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The hand and the mind are inseparable. The hand can activate the mind in ways a keyboard cannot, and the mind can become sharper by translating ideas into movement.



Futures

“I want to be an engineer,” Kerron said.

He was a 16-year-old African-American boy, slight but showing a strength across his shoulders. His smile was toothy, askew, and a rare sight the first few weeks of class. I had been circling the classroom, reviewing the craft and precision of my students’ first hand-drafting exercise. Kerron’s six words, said with a sense of determination and certainty, were the first he had spoken to me since the class had started two weeks earlier. And though small in number, those six words would prove to be enormous.

Kerron was a good student on paper, a natural at math and science. But he found his educational routine uninspiring, linear, obligatory: Go through the motions in class, learn the rote material, take the test, and then forget it all. Nothing learned in the classroom held his attention beyond the school walls. He rode the school bus every day — 20 miles to school and 20 miles back home. On the bus in the morning, he kept to himself, ate his two Pop-Tarts, looked out the window, and dug deep for the motivation to stay awake through first period.

For me, that morning had started like many others. I ran 10 miles before 7 a.m. Then I laced up my boots in anticipation of working in our

woodshop all day. I was prepared in all the ways I could have been, calculating every permutation of the day.

In the early days of this teaching project, I had learned to prepare for everything — everything except the articulation of Kerron’s dream to become an engineer, an aspiration I had never expected. “Kerron, these drawings are beautiful,” I said to him. His utterance made all the struggles involved in launching our new class — the battles with the school board, the fights for funding, the desire to get kids excited about academic exercises that were unlike anything they had ever been offered before — incredibly real. Suddenly, everything in the classroom felt acutely important. I scanned the rest of the room — 12 other students with their heads down, translating ideas in their heads to possibilities on paper. I realized I held futures in my hands.





At 16, Kerron already aspires to be an engineer.



The woodshop in the Studio H "barn" is where students design, build, and prototype.

Rethinking vocational education

As a designer by trade, I'm an optimistic contrarian. I always believe that things can be better. I care deeply about the artifact of design (that is, what you finally build) and just as much about the process it takes to get there. This means looking at your world in a critical and constructive way, and then pulling out all your tools to improve it. I hoped to build this instinct within students: the whole-body belief that anything is possible.

Trained in architecture and product design, I founded the nonprofit Project H Design in January 2008, with just \$1,000 and the same fierce determination I now heard coming from Kerron's lips. I teamed up with kindred spirit Matthew Miller, an architect by training, West Virginia born and bred, with a MacGyver-like instinct and ability to build useful things from any components. He has built a single-family home in Detroit, a school in Uganda, and comes with the rare combination of brilliant design instinct and precise construction abilities. Within our project-driven design practice we also created Studio H, a high-school-level design-and-build curriculum. It is, in essence, a reinvention of vocational education for the 21st century; to the standard shop class, it adds a focus on design as a preproduction phase, and a focus on local social impact, toward which all projects are oriented. In practice, we teach design and construction to high

school students, and they imagine, initiate, create, and build large-scale and ambitious public architecture projects for their own cities and towns.



Project H co-instructor Matt Miller teaches architectural drawing skills using an elegant structure from nature.

The concept of Studio H grew from a constructive critique on

vocational education as we have known it. Vocational education has two primary flaws that we sought to upend. First, it has traditionally only been for students for whom postsecondary education is not an option, whether for academic, social, or financial reasons. Second, even the current arguments in favor of vocational education tend to have tunnel vision, centering on the economic, job training and job placement benefits: Vocational education will put people in jobs, and those jobs help our economy.

In April 2012, Secretary of Education Arne Duncan unveiled the Obama administration's new vocational education plan. It calls for a \$1 billion investment to increase partnerships among high schools, colleges, and employers, with the goal of directing students toward high-need industries such as engineering and health care.

“The traditional mission of career and technical education has to change,” Secretary Duncan said. “It can no longer be about earning a diploma and landing a job after high school. The goal of CTE should be that students earn an industry certification and postsecondary certificate or degree — and land a job that leads to a successful career.”

This argument is valid, a step forward, and of deep economic potential, but to measure vocational education by future career placement is only one piece of the puzzle. Matt and I believed Studio H could be more than simply vocation.

Because vocational education is, at its core, project-based in nature, hands-on, and relevant, it is perfectly poised to address both these opportunities. It can engage all students, regardless of their career or higher education path, by teaching critical, complex, communicative, and creative skills through real-world projects. These skills matter whether a student is employed as a welder right out of high school, pursues a PhD, starts a business, or becomes an engineer or doctor or artist. The metrics for such an education are many: economic, yes, but also social, environmental, intellectual, emotional, and personal.

While most vocational education programs focus on building isolated skills required for a specific job, Studio H would begin with design, and end with real projects for the community. The specific skills required would serve as the vehicle to go from point A (the idea) to point B (the impact). We hope to shift the age-old model of vocational education from a prescribed and simple process (“Take these plans and build this birdhouse for your mother”) toward a space of creative invention, skill building, and the delivery of socially transformative projects used by many people.

The addition of design gives students ownership and pride in what they will produce, and just as importantly, asks them to think about why their actions are important. Design makes production personal and meaningful, and develops creative problem-solving and exploratory skills that are

applicable in any discipline.

The addition of a social focus makes learning visible and valuable to a broader audience. Because vocational education is built around production, making, contributing to the machinery of our culture and economy, we believe the products of such education should be directed towards social betterment. Impact can and should exist beyond the school's walls, putting the school at the center of local progress, as a source of community rather than a mere byproduct of it.

The untapped potential of hands-on, relevant education lies also in its ability to link the hand and the mind as tools for lifelong curiosity. In Studio H, the hand and the mind, we believe, are inseparable: We make by thinking and we think by engaging physically. The hand can activate the mind in ways a keyboard cannot, and the mind can become sharper through the translation of ideas into movement.

In a more contemporary arena, in which high tech rules all, the idea of vocational education as social change maker holds even more merit. It reminds us of the analog, the brick and mortar, and the unavoidable truth that our existence will always require things that are real, tangible, and human-made.

Whether high tech or low tech, though, a good vocational education

teaches the critical thinking required to tackle many problems with many tools. For our students, the table saw, X-Acto blade, and laser cutter are of equal importance and essentially serve the same function: to cut. We do not teach the tool; we teach the thinking. The tools are a way to achieve an ultimate goal. That goal, too, must always be rooted in citizenship. We must use our tools for the benefit of others. What is their value if not to construct the world we want to live in?



A billboard on U.S. Route 17 entering Windsor displays the Studio H slogan.

Design. Build. Transform.

We have a simple slogan for the Studio H program: “Design. Build. Transform.” That is, teach students design as creative problem solving, equip them with hands-on, industry-relevant vocational skills, and put both to use to build contextually responsive and socially transformative architecture projects for the community. In doing so, youth, education, and community will be ignited with new purposes, programs, capital, and sense of citizenship.





The first Learning Landscape educational playground built by Project H flanks the Kutamba School in southwest Uganda.

In May 2010, partner Matt Miller and I moved from San Francisco to Bertie County, North Carolina. One year earlier, we had received a cold-call email request from the visionary former superintendent Chip Zullinger (aka Dr. Z), who had seen our Learning Landscape educational playground project published on the design blog *Inhabitat* and asked us to come build some for his elementary schools (“What superintendent reads design blogs?” I remember thinking). Known as a “fixer” for broken school districts, he believed design might be the secret weapon to reengage every stakeholder in the success of the Bertie County school district.

Within a few weeks of our first communication with Dr. Z, Matt and I got on a plane. Arriving in Raleigh, my first sight of the area instilled more shock than awe. Vast fields and the occasional kudzu-covered barn were interrupted only by the usual highway exit restaurant chains. The greenness of the pervasive tobacco plants was startling. From the airport, we drove two hours due east. Once beyond the outer ring of the Research Triangle, the nothingness abounded. We were not sure what awaited.





Colerain Elementary is one of four Bertie County schools to receive a Learning Landscape playground.

But in the days that followed, we got to work, building four playgrounds in four days, using a backhoe and a “crew” of maintenance guys named Otis and Woot. In the months that followed, Dr. Z unveiled his laundry list of additional projects. He gave us a modest budget and “turned us loose,” as he said. We designed and built three computer labs, plus a

weight room for the football team, and we designed a campaign for a free public broadband program. His requests continued. We completed every project he threw at us, traveling back and forth from the Bay Area to Bertie County, from the land of organic urban farming to the land of industrial poultry farming, from liberal diversity to polarized racial rifts. We built and welded and raised and hammered. We met students and teachers and the postmaster, a middle-aged man named George, born and bred in Bertie County and proud of it. Although we would never be Bertie County natives, we were becoming known, forming alliances, sharing stories, and deepening emotional attachments with the community.





