Integrating Conflict into Early Design Education

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Introduction

The day-to-day practice of architecture must navigate within a system of contexts often replete with competing values. This requires the process of design and construction to rely on constant tactile adjustment made by constraints of codes, clients and consultant needs, to address a landscape of contingency. Engaging these conflicts defines the profession of architecture. Without a strong architectural presence, the authority of the designer diminishes. The more informed as designers we are about the factors that affect what can be made, the greater the opportunities we have for making appropriate architecture.

What are benefits from embracing conflict? Conflict is not an established area of engagement for beginning design students within architectural curriculum. Design projects typically try minimizing conflict to reveal clear specific design objectives. Conflict resides principally through confronting the dialog of site and form, space and light, structure and envelope. However, an opportunity for self-discovery emerges when students are awarded the chance to compare multiple strategies they made and reflect on the success of one decision made on the behalf of another. Conflict should be opportunistic; a productive didactic concept that is a positive and empowering interpretation of the real-world dynamics that happens in architectural projects.

Nowhere is this more apparent than in Community Design projects. In contrast to traditional design studios, Community Design studios are opportunities to engage the contingencies that confront real-world design issues. These types of studios engage community/university partnership approaches with a range of community groups and non-profit organizations. Students and architectural curriculum benefit because they build the capacity within an architecture program to define problems with an interdisciplinary lens, encompassing a broad spectrum of design challenges. They rely on a beneficial exchange of knowledge and resources in a context of partnership and reciprocity. These learning opportunities are essential for the beginning design student. Unfortunately, many Community Design opportunities are not available to all students and even then, rarely until late in a students' design education.

Integrating Integration

So how can the beginning student better confront these real-world conflicts within their own education?

In the book Integrated Buildings, Leonard Bachman argues: "Integration is about bringing all the building components together in a sympathetic way… where components "share space, are aesthetically resolved, and at some level…have to work together or at least not defeat each other." Bachman's argument requires a broader system thinking approach. When individuals have a better understanding the interdependency of dynamic systems, they are better able to identify the leverage points that lead to desired outcomes.

This is echoed in the 2014 NAAB guidelines for Integrative Design (C.3), which requires students to demonstrate an "Ability to make design decisions within a complex architectural project while demonstrating broad integration and consideration of environmental stewardship, technical documentation, accessibility, site conditions, life safety, environmental systems, structural systems and building envelope systems and assemblies (NAAB, 2014). Confronting and testing decision making is a condition to the criteria. Architecture students like architects in practice need to engage and assess the outcomes of their decisions. Learning when and where their design decision is effective and those times when it falls short of its intent. This requires a feedback of information to occur and from which to adjust design decisions accordingly. Capstone design studios, most commonly placed at the end of the design education, have traditionally served the role of Integrative Design. However, there are opportunities outside the design studio for early design education to integrate real-world design challenges and engage real-time information. The technical curriculum required in architectural education is rooted in integration. Content taught in structures, building construction and environmental systems courses are interconnected, bleeding into each other's territory. This blurring of edges defines Bachman's definition of Integrative design. Integratively speaking, it is not the way most of these courses are taught.

Bridging Disciplines

In pursuit of a broader more integrative curriculum, an innovative pedagogical approach at the Department of Architecture at Kansas State University was created that immerses 3rd year design students into an integrative design praxis. It conflates the learning objectives of two required technical courses: Architectural Structures and Environmental Systems in Architecture through an iterative design project bridging both courses. The design process is <u>not</u> prescriptive, it's intent is to expose students to a more reflective process, where structural and environmental systems are truthfully integrated.

As a structures teacher imbedded within an architectural curriculum I recognize these integration challenges. During the fall 2017 semester I worked with Associate Professor Michael Gibson who teaches Environmental Systems in Architecture on the development of an Integrated Design Project. The Structural Systems in Architecture 2 and Environmental Systems in Architecture 1 courses are offered concurrently during the Fall semester of third year. Each is 4-credit hour class with a lecture and lab components. Both courses are required for the Master of Architecture and Master of Interior Architecture and Product Design degree tracks. The weekly labs provide active learning environments by integrating project-based teaching approaches into the learning objectives. Prior to 2017 each course had separate projects incorporated into their respective lab. Through multiple conversations we agreed to develop a new design project positioned outside the design studio that would link our two courses and create truly integrated project.

