’ of our facilities staff to the students — a job to be proud of by all. Well done!”

SIGNIFICANT TAKEAWAYS

One takeaway is that what to many may appear to be a high-risk collaboration may actually prove to be a very good investment. UAFM increased its credibility and value not just within CAPLA, but in the wider academic community, as we were seen supporting the university’s teaching mission and students, becoming 100 percent engaged in its 100% Engagement Initiative.

But the most significant effect of our involvement is the investment made in these students’ education. At a project appreciation gathering, Professor Miller spoke about the advantage these students will have in the workforce because of their increased understanding of facilities management concerns and function. He goes on to say,

“Many a morning would I arrive at 6:30 a.m. to see students already on site, being coached and instructed by FM personnel on everything from concrete cutting to welding to formwork to plumbing to wiring. The experts from FM were not only more knowledgeable in their respective crafts than Architecture faculty could ever be, but were exemplary teachers: patient, precise, and generous with their knowledge. There could be no better way to train emerging architects than to teach them, firsthand, how to learn from, and work with, craftsmen and contractors.”

Every school of architecture housed at a university has a facilities department as a potential ally. The UA is the only place of which I am aware that has facilities leaders who are sufficiently wise and generous as to include the teaching of architecture in its purview.”

And who knows when one of those new architects, involved in the design of a building, will pause for a moment in his or her work to think about the impact of their design on the constructability, maintainability, and functionality of that building. §

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