Our computer lab renovation at Bertie High School incorporated a wire-free space and collaborative pods.



U.S. Route 17 passes through Bertie County on its way from Virginia to Florida.

An honest place



King Street, Windsor's main drag, splits off U.S. Route 17 and crosses a spur of the Roanoke River.

The profile of a place can be articulated in two ways: by data and by experience. By the data, Bertie is a county of 20,000, at 26 people per square mile. One in three children live in poverty. The black and white

communities (63 percent and 36 percent, respectively) are divided. Rumor has it that the public baseball parks were “white only” until 1997. The school district is failing, with only about one-third of its third- through eighth-grade students passing the state standard in 2008, though the numbers rise a bit every year (due mostly to Dr. Z’s efforts). The county seat, Windsor, is home to 2,000, including the nearby prison population. Few of these 2,000 can be seen walking down King Street, the main thoroughfare, which looks like a ghost town. There is no bookstore, coffee shop, movie theatre, community college, or Walmart in the county.

Bertie County is emblematic of the disproportionate geographical funding gap in this country: Only 6.8 percent of all philanthropic funding benefits rural communities, while close to 20 percent of the population lives in rural communities.

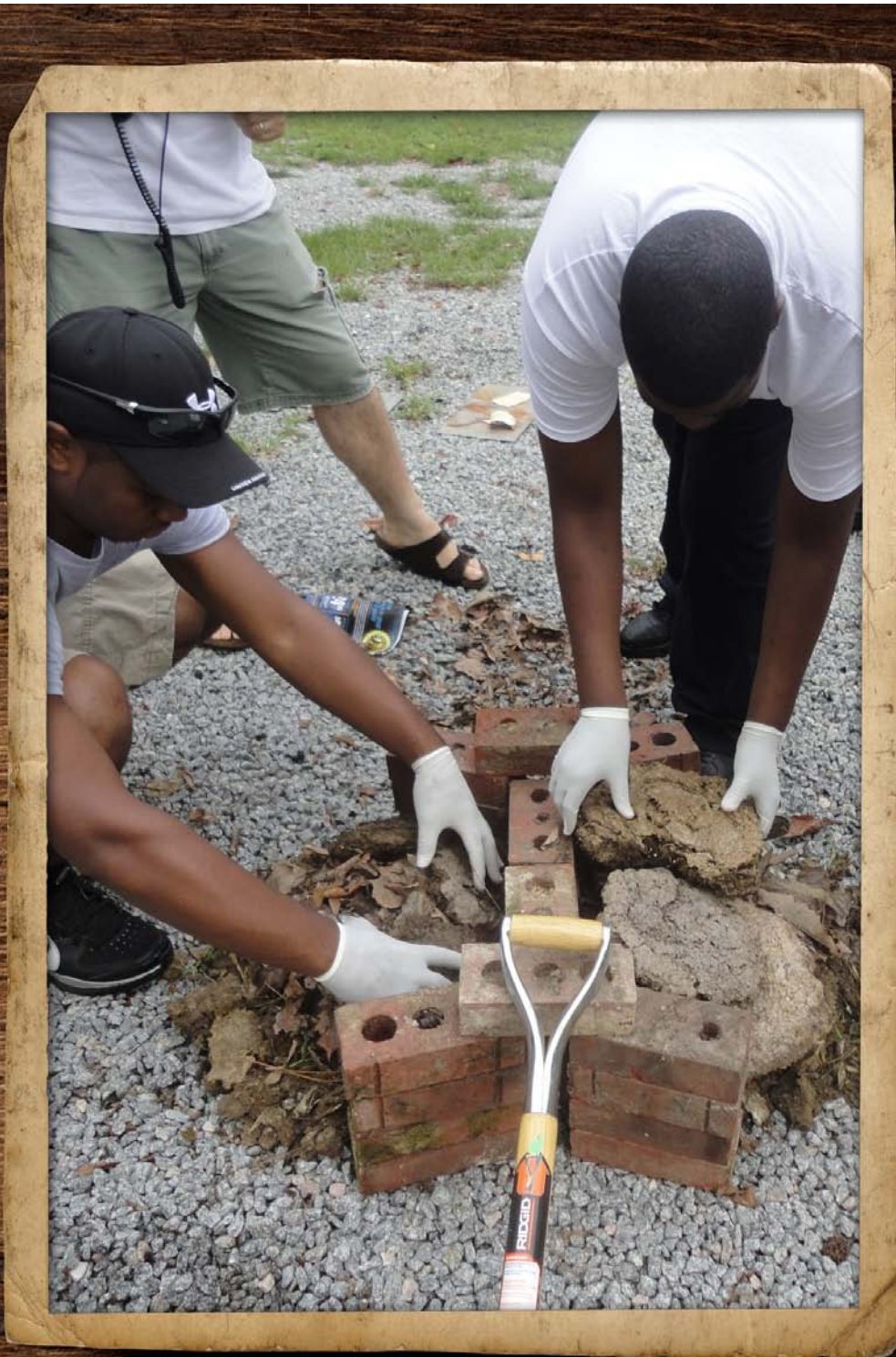




Vast green fields of tobacco, cotton, soy, and peanuts dominate the Bertie County landscape.

By experience, Bertie County is an honest place: Everyone knows everyone else, everyone says “y’all,” and anyone will drink sweet tea with you on his front porch at any time. The pronunciation of “Bertie,” with the emphasis on the second syllable, along with colloquialisms like “pop and nabs store,” “might could,” and “case quarter” make for a site-specific linguistic bond. In the summer, the heat can be paralyzing. During spring planting season, the air smells of sweet chemicals. Before harvest, flecks of cotton float across the two-lane rural routes, which stretch across the county and cut through the vast fields. One’s “place” can be defined by race, gender, kin, and church membership, usually in that order. It can feel like a trip back in time. In Bertie County, I found myself more present, less distracted by the sensory overload of urban life, enjoying the eye contact and handshakes I encountered on the short walk from my house into town. It

was a small place, not without its hurdles, but a special one.



Students fire ceramic water filters made from clay and coffee grounds over a cow-dung fire.

Students should go home covered in dirt

Bertie County began to take root in me, and I saw in its youth a collective spark to take action, a deep human desire to build a better future together. To give legs to this sentiment, after completing the football team's weight room renovation, we pitched the concept of the Studio H program to Dr. Z over steak and whiskey. We believed the program could build creativity, capital, critical thinking, and citizenship: skills the youth of Bertie County sought in order to succeed, and the same assets this Deep South rural community needed in order to survive. We believed our role as designers could be more than creative consulting. "Design should be in the classroom," we told him, when making our pitch. "It should be part of the school day. Students should go home covered in dirt."

We described our plan to build public architecture projects for Bertie County — for, with, and by the hands of its students. It was not so much about the glory of design as about putting youth at the center of a community's progress, and their education at the forefront of their own future. Amid a litany of socioeconomic issues, the raw brilliance of youth is the best resource to bring those possibilities to real life. Dr. Z agreed. "Yep, we could do that," he said.

With his no-frills response, we had our green light, and a new line on our resumes: “High school teacher.” We wrote the curriculum. We turned an old barn on the high school campus into our classroom, studio, and shop space. Dr. Z earmarked two teaching salaries for us. We enrolled our 13 junior-year students, who would be with us in the classroom for a full year, three hours a day, every single day. I raised \$180,000 in grant funding for the classroom materials, student work stipends, brick and mortar for the structure we would eventually build, insurance costs, and subcontractor labor. We convinced the closest community college to dually enroll our students in 17 college credits per year.

We were on our way. Or so we thought.

Then the sky cracked over our heads.

Four weeks before we launched the first academic year of Studio H in August 2010, political tensions between the school district’s board and administration forced forward-thinking Dr. Z out of his position (and out of town).

With his departure went many programs he spearheaded. He had, in his two-and-a-half-year appointment, raised test scores, brought in Teach for America teachers, embraced design as an integral strategy for the district, and forged unlikely partnerships that were already bearing fruit for the

district and its students. “Machiavellian!” he said. “Some people can’t stomach change, even when it’s good.”

As the school board began chopping everything that Dr. Z had blessed, our Studio H program was at the top of their blacklist, but we fought to stay. We endured screaming phone calls from the school board chair, ridiculous requests to provide grant confirmations and bank account statements, and personal attacks on our character and experience. After standing our ground for weeks, the board chairwoman made us an offer: “You can stay here and teach Studio H if you do so as unpaid teachers and never ask us for a dime.” We agreed. And then we walked into our barn on the first day of school ready to slay dragons.



