PLAY PERCH: A Case Study of Design-Build in the Curriculum

PLAY PERCH, a project undertaken by students and faculty at Syracuse University, helps to ignite debate about the aims and address of Design-Build in an educational context: Who is entitled to good design? Do children need good design? Does design for the physically disabled need only to meet minimum legal standards? What does design for those with non-physical challenges look like? How does the architecture profession protect its professional boundaries while also educating its consumer about the value of design?

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BACKGROUND

PLAY PERCH represented an opportunity for students to think about the issues above and to present personal responses. As a community engagement project realized in an educational context (but outside the architecture studio), PLAY PERCH was a student-faculty collaboration structured as an independent study course. The teaching, evaluation and assessment of the project and its curricular structure represent an opportunity for architectural educators to think about the role of Design-Build and service learning and to draw conclusions about how best to deploy both to maximum effect.

Both Design-Build and community service are long-established modes of pedagogy and research in schools of architecture. Among the most significant programs that have tested and refined methodologies are Studio 804 at the University of Kansas,[1] Urban Build at Tulane University,[2] Rural Studio at Auburn University,[3] and the Jim Vlock First-Year Building Project at the Yale School of Architecture.[4]

Educators ascribe numerous pedagogical advantages to Design-Build, including professional preparedness; exposure to alternate practice models; experience with the realities of construction tolerances and accuracies; synthesis of knowledge learned in required courses;[5] and more refined knowledge of the materials and tools of design.[6] Iwamoto and Scott argue that courses where students realize their designs in built form are unique opportunities to test "pedagogies of making."[7] Writing specifically about community-service Design-Build projects, Francis asserts that such projects can significantly enhance architecture education, providing an opportunity for students to witness the "social and psychosocial aspects of design" and "contrasting theories of aesthetics."[8]

Foote, however, laments that time constraints often compel a linear design-then-build process, one that is prematurely deterministic.[9] Erdman *et al* argue that much of the writing about Design-Build "resists theorization" and too often presents

the value of such programs as self-evident or overly centered on either student empowerment or social utility.[10] However, Corser and Gore note that in the years since the Erdman study, increasing emphasis on "action in the built environment in service of both education and community enrichment" has improved the educational experience for Design-Build students. Hinson, writing about recent developments in Design-Build (including those at Auburn University), similarly notes that the move towards "research-driven Design-Build studio offers the faculty and students involved the opportunity to expand their goals beyond student learning outcomes to addressing questions with impact much broader than the scale of the single building and with significance beyond the single client."[11]

Research in the area of technical education for architecture students bolsters more qualitative and anecdotal evidence that Design-Build offers distinct pedagogical advantages. Although architecture students do take technical courses, good evidence suggests that students do not absorb this knowledge (or indeed many other types of knowledge) when it is presented in lecture format without a design context. John Folan, professor at Carnegie Melon, asserts that "Delivered outside the context of a design scenario, already abstract concepts of social, legal, economic, and contractual performance become entirely opaque, or even impenetrable for most students. As a result, the content remains entirely irrelevant in the academic setting and many students emerge into the profession without the capacity to evaluate

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Figure 1: Play Perch, an outdoor learning environment built around an old-growth tree, for a preschool serving traditional needs and special needs children in an inclusive setting.

priorities as they relate to performance."[12] Pedagogical research across disciplines in higher education demonstrates the value of "just in time" learning where students best learn complex procedures and skills (*e.g.*, a specific math concept) when they have immediate need of that tool to achieve some other pressing work goal.[13]

INTRODUCTION

Like many NAAB-accredited architecture programs, the School of Architecture at Syracuse University has a student chapter of AIAS Freedom By Design. As is common nationwide, Syracuse students have designed and built a number of capital improvements on private property for clients of limited financial means. The service-learning obligations inherent in a Freedom by Design undertaking have always been understood at Syracuse to be opportunities for advancing design intelligence, formal experimentation, and tectonic innovation.

Building on previous successes, and with prodding by faculty advisors (the authors), the students began to expand their mission and extend the boundaries of both service-learning and accessible design. Early projects (mostly for private citizens on personal property) had received extensive local media attention, and potential institutional partners began to propose projects and collaborations. The most promising was a local pre-school, which serves a population of special-needs and traditional-needs students in an inclusive setting, that had a donor in place to fund a tree house on their existing nature trail (see Figure 1). This project was initially planned as a totally student-run initiative, but as the scope and budget began to grow, it required a more formal curricular structure. The students allied with faculty to propose that the school administration set up an independent study 3-credit-hour course in which they might realize this Design-Build opportunity.