The challenges to creating the shared project are significant. Each course has a lab component associated with it but the duration for each lab is different and they fell on different times of the week. Calibrating how the project would move between labs each week for the semester is key to the project's success. The integrated design project has multiple parts extending through the semester (see Figure 1). It is divided into Schematic design, Design Development and Analysis phases. The process, learning objectives and schedule for both classes are kept separate, but the underlying designs are shared by both classes. Each phase follows a series of lectures presenting design through a range of design issues. They require weekly lab submissions building up to a final submission at the end of the semester.

The two classes share one integrated digital model using Rhino modeling software. The Rhino base-model is created by teams of 2-3 students and serves all ESA 1 and SSA 2 assignments. The digital models change and evolve, as they move between the class assignments for each course. Teams do their best to coordinate structural and environmental progress in their models. The shared integrative model creates a feedback-loop into the design process, exchanging knowledge between the courses.

It requires students to identify design information, gleaned in one class to address issues in the other. Engaging these conflicts reveals meaningful issues and deepen students design knowledge. It encourages tactile improvisation and opens possibilities unlikely to have been explored otherwise.

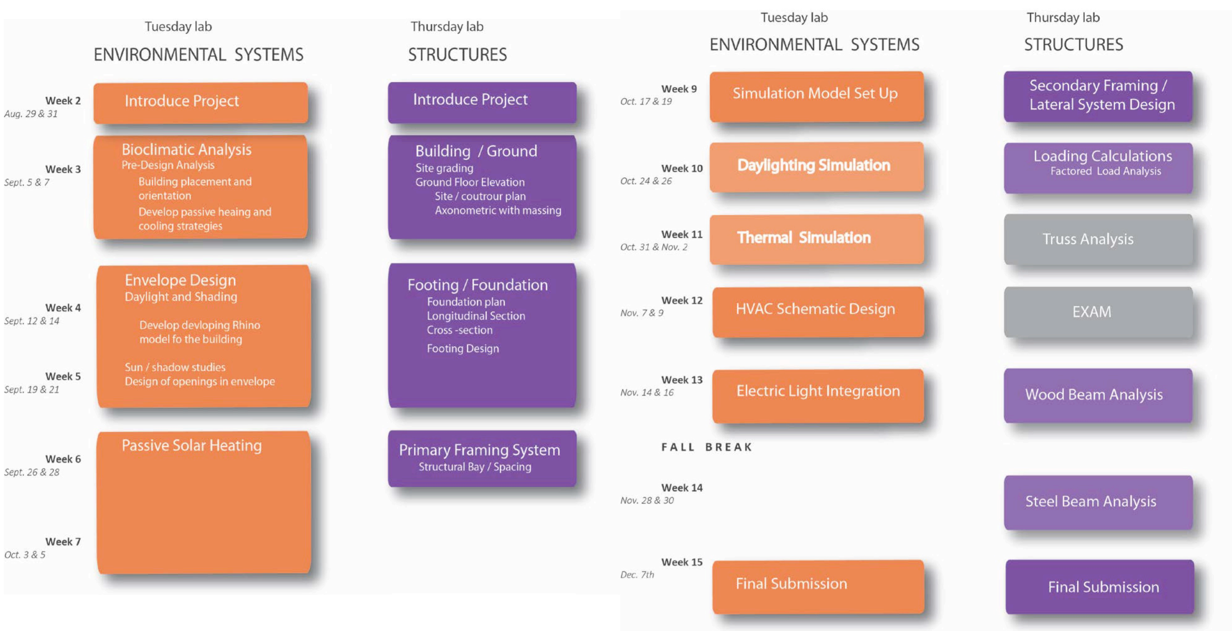

Figure 1 The integrated design project has multiple parts extending through the semester