Studio Ht students brainstorm design opportunities within Bertie County.

Building a five-point framework

When we first began to dream about Studio H, we knew we wanted to create a model that would be inspire similar action in many schools. While not everyone can or should build chicken coops and a farmers market in their hometown, every community has needs and hopes. We wanted an easy answer to the questions we knew we were going to be asked: “How can I do this in my school? How can I do this in my community?”

In response, I offer these five suggestions as a framework for where to start.

1. Make it now.

The best piece of advice I ever got came from my graduate school mentor. I asked him about my thesis project: “How do I start?” His reply was brilliantly dumb: “You just start.” The words stuck with me. The best thing any of us can do when we feel the inspiration to act is to act. The details will follow the movement. The “how” will come to us once we are out the door. Go to a town hall meeting. Send 50 random emails to people whose brain you would love to pick. Start a business. Host an event. Call the mayor. Find an empty lot and start digging.

2. Make it your own.

While it is logical and instinctual to want to replicate things that have already been done, one of the most powerful tenets of design is that it is always a response to a context. There is no drag-and-drop option when it comes to designing and building something for and by your own community. A farmers market means something very different in the food desert of Bertie County from what it means in the food-savvy San Francisco Bay Area. Work to make your project place- and people-specific. Do this by being a citizen first. Take off your professional hat. Listen. Understand every piece of the context before proposing solutions. Ask others. Draw inspiration, but do not duplicate.

3. Make radical connections.

Design is a versatile ingredient: It bridges disparate people and ideas with grace. While design can bring forth new connections, radical connections also breed great design. The butting up of opposing ideas and groups often explodes in a cloud of unexpected things neither party could have discovered on its own. In starting your project, seek out these connections. Talk to the people with whom you most vehemently disagree. Be vulnerable and open to their critique. Don't just "reach across the aisle," but leap across it and make yourself at home.

4. Be audacious.

Crazy is a great place to start. Seek out and entertain the most far-out ideas: They can always be edited, but if you begin with the predictable, you will rest in the comfort and not push an idea to its edge. Let audacity reign for both the content of an idea and the way in which it is delivered. Why send out a direct-mail campaign when you can plaster the side of a building with a befuddling graphic? The spectacle of progress brings people together in a combination of stupor and intrigue. When brainstorming, throw in wild cards to intentionally derail your train of thinking. Embrace the discomfort of not knowing where you might end up.

5. Make it count.

“Git ’er done.” Anything you start, finish. Design-driven projects have a secret weapon in achieving this goal: They are usually visual and visible. Making a project count means not only making it real but also constantly asking yourself if it is of value and to whom. The display and presentation of an idea is only the 50-yard line. Making it real and making it count requires grit, sacrifice, the willingness to look stupid, and above all, dedication. Stop at nothing to get your projects done. To execute the vision we propose means delivering on the promises we make to our collective communities, providing proof that change is possible.



These lumber sections will become colorful cornhole boards.

Make it now: Cornhole showdown

During the first week of school, we asked our students, “What is the last thing that you made?” Answers ranged from “a fence for my cows” to “a greeting card for my mom” to “I don’t make stuff ever.” Kerron, my aspiring engineer, told us with his eyes fixed on the ground, “I made dinner for my brother last night. I make dinner for him every night.” I learned that he was the de facto caretaker of his home. Over the entire year, I never met his mother. I saw her only once, through a rainy windshield when she dropped Kerron off at our shop after a doctor’s appointment. As she pulled away, I asked him what she did for a living. “I don’t really know,” he said. “She isn’t around much.”

We asked this question as a benchmark to gauge our students’ experience with making, building, creating. To separate the dreaming from the reality. Studio H is rooted in doing, and in using both mind and hand in tandem.

In those first few weeks, we were just getting to know our students, learning to trust each other. I learned that most of them had not had an art class in years, or ever, and few of them could read a ruler. Most of my female students were terrified of power tools, backing away from them slowly as if

they were activated bombs.



Students draw elevations of stacked blocks, “learning how to see.”

Our first assignment was a simple drafting exercise to develop what Matt and I refer to as “learning how to see.” It begins by looking at a stack of blocks at the center of the group table. Students must then draw the stack

as a plan, section, and elevation (the three staple architectural drawings) at a 1:1 (full) scale, first from one side, then from another, from the top, and as a cross-section through the middle. Some students, particularly those of the millennial generation whose haptic instinct leans more toward a touch screen than a pencil, struggle to translate what they see in front of them into a visual language. A few pick it up quickly; their drafting pencil becomes a sixth digit on their hand, their line weight varied and perfectly representative of the mass of each object. Kerron fell into the latter category. The lines flowed from his right hand like calligraphy.

This initial exercise would pave the way for our first built project: the construction of wooden sets of boards for the beanbag toss game dubbed “cornhole,” a popular pastime in Bertie County (though Ohioans will claim they invented it). Creating the boards developed basic carpentry skills, a comfort with the band saw, chop saw, table saw, router, sander, and biscuit joiner. It also pushed students to think about graphic design as a tool for communication, beyond corporate logos or college mascots, both of which are common cornhole board decorations. Each board was intricately painted with a graphic inspired by an action verb, such as “to hinge” in shades of green and blue, or “to bend” in red and black. The resulting designs were bold, conceptual, and totally unique.







Who knew the cornhole board could be a medium for bold expression? Students build their own and prove it can.

When the boards were complete, we invited families and friends to our cornhole showdown to celebrate, get to know our students and the program,

and of course, to play cornhole. Kerron attended the showdown with his younger brother, who followed him around timidly. Our students taught their aunts and uncles the rules of the game, and looked at their boards with pride. Their dreams were becoming real, in wood, paint, and sweat.



The Studio H wall bears words to live and work by.

Make it your own: Beyond Perdue

The largest employer in Bertie County, with no close second, is the Perdue chicken processing plant. Many families raise chickens for Perdue, including our student Stevie's family. They house 250,000 chickens in 10 houses on their property at any given time. Bertie County's chicken industry looks a lot like the worst scenes from the documentary *Food, Inc.* Industrial poultry farming brings with it troubling economic, animal welfare, and social dialogues, but also prosperity for many families. To speak of it within the classroom walls is a delicate dance between an honest critique of the industry and a sensitivity to the daily lives of local farming families.

When it came time to embark on our first architectural project, we started, as good architects should, with context. We were deep into our second rule: Make it your own.

In a county dominated by industrial poultry farming, we asked the students, "What's another way to look at it?" Instead of 250,000 chickens on your property farmed for a large corporation, what might it look like to have six to eight egg-laying hens in your backyard as a sustainable source of food? This question began our students' first adventures in the architectural design of a structure to be inhabited by living beings.



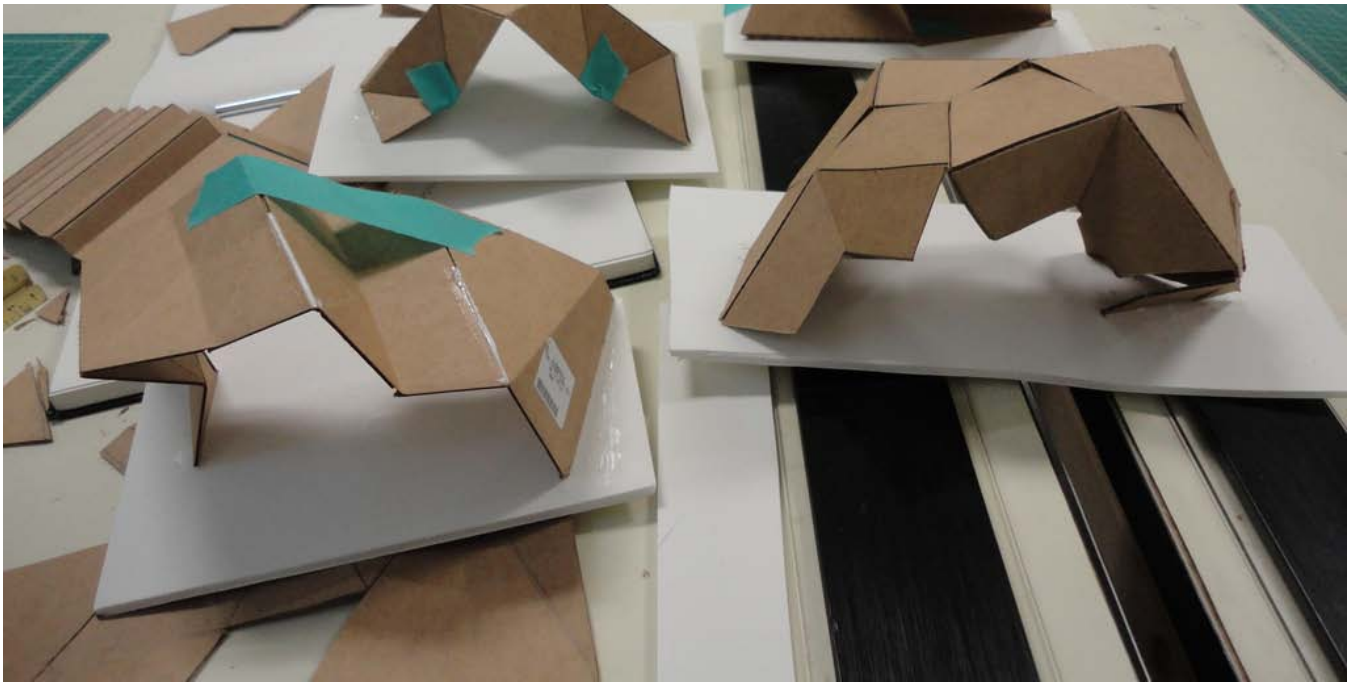
Our “clients,” Henrietta and Jezebel, resided in the classroom for frequent consultation.