From the outset, it was clear that the 3-credit-hour structure could not continue as a long-term model for Design-Build projects of the desired scope and scale. However, the timeline of the project, existing curricular demands, and the lack of Design-Build history at the school all led to some understandable hesitation by administrators. The independent study course would have to suffice. Both faculty and students were committed to the project as a one-off experiment to demonstrate that the interest in and capacity for Design-Build existed within the institution and that the outcome could serve to ensure a future place for Design-Build within the studio sequence.

THE CLIENT

The client is the Jowonio School, a preschool recognized worldwide as an innovator in special-needs education. Jowonio School serves students aged 3 to 6, guided by the philosophy that students of all physical and mental abilities should be educated in an inclusive setting. The school strives to provide an environment where all students, some 30% of whom have a disability, are assisted so that they might participate in as many activities as possible. Consistently balancing risk with opportunity, the director, teachers and therapists collaborate to educate not just children but their parents in the need for all preschoolers, including the disabled, to flex and strengthen their minds and bodies in a safe and nurturing environment.

Jowonio faculty and staff have long partnered with volunteer organizations. A landscape architecture student from a local state university built the nature trail contiguous with the school playgrounds about 10 years ago and since then, groups such as the Eagle Scouts, parent volunteers, and local college students have maintained and improved it. In 2012, the director of special projects at Jowonio approached

Freedom By Design precisely because Jowonio was interested in a high-profile project with an explicit design agenda.

Significant for the future success of PLAY PERCH, Jowonio attempts to address what it refers to as "nature deficit disorder." Relatively new research in early childhood development suggests that less time spent outside and restricted access to nature contribute to a host of negative behavior and health impacts; in particular, access to the calm and quiet of a natural setting greatly helps students with ADD.[14] The school makes heavy use of their nature trail, with some classrooms venturing out every day unless temperatures fall below 20F. Where the trail is wheelchair inaccessible, classroom attendants will carry a child to an activity.

THE COURSE

In order to integrate student–led community-service into the curriculum, PLAY PERCH was established as a 3-credit-hour independent study course, which faculty taught beyond their regular assignments as an unpaid overload. The faculty advisors for the course were the authors: a structural engineer with no previous Design-Build teaching experience but with training as a field engineer, and an architect who teaches design, is a registered architect in the state of New York, and has considerable experience in community-service Design-Build teaching. There were 14 students: 12 undergraduates in architecture (3rd-5th year BArch students), one architecture graduate student (1st-year MArch) and one graduate student in art. The group met weekly, on an evening after studio. Additional design meetings, and almost all fabrication and construction sessions, were held on Saturdays and Sundays.

Faculty allowed students to self-assess their interests and skills, helping to locate them within an organizational framework: in groups of three or four, students formed teams in Administration (including client and institutional outreach); Public Relations and Marketing; and Fabrication and Construction. Each of these groups developed tactics and strategies for inter-related planning efforts: the Administration team worked on insurance, contracts, facilities and other logistics; the Marketing team developed branding and a media strategy, producing graphics, copy and video for web and social media outlets; and the Fabrication and Construction team sourced materials and suppliers, optimized constructional assemblies, and planned the production and installation of components. Significantly, the three groups each elected one member to a design group, who were tasked with initiating and developing schematic proposals based on input from all three groups, faculty advisors, and the client. Design, in short, emerged from a process that worked within the parameters of performance, identity and buildability.

As a group, we gave the branding of the project some consideration. While we took our community-service obligations seriously, we reached beyond the needs of a sole client on a singular site and instead developed a broader understanding of our disparate audiences. First, we aimed to influence the student body and faculty at Syracuse Architecture, so that we might encourage service- and hands-on-learning within the broader curriculum. Second, we strove to address architectural education nationwide, as many of the PLAY PERCH students were actively involved regionally and nationally in AIAS, Freedom by Design, and the student-run journal *Crit*; students anticipated that their designs would be widely disseminated. Finally, students and faculty both wished to generate a discussion within the larger profession about who has access to design expertise and whether it might be possible to generate high-quality design outside the normal framework of client patronage.

