Examining Strategies for Delivering Design/Build Content in High-Enrollment Architecture Courses
INTENT
• reflective analysis of the past five years of teaching Building Construction I in the School of Architecture at Southern Illinois University

• not a critique of the practice of design|build in general or of the overall learning experience of this course

• primary examination of the relationship between course learning objectives and project experience and outcomes

• other points of analysis include student performance data, student survey data, amongst others
INTENT

Revised Course Philosophies

drawing: Mark Ryan Studio
photo: Bill Timmermann
Revised Course Philosophies
- core course in architecture and interior design programs
- second semester (spring) of second year in the program
- (2) one-hour lectures and (2) two-hour labs each week (both faculty taught with graduate assistant support)
- (3) projects undertaken in the lab
COURSE Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>Spring</th>
<th>Spring</th>
<th>Spring</th>
<th>Spring</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>67</td>
<td>61</td>
<td>45</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>2013</td>
<td>61</td>
<td>45</td>
<td>48</td>
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<tr>
<td>2014</td>
<td>45</td>
<td>48</td>
<td>35</td>
<td></td>
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</tr>
<tr>
<td>2015</td>
<td>48</td>
<td>35</td>
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<tr>
<td>2016</td>
<td>35</td>
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</table>
Focus of this study is on the iterations taught in 2012 and 2014 as they utilized the same project set.

<table>
<thead>
<tr>
<th>Year</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>67</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>45</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>35</td>
</tr>
</tbody>
</table>
Project 1: Intersection

constructions: E. Hamilton, A. Michael, J. Mckinney, M. Ollmann
photos: by author
Project 2: Cairo Residence

drawing: M. Ollmann
PROJECTS

Project 3: Design|Build

photos: R. Swenson and S. Jariwala
• design|build undertaken in the courtyard of the School of Architecture building

• project is a 4’-0” wide single story residential wall section

• students working in groups of 6 or 7

• project in both 2012 and 2013 with slight variations

• emphasis on translation through a series of tasks
COURTYARD

ARC242 - Problem 2
Wall Section Drawing

2: Design Completion
### Problem 2 Materials List/Price Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Finish/Found./Etc.</th>
<th>Fasteners</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wood</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quantity</strong></td>
<td><strong>Price per Unit</strong></td>
<td><strong>Total Price</strong></td>
</tr>
<tr>
<td><strong>Studs</strong></td>
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<tr>
<td>2x3-1/4''</td>
<td>2</td>
<td>$1.38</td>
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<tr>
<td>2x4-8''</td>
<td>2</td>
<td>$1.97</td>
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<tr>
<td>2x4-10''</td>
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<td>$2.58</td>
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<tr>
<td>**2x6-8''</td>
<td>11</td>
<td>$3.14</td>
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<tr>
<td>2x6-6x8''</td>
<td>1</td>
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<tr>
<td>2x8''</td>
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<td><strong>Foundation</strong></td>
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<tr>
<td>2x10-12''</td>
<td>2</td>
<td>$6.83</td>
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<tr>
<td><strong>Sheathing</strong></td>
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<td></td>
</tr>
<tr>
<td>3/4'' Ply</td>
<td>1</td>
<td>$39.97</td>
</tr>
<tr>
<td>1/2'' Ply</td>
<td>1</td>
<td>$44.49</td>
</tr>
<tr>
<td><strong>Trim/Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x4''</td>
<td>6</td>
<td>$1.99</td>
</tr>
<tr>
<td>1x6'' Lap. - 8''</td>
<td>3</td>
<td>$10.43</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Tab. 16 sq. ft</td>
<td>1</td>
<td>$21.54</td>
</tr>
<tr>
<td><strong>GWB</strong></td>
<td>1/2''</td>
<td>$8.30</td>
</tr>
<tr>
<td><strong>Barrier</strong></td>
<td>Tyvec 12 sq. ft</td>
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<tr>
<td><strong>Floor</strong></td>
<td>Carpet 8 sq. ft</td>
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<tr>
<td><strong>Nails</strong></td>
<td>Roof/Tribe</td>
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</tr>
<tr>
<td><strong>Finish</strong></td>
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<td></td>
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<tr>
<td><strong>L-Hangar</strong></td>
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<tr>
<td><strong>Anchor</strong></td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
</tr>
<tr>
<td>Gross Total:</td>
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<td>$203.67</td>
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<tr>
<td>Final Cost Estimate:</td>
<td><strong>$512.62</strong></td>
<td></td>
</tr>
</tbody>
</table>
1a) Place (3) 8"x8" CMU blocks together end to end, creating a straight line on scrap plywood.