After “borrowing” two chickens from a friend’s farm, we installed a makeshift coop in the classroom, built from a semitruck hood dragged from the woods behind our barn, some leftover wood slats, and chicken wire. This

coop was in no way intended to be design inspiration but a quick housing solution for our new classroom hens, Henrietta and Jezebel. In three days, students would get to know their feathered “clients” by observing their behavior. How do they eat? “They like pecking out of the straw, not eating from the trough,” noted Kerron. How do they sleep? “They huddle together up in the roosting box,” said another student. After three days, our students knew far more about chicken behavior than they ever imagined or wanted.

A few weeks later, it was time to “raise the roof” of one of the coops our students had designed and engineered. Matt and I had been working with our Team Coopus Maximus for the past three weeks to figure out how the heck to get the chicken coop to stand up. Kerron, Erick, Alexia, and Cameron had co-designed a chicken coop inspired by the simple geometry of Buckminster Fuller’s geodesic dome. The coop was essentially a roof strip that reached from the ground up to the sky and back down again in a rainbow-shaped arc of triangular facets. The structure folded along the edges of smaller equilateral triangles that made up the whole. It was not a simple feat, in design or in construction.





Kerron and Erick’s cardboard sketch models explored geometry and folding.

When Kerron and Erick had first begun tinkering with the geodesic-inspired forms, they worked in cardboard. They scored a rectangular piece in parallel lines and triangular mosaics and folded the single piece into a faceted shape. The two boys made dozens of these “sketch models,” learning from each one and trying again. Against the constraint of the design brief, which included the number of square feet, a need to protect the chickens against predators and weather, and a \$500 budget, their forms butted up against function until a final design emerged.

This was iteration, and it was a totally foreign concept to most

students. Unlike their other classes, which were far more formulaic (read this, do this worksheet, turn it in, take a test, get a grade), our curriculum asked students to begin, over and over again, without knowing where they would end up. We banned the use of two phrases: “I’m bored” and “I’m done.” This approach is at the heart of design education and is a mode of thinking that students are not often taught in public schools. “Yes, but ... ” is always followed by “And so”



Iterate, iterate, iterate: Students made multiple sketch models of their chicken coop design concepts.

Make radical connections

The idea of failure has taken root in many design thinking circles, the premise being that failure teaches us how to rapidly redirect toward a solution. One idea fails and we try something else. In fact, failure is a misnomer. To fail would be to walk away from the problem entirely. What occurs within an iterative process is a series of manipulations, deliberate “poses,” strung together, inseparable and codependent, toward the moment at which the final generation is ideally suited to the context of the problem. At that moment, we build, knowing that failure in the real world is not an option, nor has it ever been part of our process in the true sense of the word. We push and pull and tweak and erase and reorient so that we may produce the best version of our ideas. We do not fail; we commit to incremental and constant improvement.

For Kerron and Erick, after dozens of cardboard and chipboard sketch models were strewn across their drafting tables, the final generation took the form of architectural origami. The model was built in chipboard, with precise slices and folds that transformed a single flat sheet into a three-dimensional faceted arch. They presented the scale model to us, being careful not to use the phrase “We’re done” but saying instead, “This is what we want to build.”

Matt and I looked at each other, proud of the product that had resulted from their process and, at the same time, entirely perplexed. I looked at him and we had the same thought: “This is awesome, but I have no idea how to build it full-scale.” The vision that came to life in chipboard might never hold up in wood and metal, buckling under its own weight. The only way we would find out, though, would be to return to the same process by which Kerron and Erick had built their model: Do it over and over until it works.

Over the next few weeks, we bounced between woodshop and studio, trying to figure out the full-scale bending piece. The challenge was finding a configuration that matched the action of the model: a flat piece with built-in flex points, which, when bent into shape, would hold its form and remain structurally sound. It was an easy feat in chipboard, but the weight of more structural materials, and the simultaneous need for both flexibility and strength, proved a conundrum. Rounds and rounds of testing, editing, material swaps, cutting in new geometries, finally yielded a viable solution. The roof “ribbon” was constructed using two layers of plywood, cut into pairs of 30-60-90 triangles, between which strips of sheet metal were sandwiched to form flexible hinges between the triangular pieces. As a whole, the piece was rectangular, about 4 by 18 feet when laying flat.

It was this flat but flexing piece that lay before us on the concrete floor of our studio, drafting tables moved aside to accommodate the roof-raising.

It would take the whole class to lift it, twist and turn it into shape, and secure it in place.



Raising the roof is a delicate, precise, and heavy (!) operation.

Circling around the soon-to-be-coop, we bent and lifted in unison. It was a dance, a choreographed motion requiring total focus and

communication. “Lift that, bend there, hold still,” we instructed, as students moved under, around, behind, and within the lifted roof. Across the room, on a table, the chipboard model was our reference. We eyed it carefully, our motions following its lead, the wood bending to its form. Forty-five minutes later, two-by-fours bracing the raised and bent coop roof in place, we stepped back, as if backing away from a pointillist painting to see the whole image.

Kerron leaned against a ladder. “It’s ... amazing,” he said. His teammate, Erick, wiped sweat from his brow using the back of his work glove. “Man, I hope the chickens appreciate this.”

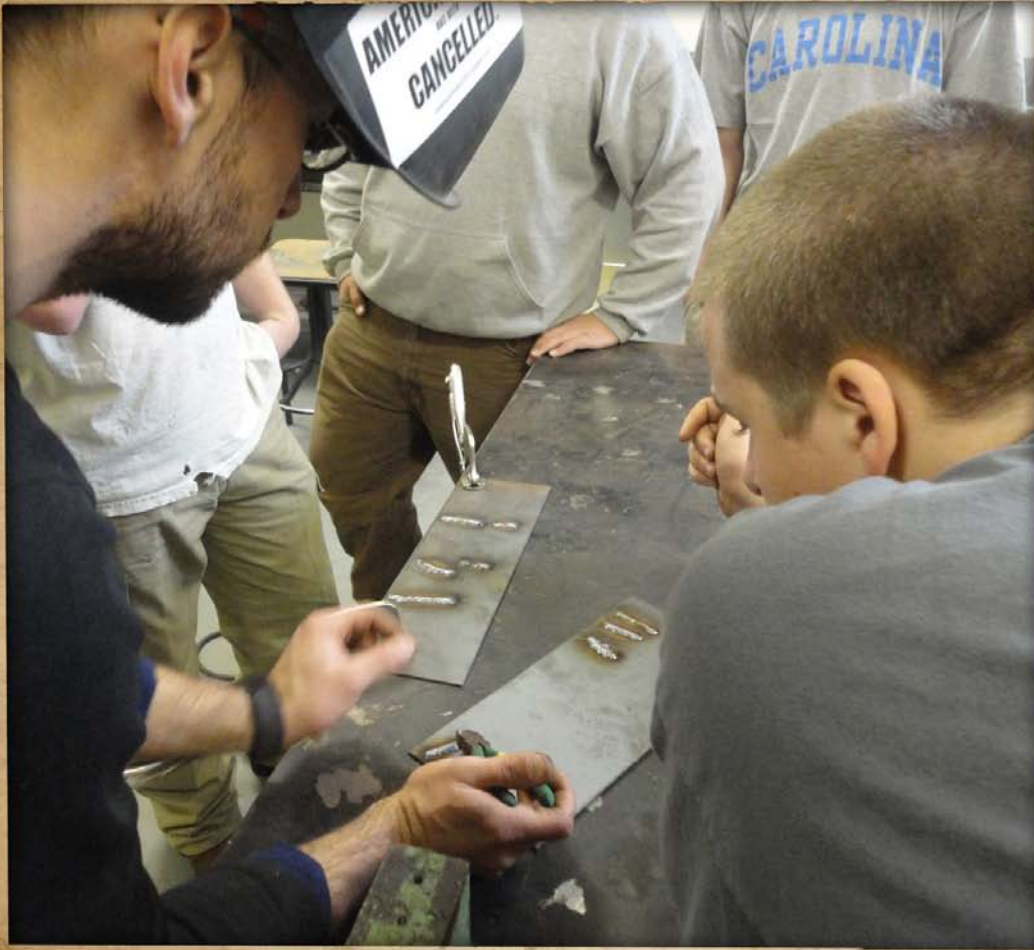




Coopus Maximus, completed, is striking in its minimalism.