Over the course of the semester, boundaries blurred between the teams as some natural leaders emerged and all students were expected to fabricate and assemble PLAY PERCH. Faculty encouraged more senior students or those more skilled in a particular area to not just lead but also to train their peers. This directed training and learning became especially important on site, as some students were less capable and confident with some tasks and tools. The students had access to the School of Architecture woodshop, the Art School's metalworking shop and to all the computing and fabrication facilities at the university. Tools that could not be borrowed from the School of Architecture were purchased or rented as appropriate or necessary. Fabrication that was beyond the skills or resources of the students was outsourced to local businesses, some of which provided their services at reduced costs.

THE DESIGN PROCESS

The preschool sits at the bottom of a low glacial drumlin and the nature trail makes a loop half way up the hill, parallels a ridge below the crest, and drops back down again. The students and their client considered a series of locations on the trail, determining the final location after a geotechnical engineer advised that the unstable slopes of some potential sites would prohibitively complicate foundation design and construction. On the selected site, a mature solid tree allowed us to build in a relatively open clearing with a nice slope, making it possible to have a horizontal

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Figure 2: Play Perch study models.

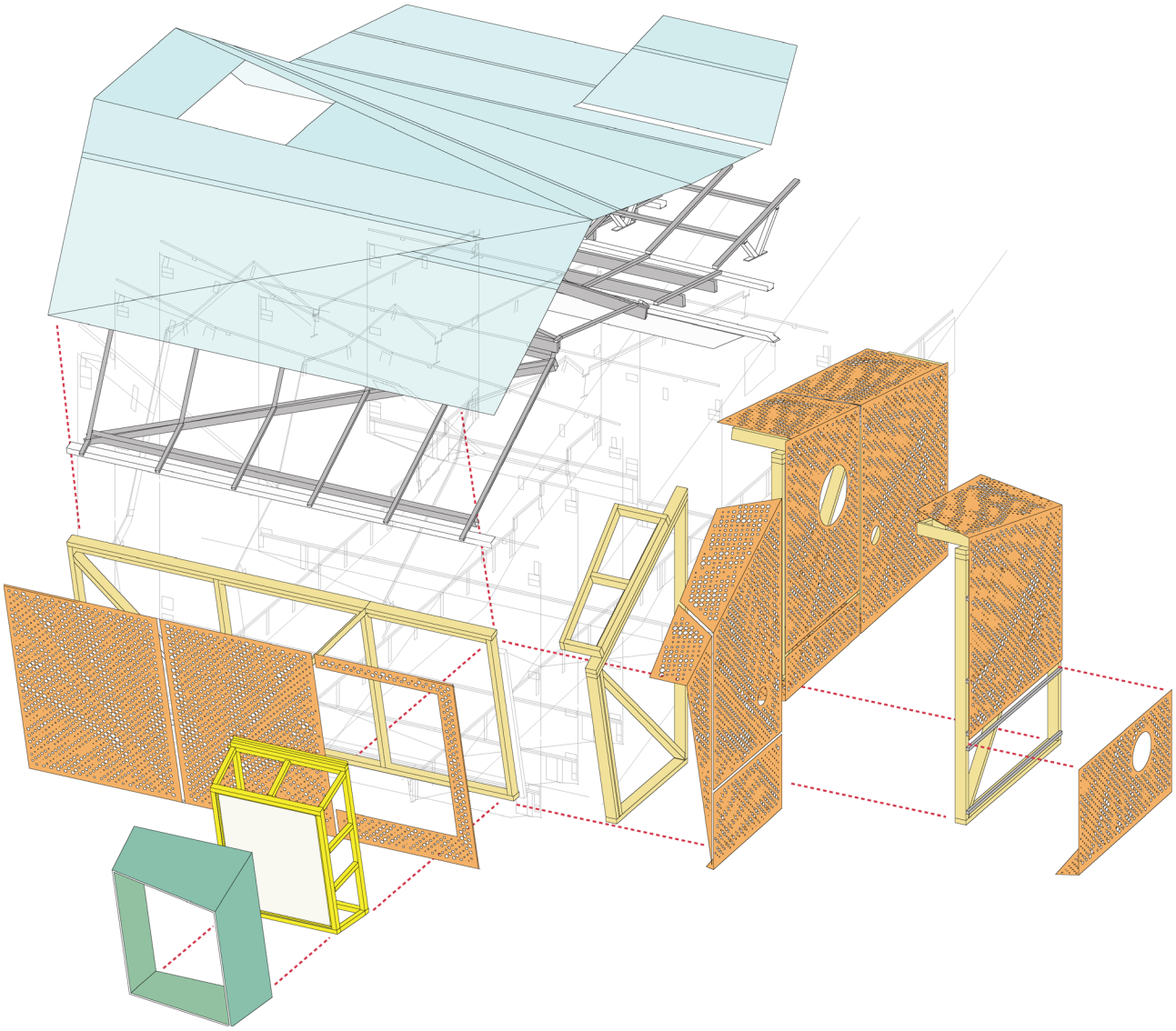
ramp enter the structure from the trail-side while having a dramatic 8ft drop at the other end. Through bare winter trees, the site has good views back to the school playground. On the advice of the structural engineer and the city arborist, the team decided to build the structure around a tree with independent supports rather than bearing on trunks or limbs.