1b) Mix one bag of concrete to proper consistency and pour into each CMU core.

1c) Place 4" flashing/ termite shield (not shown in picture) on CMU blocks and drill holes for anchor bolts

1d) Insert (2) ¾" anchor bolts into wet concrete and let dry.

2a) Place (2) 4' long 2x10 member four feet apart on the ground.

2b) Position (4) 2' long 2x10 members perpendicular at 16" o.c.

2c) Use the positioning of the joists to nail the (4) joist hangers in place. Use 3" framing nails

2d) Place joists in joist hangers and nail all joists in place.

4a) Drill holes in treated 2x6 member to allow anchor bolts to pass through. 2x6 is offset ¾" from the exterior face of CMU blocks.

4b) Place floor system and nail to rim joists, then place ½" plywood sheathing on top of floor and nail down. Use 2" framing nails.

4: Storyboard
COURTYARD

5: Build Day
COURTYARD

5: Build Day
5: Build Day
5: Build Day

photo: R. Swenson
• one project built in the School of Architecture’s gallery for longer display, including accreditation visit

• the courtyard constructions were disassembled one week after construction in a single day - as much material as possible was salvaged and brought to the woodshop

• each group submitted a photo narrative at the conclusion of the project
• design|build undertaken at SIU’s 3100 acre Touch of Nature preserve in 2014 through 2016

• funded by a grants from SIU and SIU’s Green Fund

• students working in lab sections on components of overall project and within multiple smaller groups for tasks

• goal was to translate the working process of the courtyard build into a community-based construct
• 2014 project was the redesign of TON’s Camp II hillside amphitheater - space is used for camps, retreats, weddings, and other events throughout the year

• 2015 project was the development of a series of enclosures for grant funded ELOO composting toilets that were located in the remote areas of TON’s campus

• 2016 project was the creation of a series of stations along a new trail system being developed at TON - these stations included seating, educational signage, platforms, tables, etc.
1: Site Analysis
Proposal B Layout

HILLSIDE

drawings: R. Bdair and C. Cornell

2: Conceptual Design
Bench

2: Conceptual Design

drawings: L. Ovca and A. Nash
CLIENT NEEDS

USE OF THE FACILITY FOR VARIOUS ACTIVITIES

We created this entrance area to accommodate a wide array of activities that take place at the amphitheater. These could range from skits put on by campers, to storytelling, and to weddings. We wanted to accommodate these events by providing a front facade that was more elegant than that that you would normally see at a summer camp. This facade was designed to provide an entrance for religious gatherings as well as weddings.
Promoting Personal Communication

Current Railings

Proposed Railings

2: Conceptual Design

drawings: W. McGuire and S. Jariwala
<table>
<thead>
<tr>
<th>Product</th>
<th>Size</th>
<th>Material</th>
<th>Quantity</th>
<th>Details</th>
<th>Weights</th>
<th>Weights Totals</th>
<th>Lowes</th>
<th>Lowes Totals</th>
<th>South Side</th>
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<td>Lamend</td>
<td>0.5&quot; x 0.5&quot;</td>
<td>MethylThi</td>
<td>223</td>
<td>$0.98 each</td>
<td>$218.63</td>
<td>$218.63</td>
<td>$15.99 in HgP</td>
<td>$15.99 in HgP</td>
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<td>2&quot; x 2&quot;</td>
<td>PT</td>
<td>4</td>
<td>Ground Contact</td>
<td>$9.98 each</td>
<td>$39.92</td>
<td>$39.92</td>
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<td>$939.00 in HgP</td>
<td>$2,361.00</td>
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</table>

**Concrete 40%:**
- Grade: CAC 3000
- Quantity: 349 CF
- Weights: 464,300 lbs
- Cost: $8,430.00

**Framing:**
- Material: Sheet Steel
- Details: Hot dip galvanized or stainless steel
- Weights: 3,125 lbs
- Cost: $1,562.50

