

Design-Build: A Vehicle for Self Discovery

Gender equality in higher education has made great strides in the past fifty years in terms of providing opportunities for women. Male and female students are now almost equally represented in many design programs. However, the design profession, while experiencing a surge of female practitioners, is still largely a male dominated field.

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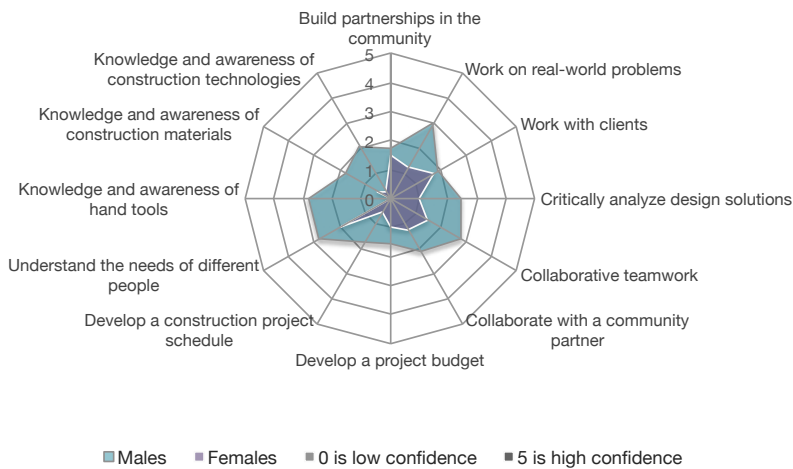
Ironically, evidence is mounting that young males, because of reasons often attributed to distraction, boredom, and pressure for immediate success, are falling behind. At the same time, women are completing their education, graduating from universities and then, for a variety of reasons, declining the pursuit of a professional career. The paradox then is while women are outperforming men in design programs, men are still dominating the field, yet with diminished preparation. We must ask ourselves, is this a result of an outdated design curriculum? Can we do better by understanding the students we are teaching and adapting our educational content to suit their needs? How do we increase the male performance in schools and simultaneously encourage females to continue in the profession?

An additional obstacle facing young designers today is that society expects them to have a prodigious surface knowledge of the world and mastery of the skills needed to balance a singular specialized career. The expectation is that by the time undergraduates complete their degree they should have an all-inclusive knowledge beginning with a full history of design and ending with thermodynamics and LEED certification. A half-century ago the world was smaller and simpler; there was a working knowledge of the world that developed by just growing up, and a culture of hands on experimentation. The Millennial Generation has grown up learning a different, more specialized, set of skills at the deficit of mastering some key concepts. Many in this generation can program computers but have never built things. Ultimately, to become a skilled designer one must understand construction, and the art of making. One of the best ways to learn something is to attempt to do it. Often this process includes failing. This is where the Design-Build model can bridge a needed gap in design education. The act of making can meet the needs of both male and female students while providing a vital link to the profession's roots in tectonic culture.

UNDERSTANDING THE STUDENT

Michael Gurian, co-founder of The Gurian Institute, has been studying the

Overall Confidence in Skills and Abilities Before Design/Build



1

compositional differences in male and female brains for over thirty years. Numerous studies have shown that males are typically more spatial, visual and mechanical where women tend to be more verbal, emotional and have increased fine motor skills. Gurian’s research, through the use of MRI and PET scans, has revealed that the male and female brains adapted over time to suit them best in their daily activities. Males have a significantly higher propensity to use grey matter, the area that focuses on a task at hand and allows them to solve complex problems in isolation. Women’s brain activity shows a use of white matter that is ten times higher than men. White matter is the tissue that connects information. As a result women are more likely to ruminate and digest scenarios while men isolate and compartmentalize.¹

This information is not intended to stereotype either gender or to make an assumption that one gender is superior to the other. All people fall along the male/female spectrum and no two brains work in exactly the same way. Some people, both male and female, fall into a category that Michael Gurian defines as a bridge brain and have adapted characteristics that typically cover aspects of both genders. If we understand how the brain functions we can better adapt our educational systems to meet the needs of both sexes. Male brains tend to become bored more easily and need stimulation whereas female brains tend to need concrete conceptualization. Bringing students into the field and creating an experiential learning structure is advantageous to both genders.