Students presented initial design ideas to the Jowonio board early in the semester for feedback and evaluation (see Figure 2). From the outset, students devised an identify for the project, PLAY PERCH, with a design inspired by both the Eastern Blue Bird and the AT-AT Imperial Walker from *Star Wars*. In the final design, a level platform stretches around the tree and projects off the trail into the air above the slope. Six splayed pairs of V-shaped columns support the platform; custom steel splines connected these posts to both the foundations and the undercarriage. The foundations are six 16-inch diameter, 4-feet deep concrete piers dyed with iron oxide as well as a strip foundation where the ramp meets the trail. The platform is approximately 12 feet by 20 feet and cantilevers beyond the column line.

The design embeds environmental education in an outdoor pavilion, incorporating sun, wind, and water management to educate young children about natural forces. PLAY PERCH is weather-resistant rather than weatherproof and the walls consist of timber frames with perforated weathering steel panels. Variations in the perforations, which are patterned after bird feathers, create windows and other apertures. The roof consists of polycarbonate panels with steel *Unistrut* supports. Gutters in the roof overhang considerably so that children might observe rainwater running off and falling on a splash rock below. The roof forms an oculus around the tree so that children may lie on the floor and peer up into the branches. At the entrance, the roof peels up to mimic the tail feathers of a bird. The large copper-clad cantilevered window, the beak, is a polycarbonate sheet that cants outward to maximize prospect from the highest elevation. Above and below the platform, a custom climbing net stretches across the opening between the floor and the tree.

The students optimized the execution of PLAY PERCH, combining off-campus fabrication by local artisans, on-campus modular panelization in the wood and metal shops, and on-site construction (see Figure 3). Students sourced producers and installers with expertise in the Rust Belt economy of Upstate New York, including laser-cut self-weathering steel sheeting, baked-on ceramic coatings for metal fittings, and digitally driven water-jet ceiling panels. A local artisan sourced lumber, recommending black locust (which is naturally weather- and termite-resistant) for exposed framing members. PLAY PERCH will age naturally in the severe weather of the Syracuse woods: exterior steel panels are weathering to orange before they will be waxed to minimize transfer of rust; copper sheets on the cantilevered overlook will gain a deep green patina.

The interior design consists of a blue tile floor suitable for playground use that continues over the top of the two seating-tunnel hybrid furniture pieces dubbed “the caterpillar” and “the slug.” The tunnel is lined with green HDPE panels etched with footprints of local animals. A specimen table, an HDPE panel atop a yellow powder-coated tree-shaped steel base, is etched with local leaf varieties and inset with magnifying glasses allowing children to examine their trail findings. Overhead, a translucent polycarbonate roof rests on galvanized steel purlins, softly illuminating the interiors. Along the inside face of the perforated exterior steel modules, linseed-rubbed locust posts support a wood trellis, providing a cove for LED strip lighting. The brilliantly colored interior contrasts with the subtle hues of the exterior (see Figure 4).



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Students designed the landscape around PLAY PERCH as well. With an almost 8ft clearance at the highest end, the space below the platform became a place of exploration and discovery. Here, a dropped ceiling of cementitious fiberboard was scribed with a constellation of openings, backlit with outdoor lighting fixtures. Students cleared undergrowth and debris to construct a new switchback path, facilitating wheelchair access. Along the path, students wove a nest of fallen branches and twigs, forming a perimeter to the site that they then dotted with concrete eggs for the children to encounter amidst their outdoor play (see Figure 5).

CONSTRUCTION

On the first day of site construction, soil conditions required students to relocate footings, resolving the design as they proceeded. The rented auger hit intractable tree roots, so students took turns with an axe, adze and sledgehammer. Twelve inches down, a layer of compacted clay forced students to excavate foundations by hand, “Erie Canal Style,” using a shovel, pick and digging iron. No water on site required that concrete be brought up the hill in wheelbarrows, three students to a load. Offsite, the overbooked sawmill could not meet our deadline, so students

Figure 3: Play Perch exploded axonometric, showing the relationship between modularized panels and site-constructed framing and cladding.