**Ground Work:**
- Quantity: 15 ropes & fill dirt
- Quantity: 349 CF
- Weights: 464,300 lbs
- Cost: $8,430.00

**Hillside:**
- Quantity: 1000 CF
- Weights: 1,250,000 lbs
- Cost: $12,500.00

**Materials & Cost Analysis**

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<thead>
<tr>
<th>Company</th>
<th>Material</th>
<th>Price/ton</th>
<th>Quantity in tons</th>
<th>Shipping</th>
<th>Total</th>
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<td>3.00</td>
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<td></td>
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<td>3.00</td>
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<td></td>
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<tr>
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<tr>
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<td>3.00</td>
<td>$45.00</td>
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<tr>
<td></td>
<td>Soil</td>
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<td>2.00</td>
<td>$0.00</td>
<td></td>
</tr>
<tr>
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<td>$10.00</td>
<td>3.00</td>
<td>$30.00</td>
<td></td>
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<tr>
<td></td>
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<td>3.00</td>
<td>$45.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gravel</td>
<td>$0.00</td>
<td>1.00</td>
<td>$0.00</td>
<td></td>
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<tr>
<td>Earthworks</td>
<td>Sand</td>
<td>$10.00</td>
<td>3.00</td>
<td>$30.00</td>
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<tr>
<td></td>
<td>Gravel</td>
<td>$15.00</td>
<td>3.00</td>
<td>$45.00</td>
<td></td>
</tr>
</tbody>
</table>

*Alling to make a deal*
Step 3:
Add 1" layer of sand under the side railroad tie.
Make sure that the sand that is being laid on the landscape fabric is level.

Step 4:
Place a railroad tie laying directly at the beginning of the landscape fabric.

Step 5:
Using 8" galvanized spikes, connect the two railroad ties together using a sledge hammer.

Step 6:
After the railroad tie from the previous step is placed there will be another railroad tie going in on the side of the previous one.

Step 7:
Before the drainage pipe is put in the area, there will be about an 1" of gravel laid in the space.

Step 8:
After an inch of gravel has been placed and the drainage pipe as been inverted, the rest of the area is going to be filled with gravel.
3: Group Development Taskwork - Construction Documentation
3: Group Development Taskwork - Construction Documentation

drawings: Lab 001 Group 4
3: Group Development Taskwork - Mockups and Models
HILLSIDE

4: Build Days
4: Build Days
4: Build Days
4: Build Days
• students were required to attend three full-day build days and were rewarded with extra credit for coming to more

• in all we were on site for about 20 days

• each lab was required to submit a summary document of the project at the end of the semester which included a photo narrative of the process and as-built drawings of their lessons learned
OBJECTIVES
OBJECTIVES

1. Primary Lectures
2. Lab Tutorials
3. Quizzes and Tests
4. Project 1: Detail Construction
5. Project 2: Design|Build
6. Project 3: House CDs

Core Objectives:
1. Understand Wood as a Material
2. Understand How to Build with Wood
3. Understand Construction Documents
4. Understand Architecture as an Assembly
5. Understand Regulation of Building
6. Develop Critical Thinking

NAAB Student Performance Criteria:
1. NAAB A4: Technical Documentation
2. NAAB B10: Building Envelope Systems
3. NAAB B12: Building Materials and Assemblies
4. CIDA 5c: Collaboration and Teamwork
5. CIDA 11: Proper Selection of Materials
6. CIDA 13: Reading Construction Documents
7. CIDA 14: Understanding of Building Regulation

CIDA Professional Standards:
1. CIDA 11a: Awareness of Materials
2. CIDA 11c: Proper Selection of Materials
3. CIDA 12: Understanding of Building Regulation
4. CIDA 13a: Structural Systems
5. CIDA 13b: Non-Structural Systems
6. CIDA 13f: Vertical Circulation Systems
7. CIDA 13g: Reading Construction Documents
8. CIDA 14: Understanding of Building Regulation

CIDA Professional Standards:
1. CIDA 5c: Collaboration and Teamwork
2. CIDA 11: Proper Selection of Materials
3. CIDA 13: Reading Construction Documents

CO Outer - 2012 | Inner - 2014

Meets Objective Partially Meets Objective Does Not Meet Objective

Four Types

1. Primary Course Objectives
2. NAAB Student Performance Criteria
3. CIDA Professional Standards
4. Core Objectives
Students should understand the principles, materials, means and methods, and sustainable design issues for wood light frame construction. Students should learn the basic tenants of the construction of a wood light frame building and learn the steps necessary to design and assemble it.