We finished Coopus Maximus, as it was dubbed, with a MIG-welded steel frame, rubberized roof paint, and chicken-wire siding. Henrietta and Jezebel, our resident chickens, enjoyed their new abode until the coop eventually traveled to Portland, Ore., to be featured in an exhibition of Studio H's year-long work. It is now a backyard fixture for a family, home to a dozen hens. The class built two other coops, ChickTopia and Chicken Circus, which sit in the front yards of two family homes directly across from each other, a block from the school. Driving down the rural route into town, there is nothing for miles. Then, out of nowhere, spring two crazy sculptures, functioning as chicken coops, given to families, raised by the teenage designers who dreamed them up, far beyond what they ever imagined a henhouse could be.

[View a gallery of the full Coopus Maximus build here.](#)



Matt and Cameron examine practice welds in the metal shop.

Be audacious: Teaching each other

He watched as the sparks flew, in terror of the welder's cracking sound as metal fused to metal. "I ain't going near that thing," he said to me. I handed him a helmet. "Get closer," I told him. "We'll do it again. Watch the tip. Back and forth."

The next day, the rest of the students stood behind the screen and watched as Kerron dropped the mask of his welding helmet over his face. He straightened his gloves. "Eyes!" he said, a standard warning for others to look away from the welder's UV light glow. He stitched the two pieces of scrap steel together in a fillet weld, not perfect but sturdy. The sparks surrounded him in an aura. When he stopped, the steel glowed orange.





Kerron draws an audience for his first attempt at MIG welding.

A week later, Cameron, a hefty boy who had recently made the decision to “not be so fat anymore,” asked us if we could install a pull-up bar in the studio. “If you build it, of course we can,” Matt told him. “Kerron, show him that weld you learned. There’s some scrap tube steel in the metal shop.” Cameron, exuberant but sloppy in his fabrication, wasn’t expecting the response. He looked at Kerron; the two exchanged a hesitant nod. “Come on,” Kerron said.

In the metal shop, Kerron reviewed the welder’s settings. Cameron had learned the basics like everyone else but was in need of more time and practice with the tool. Kerron demonstrated the proper motion for the weld required by the pull-up bar’s structure. “Back and forth, like a sewing stitch,” he said. Suddenly a master to an apprentice, Kerron spoke with confidence, watching Cameron move through his practice welds.



Students stage a pull-up contest using the bar built by Cameron and Kerron.

They built the pull-up bar in one day. The next morning, it was installed above the double doors between our woodshop and studio spaces. Cameron hung from the bar, his neck craned as he struggled to lift himself even an inch in the vertical direction. He dropped from the bar. “Man, I

suck at this. Kerron! I bet you can do, like, 10 pull-ups. Get over here.” Kerron leapt up to the bar, pulling his chin above it a dozen times with ease. Cameron shook his head, not in jealousy but in admiration. “Give me to the end of the year. I’ll be able to do one.” (On the last day of school, we would all gather around to watch Cameron do his first pull-up.)

Whether wielding a welder, a digital design program, or a table saw, our students learned by first observing, then doing, then teaching. Sushi-chefs-in-training observe master chefs for years before picking up a knife: Observation builds visual understanding of the skill. Doing negotiates and marries the visual observational understanding with the motor skills and muscle memory necessary to complete the task. And most important, to teach the task to someone else communicates learning back to the world, passes on a skill in a personal way, and builds continued confidence in the practice. In our classroom, teaching came from all of us rather than just the official “teachers.” I taught Kerron, Kerron taught Cameron; Cameron taught Matt, Matt taught me. By teaching Cameron to weld the pull-up bar, Kerron went from knowing how to weld to calling himself a welder.



Students diagram structural systems, light, ventilation, and human circulation at the state farmers market in Raleigh.

For and by the people

It was time to move from chicken architecture to building for and by the people. From the beginning, our goal was to build architecture, designed and constructed by high school students. The chicken coops had been raised. Now was the time.

The “what,” however, remained in question. The “if you build it, they will come” mentality is idealistic and at times imperialistic, if the initiative does not come from within. It was time to step back and let the county, its residents, and our students put a name to the thing that would catalyze the community.

We heard it first at a Rotary Club meeting, of all places. One of the town councilmen told us, over a spread of the usual Southern fixings, that the county used to have a farmers market, years ago, but it fizzled out for lack of space, support, and structure.

We heard it again from a friend, whose backyard beehives and garden needed an outlet for their production. She could use the extra income, too, she told us.

We heard it from an aspiring baker in town. She had always wanted to

start her own business, making cakes, but had never believed she could find the space or customers.

We heard it from the mayor, our neighbor, who echoed the sentiments of his town councilman. He even went so far as to point out a usable piece of land, should we want to build the market there.

And we heard it from our students, many of whom came from farming families but did not see the direct connections between their farms and their dining tables. Many of our students were also overweight and unhealthy, and recognized the need for access to local, green food.

And so it was decided: We would build a farmers market, a structure and an enterprise, for the town of Windsor and greater Bertie County.

We filed all the paperwork for a school field trip to the state farmers market in Raleigh. Just as we had observed the chickens to best design their coops, we also started to define the need and problem to be solved by sending our students out to interview every vendor at the state market. “Why do you sell here?” asked Kerron. “Do you think this facility meets all your needs?” They drew in their sketchbooks. They diagrammed airflow and light. They inventoried the numbers and types of goods for sale. And they eyed the building carefully.

We decided that the state farmers market building was sufficient but by

no means exemplary or inspiring. It was a simple roof structure with painted parking spaces for vendor booths. It had not been designed so much as manufactured and installed from a kit of parts. As we loaded back onto the bus, I smirked as I heard more than one student say, “We can do way better than that.”



Students think critically by sketching, building models, and revising their farmers market designs.

Levels of knowing

Knowing “that,” “how,” and “why” — in that order — are of increasing value within our Studio H classroom. It’s the difference between knowing that the weight of concrete is 150 pounds per cubic foot, knowing how to pour a concrete foundation footer, and knowing why concrete is the right material for the job in the first place.

While most classes place ultimate value on material-based knowledge (“I know the difference between an adverb and an adjective”), design-based education, particularly that which demands a final product, equally values skill-based knowledge (“I know how to write a grammatically perfect persuasive essay to argue a point clearly and without semantic distraction”). In Studio H, however, knowing “that” and knowing “how” are nothing without knowing “why.”

Over the course of the year, our students tired of our instructional habit of asking “Why?” We undoubtedly sounded like broken records and like toddlers tugging at their parents’ shirttails, asking “Why” with every subsequent answer.

Sure, we know “that” Bertie County needs a farmers market. Yes, we can teach students “how” to build it. But “why” is this project of meaning,

why will we see it through, and why is it the perfect match between education and community? These are the questions that build in the students an ingrained sense of meaning, critical thinking, and possibility within their own worlds.

Design must be deliberate, a decision born from creativity, constraint, and intent. Our pedagogy within the walls of Studio H follows this charge: We can at the same time be critical and constructive. We, as a group of teachers and students, must know what to do, how to do it, and why it will matter.



Students take their bold ideas public at an exhibition of their farmers market designs.