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hewed an alternate pair of primary structural timber beams. Welding structural steel requires certification, so students enlisted a recent transfer student in industrial design with the requisite skills.

The wall panels were constructed off-site over the winter vacation and tilted into place. The team had hoped that tilt-up could happen once the weather improved; it took place instead on 14-degree Sundays in light snow. Students devised safety precautions and implementation plans before their advisors signed off on this potentially dangerous site work.

At the end of the fall 2012 semester, the platform was constructed and the wall panels were nearly complete and ready to be installed, yet over half the class was due to leave campus for winter break and a semester abroad. Fortunately a core group of students were committed to completing the project and a further 10-15 students volunteered to join them. In order to fully capitalize on the new students and the remaining budget, the team initiated Phase II of the project, which encompassed interior design, an underbelly cladding scheme and a lighting plan. Students continued to work on the project on the weekends with final completion in May 2013.

CURRICULAR IMPLICATIONS

PLAY PERCH became an experiment in the integration of building technology and structures into design pedagogy. For students and faculty alike, the comprehensive resolution of technical information with design aspirations proved to have intersections with the existing academic course structure and frequently exceeded the confines of traditional curricula.

Figure 4: PLAY PERCH interior.

Technology

Too often, students struggle to connect lectures in technical classes with the drawings they prepare for studio reviews. Students may lack confidence in their capacity to correctly draft such systems, or they may view the making of architecture as secondary to its conceptualization. Pedagogical cultures differ among academic programs, of course, but we are all familiar with the trope that casts building technology and structures courses as "support" and design as somehow outside practical consideration. Repeatedly, the authors aimed to subvert that bias, seeking to bring PLAY PERCH under a curricular umbrella and expanding its budget and ambition so that it transcended anything that could be built with a few trips to the local big-box hardware supplier. At the completion of the project, student came to value their technical expertise as well as control they gained over the creative design process. They had learned how to deploy the knowledge and skills required to realize their design at full scale, in real time and in physical form, for a genuine client.

Structures

With faculty supervision, the students were required to prepare calculations and estimations for each structural component. Before the external structural engineer would sign off on construction drawings for the City of Syracuse Building Department, students needed to complete a preliminary structural analysis: they estimated weight and bearing capacity; sized foundations; calculated bending moment capacity for commercially available steel beams and struts; and checked that roofing could hold the ASCE code-mandated snow load for Syracuse.

To realize their visions, students who had previously displayed little interest in their two required structures courses became extremely engaged when they needed to shave 4 inches from their beam heights. When the only auger that students can hire locally has a 16-inch diameter, then suddenly the bearing capacity of glacial fill is all kinds of interesting. When it turns out there are too many tree roots to put the foundations where they were designed and a four foot span becomes a six foot span, then the college student who had bemoaned a 9:30am structures lecture is awfully grateful for being made to memorize $M= wL^2/8$ and $I=bd^3/12$.

Professional Practice

Small-scale structures such as PLAY PERCH inhabit a realm in which the architect has ceded much ground to the DIY owner, the contractor, the interior designer, and the HGTV aficionado. While PLAY PERCH began as a $4000 tree house on an existing nature trail, the scope expanded to a $40,000 outdoor classroom project with interior and exterior design. In realizing the project, students learned more about the working life of a licensed, professional architect than they ever could have in a normative studio setting.

At the outset, students drew up a contract with their client to indemnify them from liability. Working with faculty, students were responsible for the production of all filing documents and getting those documents signed and stamped by the PE (a structural engineering professor who volunteered his expertise). They also had to apply to waive the preschool site's residential zoning. They needed a building permit and a series of inspections. Students also needed to secure waivers for city requirements for workers' compensation insurance, as they were covered by national AIAS Freedom by Design policies. With faculty supervision, advice and counsel, students initiated and completed all such permits and waivers, meeting multiple obstacles and reluctant city officials along the way.

The students had to produce shop drawings for steel fabrication, millwork, window detailing, and roof panelization; electrical plans for the electrician; and code-compliance documents for the city. Our students had not been trained to think of their designs in terms of materials to be ordered (on time and in budget) and fastened to other components with the appropriate device and tool. They learned quickly, and built up remarkable institutional memory after just one term. At the start of the spring 2013 semester, the students from Phase I were quick to scold those in Phase II who came to the group with proposals: "What are you making that from? What's the lead-time? How much does it cost? Did you get a sample? What are the color options? What will we cut it with? How will we connect it? Is it rated for outdoor use? What are your back-up options?" Months before, those same students asking these and other questions would not have thought to consider such matters themselves.