In my teaching career I spend time each semester asking students to reflect and evaluate their education. The questions are based on ranking students confidence of their skills and abilities upon beginning the class and how they rank their confidence in skills and abilities after the course is completed [2]. In my research women almost always rate their initial skills lower than men [fig 1]. Either women are underestimating themselves or perhaps men are overestimating. My belief is that this is a combination of both. Perhaps here lies the seeds of the reason underperforming male students still enter the profession and overachieving women leave. After all, the business of architecture necessitates taking a leap of faith that the architect can solve the task at hand, even though the professional is often forging completely new skills and relationships.

Figure 1: Design Build Data-Before Construction

In my experience, male and female students often have little prior experience using construction tools or making things. Yet, in polling students, men are more likely to feel confident regarding tool usage and construction technologies—possibly because this is an isolated skill where perseverance will result in success [fig 2]. Men are quick to say they can do something they have never tried before. Because of their active grey matter they can visualize successfully completing a proposed task.

Women, on the other hand, are much less likely to attempt something if they believe failure is a possible outcome. They are able to deduce the potential of a scenario and the implications that may result from their actions. A semester (or two) focusing on a Design-Build project creates an enormous change in the perceived confidence of skills and abilities for women. Women underestimate themselves initially, but by the end of the project their confidence level is almost equivalent to their male peers [fig 2].

Complimenting Michael Gurian’s gender research is the data I’ve collected through these projects. It shows that females generally surpass males in their perceived confidence regarding their ability to work with clients and collaborate with a community partner. Women also develop a higher level of confidence in their ability to understand and plan for multiple scenarios, such as developing a construction schedule. Men feel that they have fully mastered specific elements, such as the ability to critically analyze design solutions [fig 2].

The objective then in Design-Build projects is to focus the male’s confidence into one of precision over expediency, clients’ needs over the act of creation, and connection over isolation. Female students learn that failure and lack of knowledge are merely necessary steps in a broader goal, and that preparation and practice can continue to lead to success in the professional world just as in school.

The students we currently teach fall primarily into the Millennial Generation category. People born in this generation are often characterized as entitled, narcissistic, tech-savvy multitaskers. They are often described as wanting instant gratification, recognition, balance, flexibility, and career advancement. However, this generation has been shown to have a strong sense of community, confidence, tolerance, and to be good team players [3]. These traits make Design-Build classes ideal for teaching both the broad and specific’s of design.

2

Overall Confidence in Skills and Abilities After Design/Build

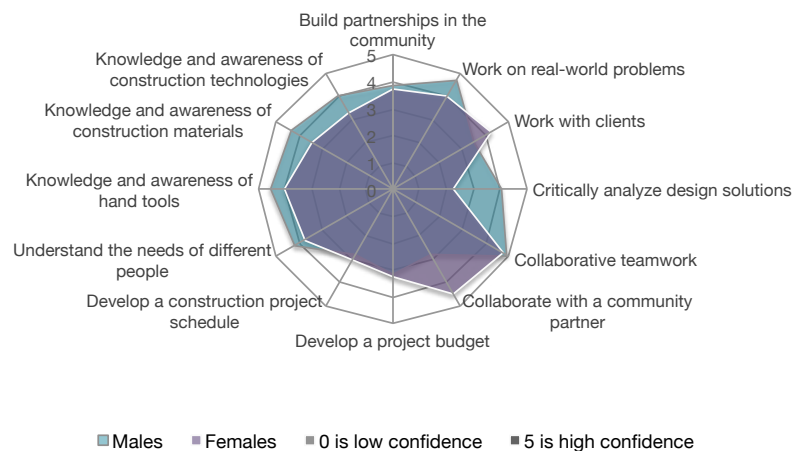


Figure 2: Design Build Data-Before Construction

The Millennial Generation is attracted to the Design-Build model because of the community engagement allure. They enjoy helping others. They are also adventurous, searching out opportunities to travel and understand other cultures. This generation enjoys working together, they are happy to take ownership of the project as a whole and are skilled at solving complex problems through teamwork. These are alluring characteristics of Design-Build classes.