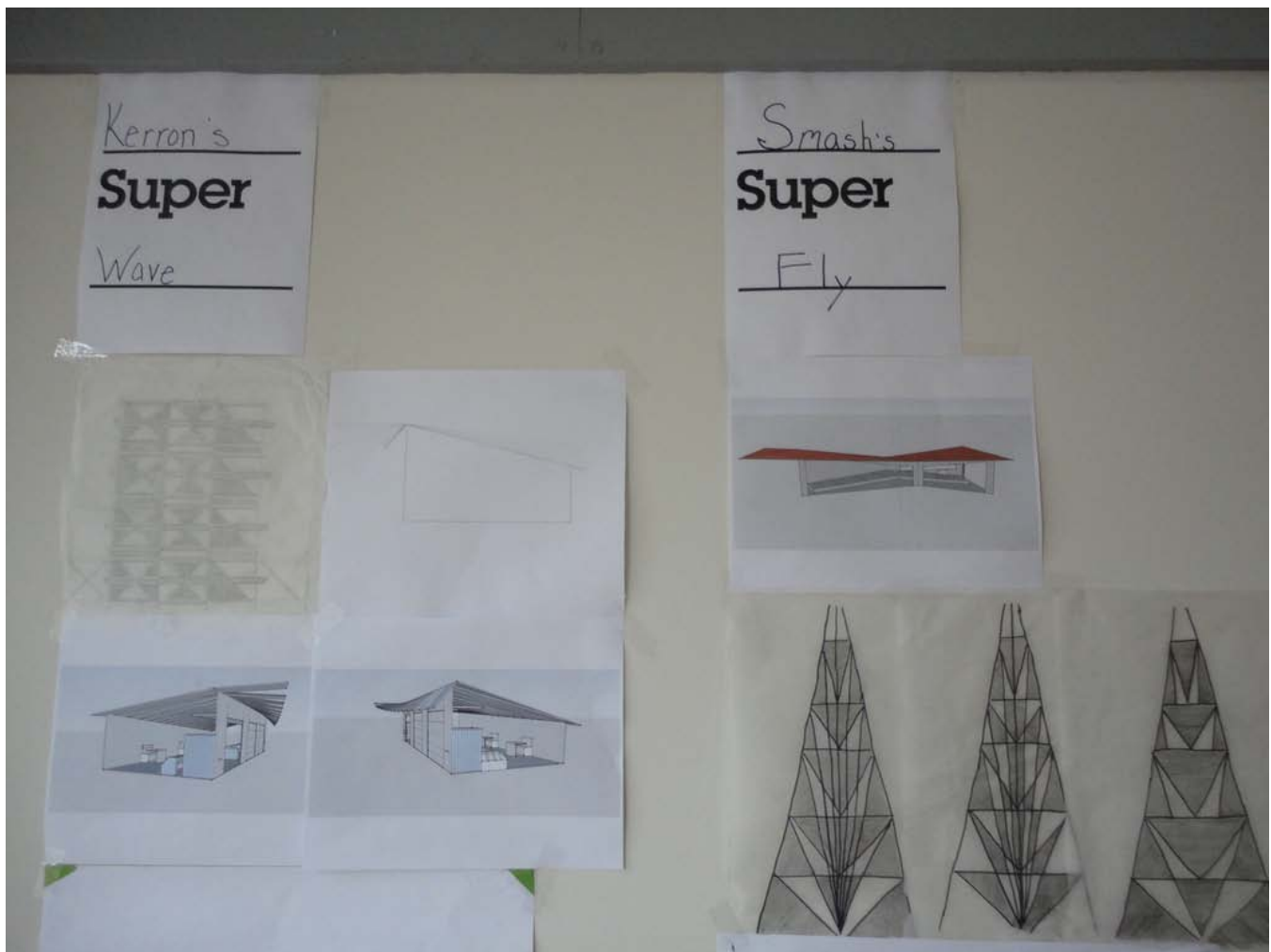
Worlds come together



Residents respond to students' farmers market designs at a public showcase in downtown Windsor.

We had plastered the walls with the students' designs for the farmers market: wacky, beautiful, and odd. "Give us your craziest ideas. We can

always bring them back to reality,” we had said. Designs inspired by a zipper, a pickle jar, an airplane wing, and a forest both captivated and confused the residents of Windsor and greater Bertie County who filled the downtown storefront that night. We had invited anyone and everyone to the exhibition. We wanted their feedback, their criticism, and their support. We wanted our students to be the docents, curators, and rabble rousers. We had four months to go from drawings on the wall to concrete in the ground.



Students' designs took inspiration from such objects as an airplane wing and a zipper.

I took the photo in a flurry, trying to document the crowd, the conversation, and the content. At home later that night, I was uploading my photos to our online gallery and paused when it popped up full-size on my screen. Kerron stood shoulder-to-shoulder with a tall middle-aged white man named Jock, the proprietor of the local bed-and-breakfast. Jock holds a Ph.D., once worked for the World Bank as an economist, has traveled the world, and somehow landed in Bertie County. The two could not have been in starker contrast, in stature or in status. And yet, the image captured a rare moment of commonality. Standing in front of Kerron's farmer's market design drawing, Kerron talking with his hands, Jock leaning into his words, the two were one. I am convinced that in no other moment, through no other project, would these two have met, let alone spoken to each other about something they both deeply wanted to see realized for their town. "This is my design for the Windsor farmers market," said Kerron. And Jock said to him, "Tell me more about it."





Jock, a former World Bank economist, asks Kerron about his design.



At last, we have our official Windsor building permit for the farmers market in hand.

Make it count: The farmers market

As we moved from concept to reality, we were wriggling inside multiple straight jackets. There were Occupational Health & Safety Administration requirements (laws required to ensure safe working conditions), North Carolina labor laws, building codes in a flood and hurricane zone, our paltry construction budget, and the physical limitations of a construction crew of teenagers. Moving our design into reality would be the hardest part, without question, yet also where all the learning — for all of us — would occur. While most design and architecture education programs, even the most prestigious undergraduate and graduate, end at representation, the production of drawings, or renderings of an idea, we envisioned Studio H with the unofficial slogan: “Git ’er done.” Representation was only the 50-yard line. The touchdown was seeing it through, bringing the project off the page and into the world.

At a design conference I attended during the spring semester, I was asked by an attendee what my organization’s “hit rate” was. I had not heard this term before and asked for clarification. “The percentage of projects you start that actually become real,” my questioner explained. I thought about the question, perplexed that such a metric existed.

“Um, I guess 100 percent. We have never done a project that wasn’t

made real.”

I said this not in boasting but out of surprise, and I wonder about the firms with hit rates lower than, well, 100 percent. It is the nitty-gritty of production — of taking an idea through the filters of reality, human constraint, physical limits, and economic boundaries — that makes good design great. Our farmers market would not end with a showcase of student renderings for parents, the public exhibition downtown, a pat on the back, and a photo op. It would end with a structure, built and solid, occupied by Bertie County residents selling their produce to their friends and neighbors.





The students' final model, built in cardboard, is a glimpse of a dream.

The students' imaginative design of the farmers market was, by comparison, the easy part. Although we assigned constraints in the design brief, the design process essentially happens within the safe vacuum of the studio. We began with precedent studies, a staple in architectural education that asks students to dissect, analyze, present, and learn from the design elements of analogous buildings. Students then moved through many rounds of sketch-modeling, editing, revising, and mashing up ideas with others. As they married similar and disparate ideas with their classmates, they narrowed the focus to the most viable concept during a public final critique. They then detailed the design into a set of working construction documents. We dubbed the design “vernacular sublime” — an eight-bay building, inspired by local agrarian structures, specifically a peanut trailer shed style found only in Bertie County but with a decidedly unexpected twist. An angled ramp opened the interior space to the road. The structure was oriented toward the street, as a sort of front porch to the town. The double-height ceiling helped move air through the space, and the upper siding would serve as a billboard.

And then came the flurry of constraints, mostly legal, primarily administrative, and totally annoying. But constraint breeds possibility. When our students found out that our site was in a flood zone, requiring the deck height to be three feet above base flood elevation level (hip height, when standing next to it), they used this as functional inspiration. “Hip height is also the height of a truck bed. Let’s make the rear access of the building a loading dock for each vendor,” suggested Kerron. His idea met with the nods of his classmates.

North Carolina labor law dictates that minors on a construction site are not allowed to use power tools. So we prefabricated the building’s large truss components in the shop during the school year, then disassembled them, moved them to the site, and reassembled them by hand. We designed each piece of the building but also each process to produce each piece within the “no power tools” constraint. Our one 18-year-old would be our designated “cut man,” the only person allowed to use the chop saw.

Our general contractors license required a whole slew of standards: workman’s comp insurance, safety handbooks, and a full-time salary for Matt, the qualifier for our license. We drafted extensive agreements for the students to articulate the exact relationship between their summer labor and their end-of-year work stipend. We wrote, revised, negotiated, and signed an agreement with the town for the ongoing maintenance of the building and

the farmer's market enterprise. We bought hard hats. We applied for the building permit. We enlisted the pro bono help of a structural engineer, who stamped our drawings. Matt and I called on a friend from Wyoming to be our third man on the job site. The last day of school sneaked up on us, and we hit the construction site the next day, in 110-degree heat. The pressure of the task ahead (coupled with the stifling Southern humidity) was both paralyzing and ideal motivation to rise every morning at 5.