Project Program

To prevent the project from being too complex and overwhelming, the program is kept simple. The project is a 4,000 square-foot office building for a graphic design firm. The site is in a mixed-use neighborhood along a main boulevard in a neighborhood modeled after a site in Manhattan, Kansas. The building design must incorporate a 1,000 square-foot open mezzanine space, overlooking the ground floor that would be used for meetings. The mezzanine requires the design of the mezzanine structure along with a stair and a small 6'x8' elevator to comply with required accessibility requirements. The support functions for the building program include a pair of restrooms, a storage area, and a mechanical room. The site slopes down from the street with a clear, unobstructed view in all directions, making the project a prime candidate for energy-saving daylight and passive design

Climate Type	**Location**	**Median EUI** (kBtu/SF/yr)
Hot-Humid – 2A	New Orleans, LA	**61** (Houston, TX)
Hot-Arid – 2B	Phoenix, AZ	**68**
Mixed-Continental – 4A	St. Louis, MO	**59** (Baltimore, MD)
Mixed-Alpine Rockies – 4B	Ely, NV	**61** (Albuquerque, NM)
Mixed Marine – 4C	Eugene, OR	**57** (Seattle, WA)
Cold-Humid – 6A	Minneapolis, MN	**77**

strategies.

Figure 2 the geographic location differs in geographic location

Design Processes

The project begins with a pre-design phase with teams completing a bio-climatic investigation and developing two proposals for the site (Figure 2). Creating multiple proposals, that can be compared for effectiveness is critical for the learning objective for the courses. The Schematic design process begins in the Environmental Systems in Architecture (ESA) class with a climate analysis for each team's proposals. While the physical site used is the same for every team, the geographic location differs in geographic location (Figure 3), requiring each team to define the set of **climate-specific passive strategies** they intend to use.

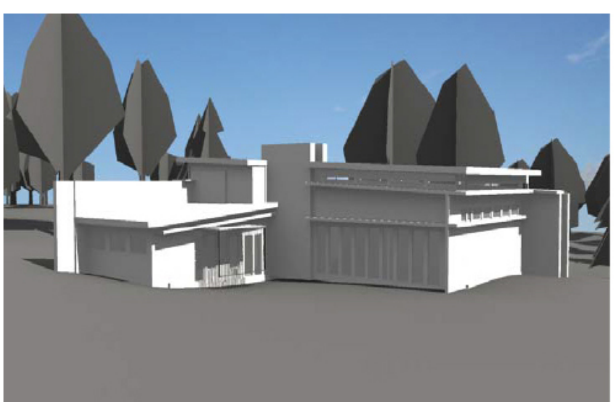

Figure 3– Two Design schemes by Group 30

After the building shape and orientation for each proposal has been determined, teams set the ground floor elevation for each proposal in the following structures lab. They manipulate the contours to accommodate for the slope based on decisions they made in relation to the building's orientation. The design process moves back into in ESA to design a building envelope to support daylighting and passive strategies. The following week they design a foundation system to support the future structural system. Working from decisions made in Environmental Systems strategies each team develops structurally stable design solution formed around their passive design strategies, focusing critically on the design of the roof and location of window openings. In the Design Development phase, during weeks 6-8, teams complete a series of structural framing drawings focusing on the primary, secondary and lateral-resisting structural system for each design in plan, section and axonometric views.

The Analysis phase is the final phase of the semester. For ESA it provides an opportunity for teams, to use computer-based **whole-building energy analysis** (aka energy simulation) to evaluate thermal and lighting performance in of their building projects. The structural drawings created in the design development phase are then used to determine the sizing requirements for key primary structural elements based on their structural layout. Teams finish the design process with evaluating daylight and electric lighting solutions and HVAC loads and integrating electric lighting and HVAC systems into the design.

Observations

Students commented that they enjoyed the project, but the learning curve is very steep. The management of two projects is too much for some teams to effectively address. This led to an inconsistency between design iterations. With most of the teams, one design model was much stronger than the other. Despite the struggles, there are still many strong projects produced during the semester (Figures 5 and 6).

Next fall the plan is to require only one design concept but incorporate a comparative analysis during the last week of the semester. Teams will develop a critical assessment of their project decisions by comparing their project with another team in the same climate. A second change is to have both courses <u>share</u> lab times each week. The assignments deadlines will be reorganized to by align on the Thursdays lab day. Each week the assignments will alternate between the two classes (Figure 4). The Tuesday labs will remain, acting as work days where both instructors and graduate teaching assistants will be available to advise the design teams.