### Primary Course Objective

#### Meets Objective
- students directly engage materials, means, and methods of construction with wood light frame construction
- all students have relatively equal opportunity to meet objective

#### Partially Meets Objective
- students directly engage materials, means, and methods of construction with manufactured wood
- many students to not directly engage with any traditional wood light frame construction (amphitheater vs. stage vs. threshold)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Meets Objective</th>
<th>Partially Meets Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>Courtyard Build</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>Trail Build</td>
<td></td>
</tr>
</tbody>
</table>

**OBJECTIVES**

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**Spring 2012 | Courtyard Build**

- Students engage in the design and construction of a courtyard using wood light frame techniques.

**Spring 2016 | Trail Build**

- Students work on a trail project, focusing on sustainable building practices.

**Spring 2014 | Hillside Build**

- Students collaborate on a hillside construction project, emphasizing integrated design solutions.
4: Understand Architecture as an Assembly of Parts

Students should understand the realities of architecture being an assembly of parts that are joined together. Students should understand the fundamentals of tectonic assembly, joining, and making.

**Meet Objectives**

- Spring 2012 | Courtyard Build

**Meet Objectives**

- Spring 2014 | Hillside Build
- Spring 2016 | Trail Build
Students should develop an ability to think critically about how and why we construct architecture in the ways we do.

6: Develop Critical Thinking Skills

**Meets Objective**

- students directly engage in a complex problem that must be thought through carefully
- students must seek out information in addition to what is provided to them in lecture/lab sessions

**Meets Objective**

- students directly engage in a complex problem that must be thought through carefully
- students must seek out information in addition to what is provided to them in lecture/lab sessions
- approached the borderline of being too complex for many students to think through in the timeframe given

**Objectives**

- Spring 2012 | Courtyard Build
- Spring 2016 | Trail Build
- Spring 2014 | Hillside Build
[Students need the] ability to make technically clear drawings, write outline specifications, and prepare models illustrating and identifying the assembly of materials, systems, and components appropriate for a building design.

**Partially Meets Objective**
- Students create detailed storyboard drawings that outline the construction of the build
- Students are required to interpret a given construction document
- Students do not create construction documents of their own
- All students have relatively equal opportunity to meet objective

**Partially Meets Objective**
- 25% of the students create construction documents for the built project
- 25% of the students create detailed storyboard drawings that outline the construction of the build
- 50% of the students do not engage with technical documentation of any type
- Drawings were not fully reviewed

**Meets Objective**

- Spring 2012 | Courtyard Build
- Spring 2014 | Hillside Build
- Spring 2016 | Trail Build

NAAB Student Performance Criteria
B9: Structural Systems

**OBJECTIVES**

- Partially Meets Objective
  - students learned about the construction and application of light wood frame structural systems through the project’s process
  - the constructions themselves, as sectional works, were not of themselves structurally sound without additional support
  - the support systems were incomplete at the foundations as the built work was temporary

- Partially Meets Objective
  - as a permanent structure, structural design was included in the process including looking at gravity loads and the lateral loading of vertical cantilevers
  - about 10% of the students were highly involved in the structural analysis done on the project
  - most students actively participated in the build and assembly of structural components of the project

- Meets Objective
  - Spring 2012 | Courtyard Build
  - Spring 2016 | Trail Build
  - Spring 2014 | Hillside Build

NAAB Student Performance Criteria
[Students must develop an] understanding of the basic principles involved in the appropriate application of building envelope systems and associated assemblies relative to fundamental performance, aesthetics, moisture, transfer, durability, and energy and material resources.

### B10: Building Envelope Systems

#### Meets Objective
- Students learned about the exterior wall system and roof system of a wood light frame building and engaged in its construction as the primary focus of this problem.

#### Does Not Meet Objective
- As an outdoor structure, there was no enclosure system included in the project that satisfies this objective.