Kerron rests in the farmers market bays after a long day of cutting and fitting floor joists.

French fries and hard hats



The Studio H crew digs foundation footers and fills them with concrete in more than 100-degree heat.

In addition to the work stipends we offered to our students during the summer construction of the farmers market, Kerron worked evenings and

weekends at McDonald's tending the fry station, banking all he could, wondering if it would add up to a college tuition payment. On the job site, the work was dirty and different every day. He dug holes for the foundation footers. He poured concrete. He dug more holes. He sorted hardware. He laid hundreds of pieces of rebar. He became our go-to floor-joist fitter and decker, able to measure each joist and floorboard within the 1/32-inch tolerance necessary for a precise fit. On the last day of construction, his classmate Jamesha would ask him in a video interview, "What was your favorite part?" and he would reply, "I basically built the entire deck, which everyone will walk on. I'm proud of that."





Kerron, left, leads the student team of deckers, who custom fit every floor joist and deck board.

His evenings at McDonald's were monotonous. One robotic action dominated his shifts: Drop premeasured bags of fries into the fryer. And just as he had gone through the motions during the school year — memorizing historical dates for Friday's exam, anticipating the pathology of his pre-calculus test question writers, breezing through his online physical education class (yes, online PE) — Kerron moved through his shifts at McDonald's. And he thought with excitement about what the construction site would require the next day: a pile of scrap wood and nails to be taken to the dump, disassembled roof-truss pieces to be custom-fit with galvanized bolts, foundation trenches to be filled with concrete. He loved the precision and craft of construction, the balancing of dozens of tasks that, in sequence, would raise the building to stand tall.

[View a gallery of the start-to-finish farmers market build here.](#)

Each day, the building rose up out of the ground a few more inches. On the day the heavy machinery lifted the trusses into place, sweeping them through the air and setting them gracefully onto their concrete piers,

Kerron stood back, his hard hat in place. He watched in the same amazed disbelief as he had on the day of the chicken coop roof raising, having just tightened each truss bolt by hand the day before. And the residents of Windsor watched in awe as well, craning their necks out their pickup truck windows as they drove into town, honking their horns in support, while trying to make sense of the teenage construction crew — black, white, male, and female — raising a structure that would transform their town.



The completed market's open design allows light to trickle into each bay.

PHOTO © BRAD FEINKNOFF 2001



Bertie County residents arrive at the Windsor Farmers market on opening day.

Photo: copyright Brad Feinknopf 2011

Tell them I built this



Vendors proffer flowers, vegetables, berries, jams, and crafts on opening day.

We had planted sod, sealed the deck, swept the ramp, and invited everyone. The mayor was there with his wife. The stalls teemed with goods

and the vendors who sold them. Trucks backed up to the rear of the building, their beds at deck height, just as the students had designed it. The high school science teacher, Mr. Boller, donned his OshKosh overalls and played bluegrass versions of Grateful Dead songs on guitar and harmonica. The sign at the entrance staked its claim: “Opening Day!”

The Windsor farmers market, as an enterprise, had been in operation since May, in its temporary location adjacent to the building’s permanent site. For months now, vendors, recruited by our students and managed by the town-run association also initiated by Studio H, had arrived every Saturday with their produce, jams, pickles, crafts, and wares, walking past the building-in-progress. It was a story that unfolded visually each week, vendors and visitors characters on a community stage.





The Newkirk family sells their greens, famous countywide, at the market.

On that opening Saturday, these same vendors arrived early, setting up their goods in their new building, rather than atop their folding tables. They had burlap sacks of greens to sell. Doris, an aspiring baker, set up her cake trays on a lace tablecloth. The building was both artifact and spectacle.

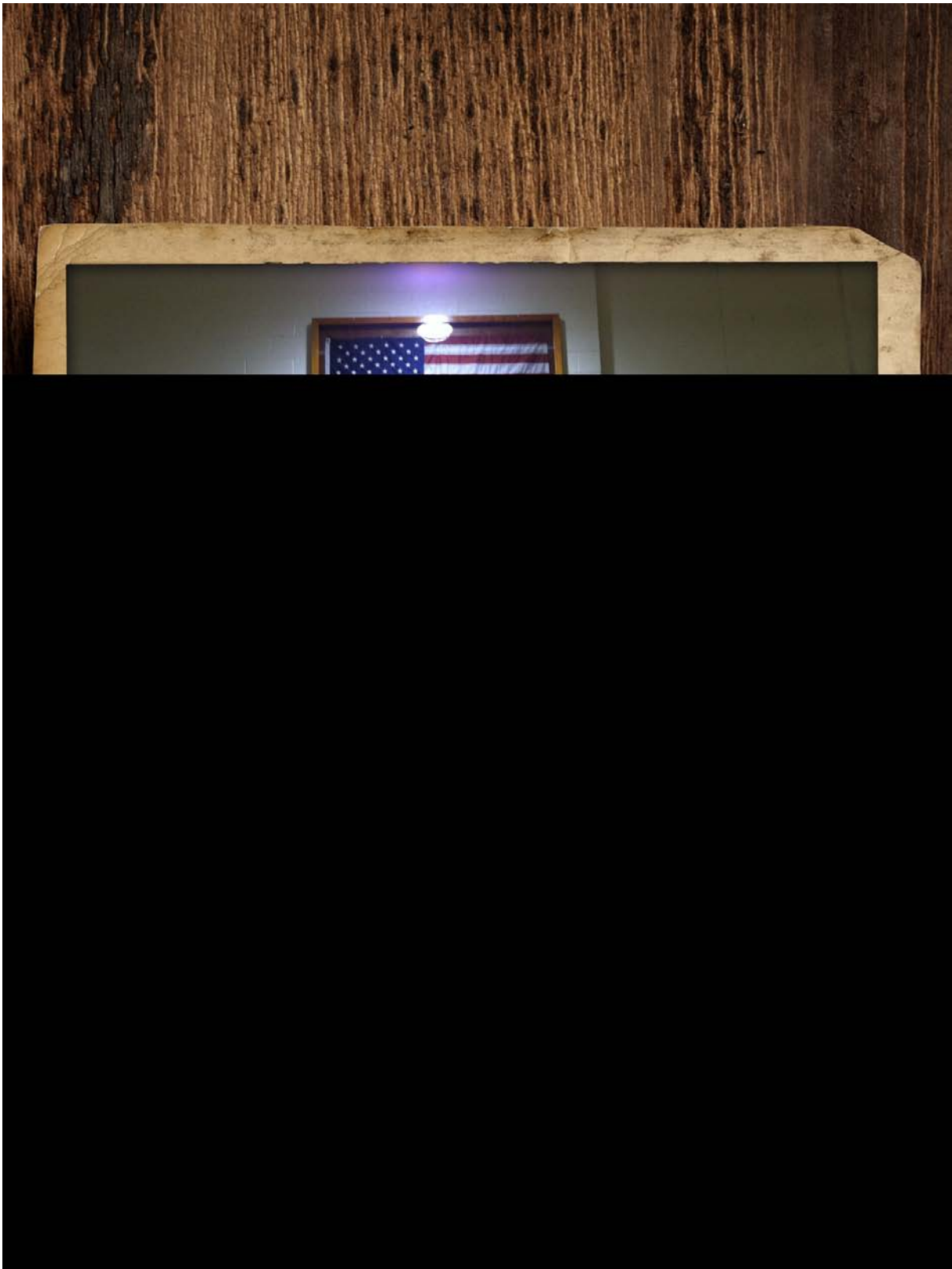
To watch architecture rise, to witness its growth from the ground — at the hands of teenage citizens, no less — is an almost spiritual experience. In a town where little new or different is brought to fruition, the simple structure, now an anchor at the end of town, represented the possibility of a different kind of future.

At the opening ceremony, our students of both races and genders stood alongside the town councilmen, farmers, parents, neighbors, and teachers who had cheered them on throughout the summer. Into a microphone, in front of the crowd, we spoke to each other.

“We are so proud of our students. This is theirs. And now it is everyone’s,” I said.

“Windsor has something to be proud of, in this market and in these young people,” said the mayor, as he presented our students and us with the key to the city, only the second one ever given out. It gleamed with the words “Town of Windsor” as Jamesha held it and passed it along to her classmates. “Oh, and that key is also a bottle opener,” he added in jest.

“I wasn’t sure we’d be able to pull this off,” said Kerron. “I didn’t know if I could do it. But we did. And now I want to come back here with my kids someday and tell them I built this.”