A key element in the University of Colorado-Boulder's design program is the Praxis semester. This sequence takes place at the end of the junior year and is designed to function like a laboratory, where students work in groups to synthesize and integrate knowledge from different sources, and participate in an engaged learning model. Praxis courses take on a multitude of forms, but the structure is based on 9 credits, a studio course and a complimentary seminar, with an emphasis on real design projects with a client or community partner. Understanding the needs of people and cultures different than one's own fosters a sensitivity towards humanity. Working with a community partner requires students to respond to true, rather than imagined, needs.

Beginning with the broad scope, our Design-Build education brings students out of the everyday context of the university town and exposes them to other cultures, asks them to get to know their clients as people and requires them to view the project through the clients needs. Our students spend time designing for someone, rather than a perceived or hypothetical client. Tyler, a student in our program, noted this about last summer's project.

Having the project outside of Boulder forced us out of our comfort zone and put us into a community we never experienced before. We were given an opportunity to understand the nature of the community/client, and also asked to learn about local building styles, local materials, and the way of the land. We were not able to go home if we were homesick or needed a break from the whole thing. Being on the mountain for three weeks in a tent was a little rough but I got used to it and didn't want to leave at the end once I pushed through.

In contrast to the broad education Design-Build also lends itself to a specific and detail-oriented experience. Students are asked to make things that work, to figure out how thousands of little pieces can come together to create one vision. Ironically they are asked to produce a complete finished product, but quickly learn the only path there is through trial and often mostly error! Another student, Elizabeth, made this comment when asked what she gained from her Design-Build experience.

I wanted to get more real world experience and understand more fundamentals on how a building is put together. After this class I am looking at design differently with a much larger eye for detail. It is the small details that make the overall product. Since the class I have noticed these small details as well as construction methods everywhere I go. It's like taking a cinematography class; you can't watch a movie normally anymore. I learned so much about building materials, costs, and construction methods and I'm looking forward to bring these new things into my next studio and then into the real world.

THE PROJECT

Our client, and site location, is the Lama Foundation. The Lama Foundation is an educational facility and retreat center located in Questa, New Mexico approximately 30 miles north of Taos. The foundation began in 1967 as an intentional community and is best known for illustrating and publishing the seminal book "Be Here Now" by the spiritual teacher and author Ram Dass. Our program is to design and build a sleeping cabin for visitors to the retreat center. The scale of the project is small, with an interior of about 100-200 square feet. Our structures are off grid and do



3

Figure 3 Installing wall sheathing

not need heating or water. By keeping a minimal size to our structure we are able to focus our time on the details and complete the full design and construction process ourselves. Students begin with research on the project and the client and then develop individual solutions to the program. Mid-semester we chose one project from the group that we will continue to develop. At this point ownership of the project belongs to the entire class. Each student is responsible for conducting research on the numerous tasks and assemblies required to build the structure. Construction documents are produced, materials are priced and a critical path of construction work is scheduled. When constructing the structure we begin with site prep and foundation construction and work all the way through the construction process finishing with designing and building the furniture that occupies the cabin.

There have been many Design-Build projects where the resulting structure is arguably the faulty member's vision. Students are enlisted as labor to the client and the architect without any representation of their ideas and visions. While this result is often beautiful it misses the concept of design education. A design education is about testing new ideas, empowering students to take risks and allowing room for failure. In response to the structure of our design process Tyler made this observation.