Finally, a lack of group engagement was also a concern with some teams, which lead to some of the inconsistencies between design iterations mentioned earlier. Two teams had to be broken up with the remaining individuals completing the project on their own. In the end this did result in better work with remaining group members but allowing for more flexibility because of group dynamics is needed. Next fall, students will be given an opportunity to work alone if they choose.

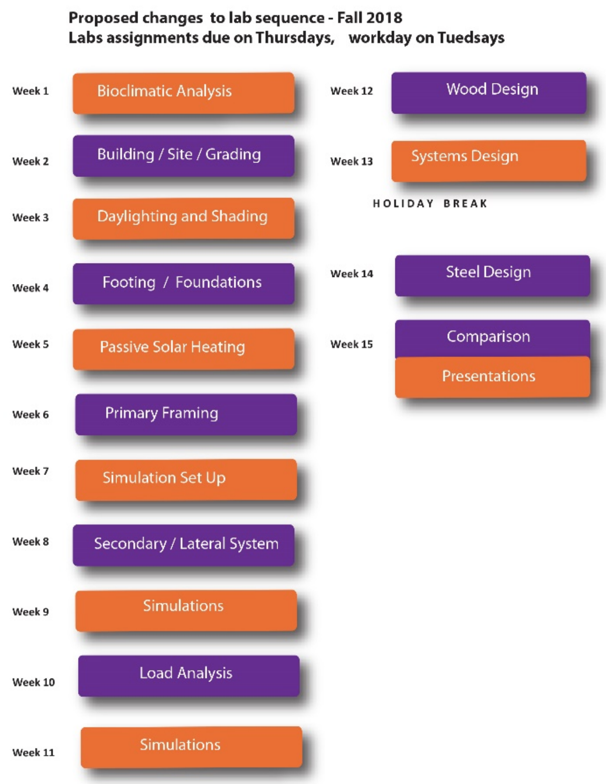

Figure 4

Conclusion

The "architect" for many projects is an assemblage of various experts: strategically selected, integrated and managed to meet the performance criteria of the project. The integrative design model at Kansas State breaks the traditional vertical hierarchy of technical architectural curriculum. It provides students a unique educational opportunity to engage an integrative architectural practice model through a comprehensive multi-disciplinary lens.

Students recognize that successful design needs to function in a system of competing contexts, where real-time information feedback can assist them in the decision-making process. This is the nature of architectural practice. The feedback loop embedded into core learning objectives of project is the key to its innovation. So where does the project go from here? The Integrative Design model developed is intended to be repeatable and adaptable. It provides an additional place for NAAB's C.3 Integrative Design criteria to be positioned with the curriculum. By merging the Structures and Environmental Systems courses, it strengthens them as <u>design disciplines</u> that enhance, not supplant the mission of the Architectural design studio. As the integrative teaching model continues to evolve over the next several years, I hope it inspires other faculty to search for specific opportunities to engage the inherent conflicts that exist in the complexity of design and advanced educational opportunities for the beginning design student.