The budget increased as the project progressed. In September 2012, we started with a client donor who had committed $4000, a further $2500 had been raised by the students, and they set a goal to raise a further $10,000-$15,000. By December, the total budget was $32,00, raised from several sources: a gift from the office of Syracuse University Chancellor Nancy Cantor; student fundraising via the social media site indiegogo.com; pledges from the Lions Club and other local organizations; and the doubling of the client's initiating donation (unbeknownst to students and faculty, the original donor attended the school's first design session and was impressed enough with preliminary designs to double the family bequest). Design ambitions expanded with the budget, and our tree house became an outdoor classroom. The team raised a further $5000 for lighting, site work and interiors.

Bookkeeping and budgeting were quite complex. Gifts, donations and funds raised were deposited intermittingly over the duration of the project. The donor funds were released in three lots as students collated receipts and submitted funding requests. Jowonio's internal budget rules precluded donor funds from being spent on fixed assets (such as tools) or non-materials costs (such as food). University chancellor funds had to be spent via the School of Architecture's purchasing office, which required time-consuming purchase orders for big-ticket items. Faculty advised students in setting up systems to track and manage the flows of money in and out, but the students carried out all the day-to-day management.

Interdisciplinary Consultation

The students required outside technical help in three ways. A colleague in civil engineering who is a Professional Engineer provided consultation services, offered advice on site selection and confirmed foundation calculations with a local practicing geotechnical engineer. That same engineering professor verified permitting documents and stamped and signed all drawings for City approvals. The site also required a more professional survey than the architecture students could prepare, so a team of second-year civil engineering students, who had recently finished their surveying course, assisted.

CONCLUSION

Students consistently approached PLAY PERCH as a remarkable opportunity to contribute to the field of architecture and to the public understanding of the value of design as an agent of community enhancement. The quality of their design work is exemplary and their commitment to realizing their precise vision in physical form is remarkable. From the outset, the group aspired to question and challenge the prevailing modes of planning and administering socially engaged design; often in

such contexts, good intentions suffice. Worse, the viability of a design—whether or not students have the skill or acumen to build something—can supersede and even overwhelm aesthetic or formal considerations. Instead, the students worked to craft each decision, relying on the decades-long experience in the region of steel-workers, wood suppliers and other trades, and not merely deploying but extending their own skills learned in their courses and design studios. The aesthetic ambitions of the project are readily apparent in the built work. The project was awarded the Chancellor's Award for Public Engagement by Syracuse University in May 2013, the AIAS 2014 Community Inspiration Award, and the 2014 ACSA Design-Build Award.

The students' willingness to continue to work on PLAY PERCH beyond the initial course requirement and the enthusiasm and dedication of the PHASE II students demonstrate that this project offered them something that they are not getting elsewhere. For the authors, it has been a labor-intensive endeavor to guide student to produce the detail and specificity required to realize a built work, and we assert that for Design-Build to persist, it must be embedded in the curriculum as both a regularly offered course and as a regular part of the teaching load for those responsible. It is also vital that it become a six-credit course. Due to the vagaries of the Syracuse climate it would also be better to complete the course in a spring semester rather than the fall. This also leaves open the potential for a weeklong build period at the start of the summer break. This project also suffered from a little mission creep. As

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Figure 5: PLAY PERCH exterior.

funds became available and new students wanted to be involved, the scope of the project expanded. This was manageable for PLAY PERCH but may hinder the success of future projects.

PLAY PERCH's collaborative course structure allowed the team to capitalize on a unique opportunity. The design process, the budgeting sequence and the curricular implications all represent a departure for Syracuse Architecture and were something of a risk for all concerned, but the project has proven remarkably successful. More than any other single observation, the authors note that overwhelming positive results and strong responses from students warrant the creation of future courses in Design-Build. As a result of PLAY PERCH's successes, one of the leaders from Phase I, a fifth year graduating student, became a Syracuse University Engagement Fellow during the 2013/2014 academic year. He proceeded to work with the authors to embed community service Design-Build initiatives into the Syracuse Architecture curriculum. In the spring of 2014, faculty and students organized PARK STUDIO, a community engagement studio explicitly involving engineering and industrial design students in service learning and public-interest design.

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