<table>
<thead>
<tr>
<th>Spring 2012</th>
<th>Courtyard Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2014</td>
<td>Hillside Build</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>Trail Build</td>
</tr>
</tbody>
</table>
Parallels objective 2 from the primary course objectives.

B12: Building Materials and Assemblies

**OBJECTIVES**

**Meets Objective**
- students directly engage materials, means, and methods of construction with wood light frame construction
- all students have relatively equal opportunity to meet objective

**Partially Meets Objective**
- students directly engage materials, means, and methods of construction with manufactured wood
- many students not directly engage with any traditional wood light frame construction (amphitheater vs. stage vs. threshold)

Spring 2012 | Courtyard Build
Spring 2016 | Trail Build

Spring 2014 | Hillside Build

NAAB Student Performance Criteria
The interior design program must include learning experiences that engage students in collaboration, consensus building, leadership, and teamwork.

5c: Collaboration and Teamwork

**Meets Objective**
- students work in a team environment (group of 6-9 students) to develop and build a complex project

**Meets Objective**
- students work in a multi-tiered team environment of small and larger groups to develop and build a complex project

**OBJECTIVES**

- Spring 2012 | Courtyard Build
- Spring 2016 | Trail Build

- Spring 2014 | Hillside Build

CIDA Professional Standards
Parallels objective B12 from the NAAB Student Performance Criteria, but with an emphasis on interior design materials.

**OBJECTIVES**

### Spring 2012 | Courtyard Build

**Partially Meets Objective**

- Students directly engage materials, means, and methods of construction with wood light frame construction.
- The study of traditional interior design components is limited.

### Spring 2014 | Hillside Build

**Partially Meets Objective**

- Students directly engage materials, means, and methods of construction with manufactured wood.
- The study of traditional interior design components is limited.

### Spring 2016 | Trail Build

**Partially Meets Objective**

- Students directly engage materials, means, and methods of construction with manufactured wood.
- The study of traditional interior design components is limited.
13a: Structural Systems

**OBJECTIVES**

Parallels objective B9 from the NAAB Student Performance Criteria.

- Partially Meets Objective
  - students learned about the construction and application of light wood frame structural systems through the project’s process
  - the constructions themselves, as sectional works, were not of themselves structurally sound without additional support
  - the support systems were incomplete at the foundations as the built work was temporary

- Partially Meets Objective
  - as a permanent structure, structural design was included in the process including looking at gravity loads and the lateral loading of vertical cantilevers
  - about 10% of the students were highly involved in the structural analysis done on the project
  - most students actively participated in the build and assembly of structural components of the project

Spring 2012 | Courtyard Build

Spring 2014 | Hillside Build

Spring 2016 | Trail Build

Meets Objective

CIDA Professional Standards
Students [should be] able to read and interpret construction drawings and documents.

### 13g: Reading Construction Documents

**Meets Objective**
- students are required to interpret a construction document as the fundamental starting point of the assignment; the translation begins with this reading

**Partially Meets Objective**
- students were asked to create construction documents that were used on the jobsite to build the project
- the construction documents were, for the most part, incomplete and hard to interpret on the site (a good learning experience in its own right though)

**OBJECTIVES**

- Spring 2012 | Courtyard Build
- Spring 2016 | Trail Build
- Spring 2014 | Hillside Build

CIDA Professional Standards
1: Develop the Ability to Translate Representation to Reality

<table>
<thead>
<tr>
<th>Meets Objective</th>
<th>Does Not Meet Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ the students take a given drawing and translate it through a series of tasks into a built construction of the original drawing</td>
<td>■ students develop virtual products in groups that are translated into a built product</td>
</tr>
<tr>
<td>■ very few students were able to make the connections from one step to the next due to the necessity for a division of labor</td>
<td></td>
</tr>
</tbody>
</table>

**Objective Summary**

- **Partially Meets Objective**
  - Spring 2012 | Courtyard Build
  - Spring 2016 | Trail Build

- **Meets Objective**
  - Spring 2016 | Trail Build

- **Does Not Meet Objective**
  - Spring 2014 | Hillside Build
The other core pedagogical issue was that of scale. The course was designed to explore wood light frame construction at a variety of scales.