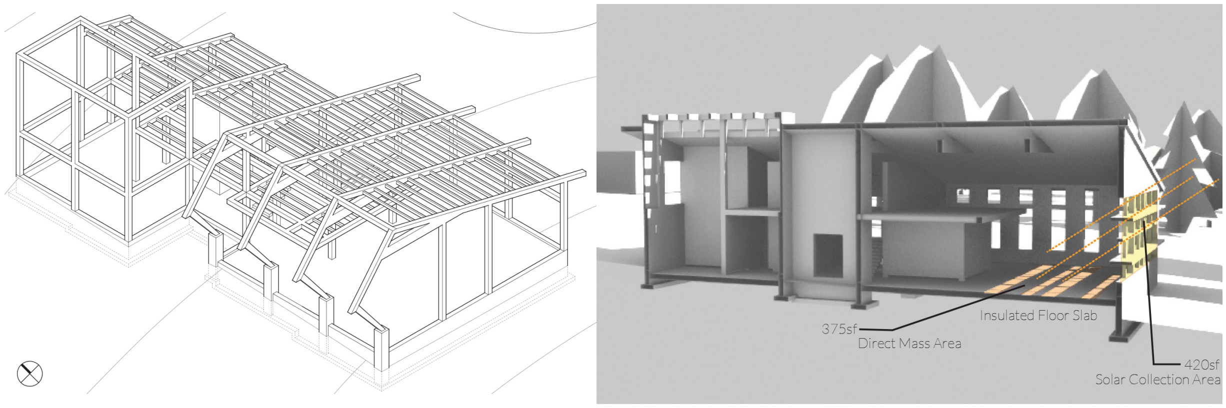

Figure 5– Structural model (left). Passive Heating study (right)

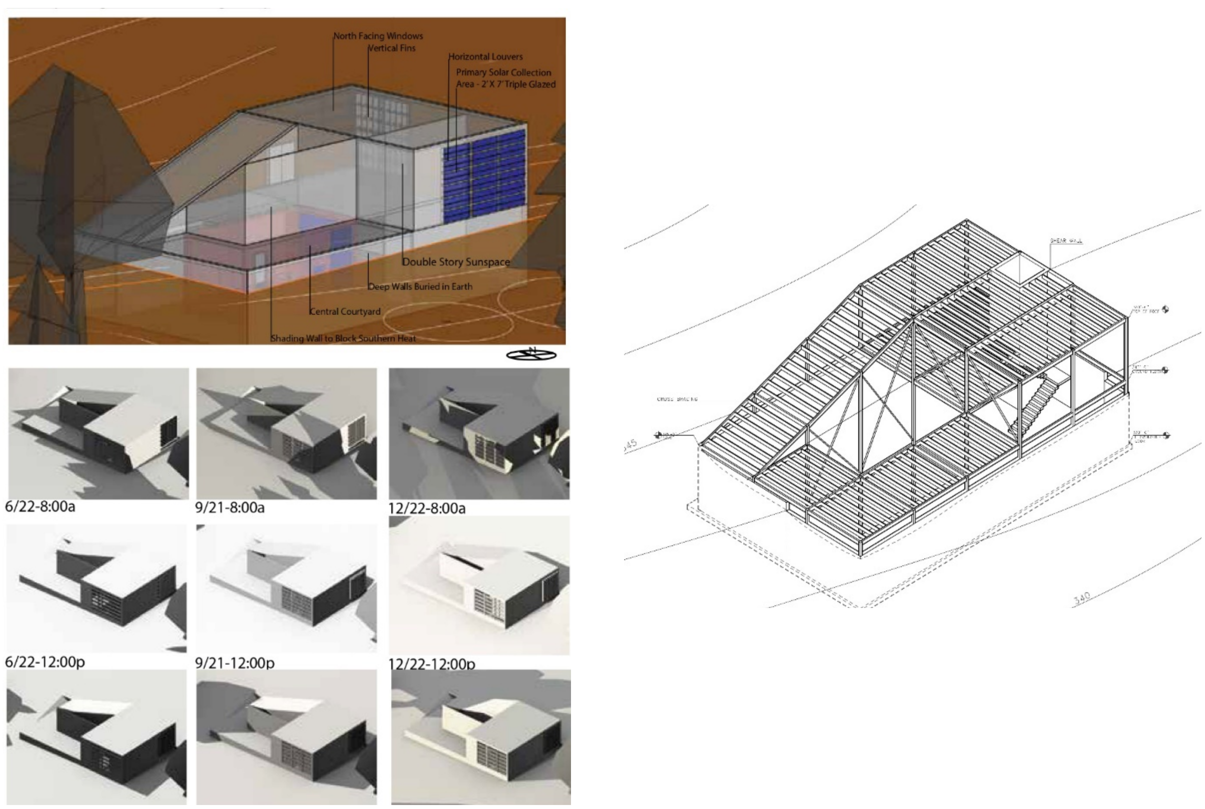

Figure 6 – Daylighting / sun shading studies (left). Structural model (right)

References

1. National Architectural Accreditation Board, 2014. http://www.naab.org/accreditation/2014_Conditions