Graduation

I wrote his college recommendation letter five times, over and over again, as if my own future depended on the word choice. I used the thesaurus. I cut and pasted. I thought about making cookies for the admissions committee. I wanted to write, simply, “Just let this kid in,” or “I guarantee no other applicant designed and built a farmers market for his hometown.” I clicked Submit on the online form. And we waited.

He got in. The acceptance letter read, “Congratulations on your acceptance to the College of Engineering at North Carolina State University.” I spent the same agonizing hours hunched over my laptop writing letters to scholarship funds so that he could afford to go. I called a colleague of mine at the Council of Educational Facility Planners International, a professional organization with a chapter in the Raleigh area. I had spoken at the group’s annual conference the year before and heard about its \$1,000 scholarships for students going into architecture or engineering fields. Kerron and another student of mine, Colin, were awarded the money. At the scholarship banquet, Kerron wore a polka dot bow tie and told me, “Thank you.”

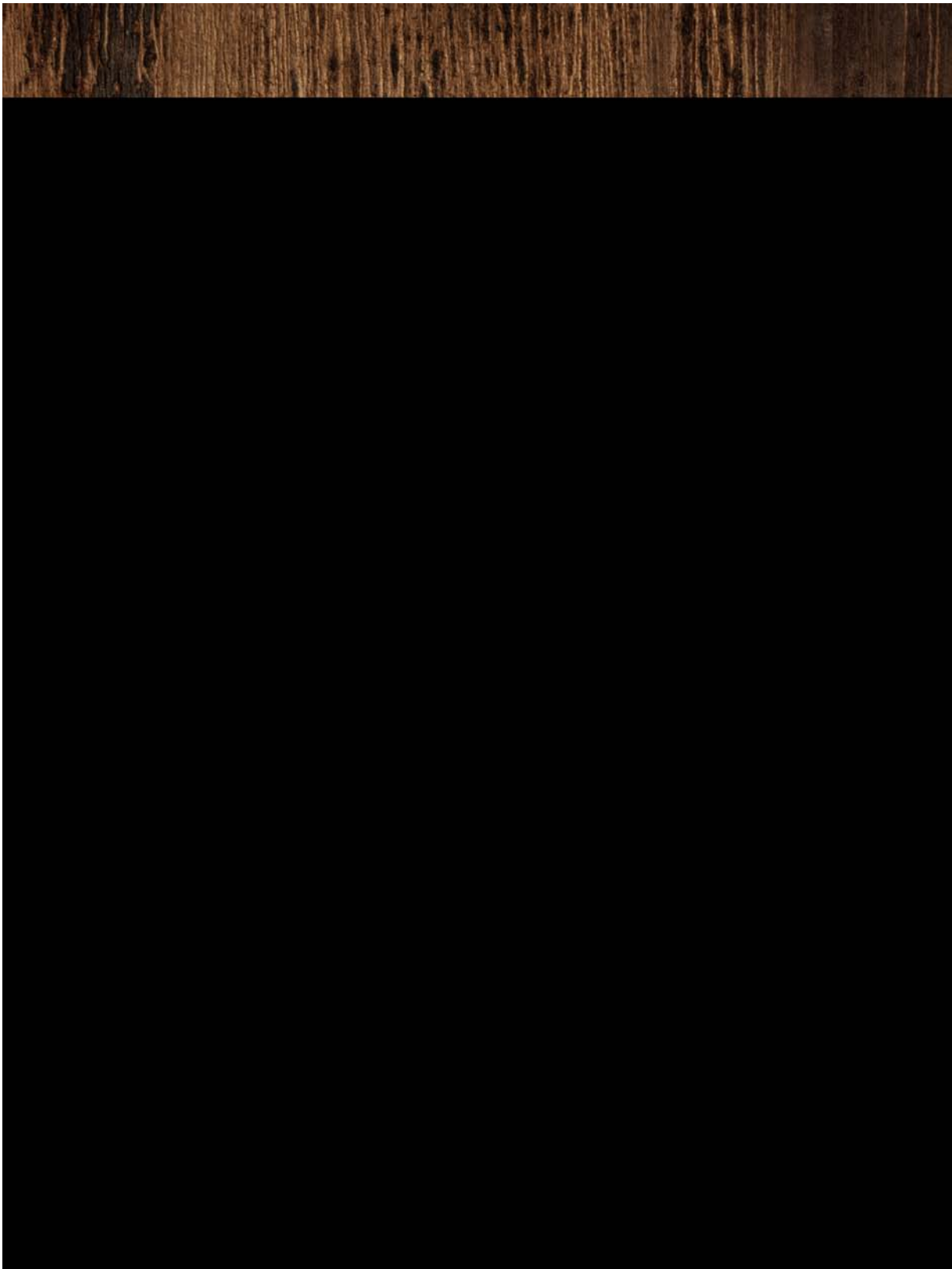
A month later, minutes before the graduation ceremony began, I told

him, simply, “Congratulations. I’m so happy for you.” He adjusted his cap and gown awkwardly. He had missed the title of valedictorian by 0.05 in his grade point average, which I thought was ridiculous (just call it a tie!), but as salutatorian, he had a speech prepared for the ceremony. When the time came, he approached the podium and broke into tears. “You can do it,” and “We love you,” we encouraged. When he gathered himself and began, he spoke only of Studio H. “Studio H made me a better person,” he said. “It has changed me in ways I didn’t know were possible,” and “I am proud and I am ready.”





Kerron, fourth from left, and fellow Studio H designers show their jubilation.



Back to the bay

After two full school years, our program remained unsupported by the school administration. This, despite our role as full-time teachers within the school system, steadfast support from the community, and the quality of work our students had delivered. After Dr. Z's departure, it was our choice to stay in Bertie County to launch Studio H, self-funded without district support, because of the immense cheerleading and excitement from students, their families, the greater community, town leaders, and some generous funders who believed in the program. For two years, all of our Studio H costs (shop equipment, classroom materials, student stipends, salaries, construction materials) had been entirely supported by grants and individual donors, to whom we remain deeply grateful.

But we eventually had to leave. Given our unsustainable financial model, our ongoing presence in Bertie County would have been a disservice to future students, as we would not have been able to guarantee their enrollment due to our annual reliance on grants. It would also have been a disservice also to the citizens of Bertie County, who deserve the partnership and support of their school district's leadership. And beyond Bertie, it would not have set a good example for the greater design community, as we seek to prove that design for social impact can, in fact, become a sustainable fiscal

model for creative professionals. So on the invitation of Victor Díaz, another educational visionary and the director of REALM Charter School in Berkeley, Calif., we moved our program to his school and, quite literally, set up shop. In this new context, with more support and access to resources, Studio H can thrive, more than just survive.

The girls team in Bertie County's second Studio H cohort designed this farm stand for a collards farmer off Route 308.

In total, 26 students “graduated” from Studio H in Bertie County, each leaving with a toolbox unimaginable to them a year earlier and invaluable to their future and the future of the local economy. Our second cohort of students built on the foundation of the first. They designed and built two roadside farm stands as sculptural landmarks for the outlying towns to connect back to the Windsor farmers market.

In the meantime, the Windsor farmers market had spawned two new businesses and more than a dozen full-time jobs in town — more than were created by Domino's Pizza on its arrival two years earlier, or any other new business, for that matter. Our students were off to college or employed locally. I am confident that they will be the next mayors, town councilmen,

small-business owners, and visionaries of Bertie County. Kerron studies computer engineering at North Carolina State, living in the dorms, working toward his degree, coming back to Bertie County on the weekends.

Currently, Studio H is up and running at REALM, enrolling more than 70 students per semester. Our students at REALM struggle with many of the same obstacles, balancing home and school, hand and mind, youth and adulthood. With them, we are building an 800-square-foot classroom, because as one student put it so poetically, “The first community we are a part of is our school community.” Soon we will launch a Studio H summer session, including offerings for younger students, teachers, and design fellows. Our move was the right one, and we look to the future in Berkeley knowing how much we owe to Bertie.

We left Bertie County that sunny Saturday after having said our goodbyes to our students. The sky was without a cloud, and we were without regret. Some parents shed tears, and some students gave us gifts (including a heavy wrench signed by each of them, and a bracelet made from bolts). We packed up our shop, from the table saws to the drill bits, and pulled out of town. I have used the term “bittersweet” to describe our departure, but now with some distance and time, I feel only the sweetness. We lived and worked and voted and fought in Bertie County for more than two years. I loved and hated and celebrated and rued every day. But we built

something. What we built is left behind not only in structure but also, and far more concretely, deep within the corps of young people whose future movements will long inspire us all.