Our designs were our own until the very end, they were not adapted to what the instructor wanted but shaped to what we as students wanted to see in the design. We weren't told not to explore but rather pushed to explore an idea until it failed or succeeded and to experience what that feels like. We were treated like adults, not like students who are just getting a degree. We were spoken to as young professionals trying to learn this industry from those who practice it everyday.

Being a six-hour drive from campus our students gain an opportunity to immerse themselves in the project and bond as a group. This distance seems ideal because it is close and simultaneously far away. Students leave their jobs, significant others, friends, and other pressures behind. Camping on site helps students to fully immerse themselves in the project and the teamwork. Another student, Scott, made these comments about having the project located outside of Boulder, Colorado.

I preferred having the location away from home. It helped build an esprit de corps in our group and created lifelong friends. It also prevented a feeling that you wanted to halt work and go home. We were at Lama and were more motivated to work until the goals set for that day were completed.

TEAMWORK AND LEADERSHIP

After the final design is chosen and again before construction begins I assign each student one or two jobs/areas of responsibility. This encourages students to develop a pride and ownership in the project while taking responsibility for the project. In assigning tasks and responsibilities one must balance the opportunity for success with a desire for challenge. For example, if a student is an accomplished woodworker he/she should not lead the framing of the structure. Yes, this student may be the most skilled but a learning opportunity would be missed. It is important to spend time investigating student's interest in the design and to not make gender assumptions in assigning these roles. I've had great success with females in foundation work, timber-framing, and roofing while male students have been equally accomplished at choosing colors and finish work. Every student is encouraged to learn to use the table saw, the pneumatic nail gun and spend time on top of a ladder. There are justifiable fears in construction but many of these tasks can lead to a sense of empowerment once they have been overcome. One student, Conor, had a decent amount of experience working in an architecture practice, he felt very comfortable

leading the more challenging details in the construction documents and wanted to work on assembling those details in the field. Below is his observation.

I came to this studio hoping to learn more about real, practical architecture. Prior studio classes have felt a little distant and removed from reality. I wanted to see something built from start to finish and learn the whole process from design, to CD's, to the actual construction. I learned everything I wanted to and more! I feel I have a much better understanding of construction and the architect's role in the entire process. One thing that I understand a lot more about is that everything can be drawn out on paper and it can look 100% correct but things will come up during construction that you could never have foreseen.

Another reason for assigning jobs to students is to create a hierarchy in the construction process giving everyone an opportunity to be a leader and everyone multiple moments where they are team player. The leader of the assigned task is primarily responsible for the given phase of the project. They must complete material take-offs and ordering, understand the critical path surrounding the task, and know the construction techniques around this task. The team players are responsible for the



4

assembly of each phase. Here is an observation from Taylor in reference to the way she felt the team process was an asset to the project.

During construction an instructor or classmate was always available to answer questions for me. In other studios people tend to fend for themselves and it takes me seven times longer to learn something on my own. It was refreshing to see everyone work together and know that everyone truly wanted everyone else to do a good job and to understand what they were doing because we were all working for the same product.

UNDERSTANDING THE PROCESS

One student commented toward the end of the project “what goes on the exterior after the paint?” She said that until working on a project she had never realized how many steps and layers go into building one wall.

The materials chosen for construction should be chosen with the student’s skill level in mind. Working with wood allows students to make mistakes early in the project. Wood is forgiving. If a nail doesn’t go in correctly it can be removed. If something

Figure 4 Building formwork for a lenticular truss

isn't exactly plumb or square it can be disguised. Students will not learn if they are not allowed to make mistakes. Even after repeating the old adage "measure once and cut twice" there are bound to be boards rendered useless because of careless mistakes. During our last project one student measured all the window perimeters for trim, she then spent careful time understanding how to best use the lumber. Then, invariably, she cut a long piece when a short piece was needed. Those mistakes can be opportunities for learning lessons. Losing one piece of trim did not destroy the project, and now she will remember to be more careful in the future. Mistakes are part of the process; they encourage creative and critical thinking skills in finding solutions.



5

At one point in the course some students felt compelled to compete at hammering in nails as fast as they could. One particularly confident male student had claimed to be able to hit the nail in two stokes, and indeed, that was the case about 1 out of 5 times. The other times resulted in smashed thumbs and bent nails. One rather shy female would take about 20 stokes and 3 minutes, to her embarrassment. Yet, after three weeks the male learned that not bending nails was important, and the female, though still choking up on the hammer, and hitting it 20 times, was able to sink a nail perfectly in about 10 seconds, like a jack-hammer. Alas both genders and the profession had won!

Similar to playing chess the construction process is one that requires extreme forethought. Careless design decisions in the beginning will result in challenges along every stage of the project. An attention to precision is easy to profess but better understood when experiencing the results first-hand. This concept of seeing a project through is ideal for the Millennial Generation because it shows the recompense

Figure 5 Celebrating the completion

of hard and often tedious work. The satisfaction that one gains by completing a series of challenging tasks is indescribable and terrifically memorable. This creates a memory that can be drawn upon for countless year afterwards and creates a domino effect of self-confidence that carries through to future tasks. Below is an observation from Tyler regarding the experiential learning process.

This learning process really helped me as a hands-on learner. It was one thing to understand how a chop saw works but to actually use it and cut every piece of wood needed and understand how precise you have to be was fantastic for me. It was incredible working for a real life client where you had to understand their needs and wants for the design and figure out how that can be met while still keeping your design in mind. Not everything in a design will run smooth and kinks will arise. A great example was how something may change last minute (the floor) whether it is as simple as where the tiles are placed and how they are fastened. Thinking and solving on the go was where I learned the most.

CONCLUSION

In Design-Build classes one must separate the goal of completing the project with the goal of teaching the students. These projects are really about building confidence in the student through the act of making. The Millennial Generation typically perceived as lacking hands-on skills but they are eager for opportunities to develop those skills. Without these skills males can develop a false confidence further undermined by lack of preparation, which can diminish their innate talents in the field. For women it can manifest itself into anxiety and fear in a work-force setting despite seemingly bright prospects. While Design-Build is not a panacea that solves all problems in design education, it provides clear benefits in bridging some glaring gaps. An education that covers broad fundamentals and maintains rigorous dedication is still essential. If done correctly, Design-Build is a piece in this educational puzzle that fosters independence, confidence, and creativity in young adults. Bringing students into the field will typically have a positive effect. The sole act of changing one's surroundings can breathe fresh air into a dated method of teaching. It creates a change in perspective, a rethinking of ideals and a commitment to see something through. One former student, Kaitlin, summed up her Design-Build experience this way.

It was the most educational experience I've had in my design education. It's really the only type of experience I want, anymore, having been exposed to it. When working on a real project, I think everybody tends to step up more, show more initiative, and work harder than if the project is a theoretical building with no consequences. And when you're willing to put that effort into it, you get a lot more knowledge and experience out of it.

ENDNOTES

1. *Boys and Girls Learn Differently* by Michael Gurian. Michael Gurian is a social philosopher and family counselor who has pioneered efforts to bring neurobiology and brain research into homes, school, corporations and public policy. He is a co-founder of The Gurian Institute, which conducts international research on brain behavior among genders. He has written twenty-eight books on gender and education.
2. *Service-Learning in Design and Planning* by Tom Angotti, Cheryl Doble and Paula Horrigan. This collection of essays and case studies examine the practice of service learning in the design disciplines. Themes focus primarily around the topics of pedagogy, collaborative design, reflection and evaluation.
3. *Millennials Rising: The Next Great Generation* by Neil Howe and William Strauss. Strauss and Howe are generational experts who have been studying generational theory since the 80's. They have written four books on these topics and have developed numerous theories on generational trends. They are the founders of LifeCourse Associates.