### Core Objectives

#### 2: Develop the Ability to Relate Between Scales

<table>
<thead>
<tr>
<th>Partially Meets Objective</th>
<th>Meets Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>- good relationship between the scale of the section in this project and the scale of the building in the shotgun house cd set</td>
<td>- only a partial relationship to the larger scale building of the shotgun house cd set</td>
</tr>
<tr>
<td>- poor relationship to the scale of the detail in the 2x4 joint problem</td>
<td>- good relationship to the scale of the detail in the 2x4 joint problem</td>
</tr>
<tr>
<td>- partially meets objective</td>
<td>- excellent comparison of scale within the design/build problem itself</td>
</tr>
</tbody>
</table>

**Spring 2012 | Courtyard Build**

**Spring 2014 | Hillside Build**

**Spring 2016 | Trail Build**

**Partially Meets Objective**
**OBJECTIVES**

<table>
<thead>
<tr>
<th></th>
<th>2012 Courtyard Build</th>
<th>2014 Hillside Build</th>
<th>2016 Trail Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Objective</td>
<td>8</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Partially Meets</td>
<td>5</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Does Not Meet</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Summary of Findings**
not a fair comparison

the courtyard build was designed to fulfill the objectives

the hillside build was an experiment to understand how community based design build would work in this course

the trail build was tailored to respond to earlier lessons and to include the best aspects of earlier semesters

does the project modify, or do the objectives modify?
The Construction Document set for the small residential house is an individual project that is worked on concurrently with the group-based design/build project.

### Performance on Construction Document Set

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>+4.1%</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>+1%</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>+3.1%</td>
</tr>
</tbody>
</table>
The Construction Document set for the small residential house is an individual project that is worked on concurrently with the group-based design/build project.

<table>
<thead>
<tr>
<th></th>
<th>Spring 2012</th>
<th>Spring 2014</th>
<th>Spring 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Improvement from DD to CD Submittal</td>
<td>+4.1%</td>
<td>+1%</td>
<td>+3.1%</td>
</tr>
<tr>
<td>Percentage of Students Performing Worse on the CD Submittal</td>
<td>15%</td>
<td>42%</td>
<td>28%</td>
</tr>
</tbody>
</table>
The Construction Document set for the small residential house is an individual project that is worked on concurrently with the group-based design/build project.

Average Overall Score on the Final CD Submittal

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>85.4%</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>80.2%</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>86.0%</td>
</tr>
</tbody>
</table>

Despite the fact that the CD set has decreased from 4 sheets in 2012 to only 2 sheets in 2014.

Performance on Construction Document Set
## Average Overall Score in the Course

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>84.1%</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>82.7%</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>84.6%</td>
</tr>
</tbody>
</table>

The average loss on the CD set was almost 4 times greater than the loss in the class over the same period between 2012 and 2014.

The average loss on the Midterm and Final exams was only -0.4% during this period.

---

**Performance in the Course**
Product: Courtyard Build
Product: Courtyard Build
Product: Hillside Build
Product: Hillside Build
Product: Hillside Build
Product: Trail Build
Product: Trail Build
Product: Trail Build
What is the best strategy for keeping 35-65 students busy?
- Small groups are far more efficient than larger groups - 6-7 students seems to be ideal
- Small groups allow for more opportunity for everyone to touch every part of the project
- Discuss communication early and often

How can this be done within the available timeframe of the course? How many days can be spent building?
- Scale needs to be kept manageable, within 40 sqft of build area per group
- Project needs to span the majority of the semester to allow students to grasp and integrate core concepts and to account for complexity of communication
- It will take a minimum of 10 work days to complete a project

How does the site allow for one faculty to monitor and control 45-65 students?
- Outside of a controlled environment, graduate assistants are mandatory for monitoring work
- Community design/build cannot occur without extra eyes on the site

Other Key Considerations for This Course
How does each student receive a well-rounded experience?
- This only occurs when each student has the opportunity to assist with most of the stages
- Smaller groups allow this to happen; less complex problems allow this to happen

Where are the funds coming from?
- Grant funding is mandatory for most design/build work; seek it early and often
- Avoid projects that require union involvement, engineering, major earthwork, etc.; these blow the budget and can significantly slow down the timeframe

How does the project activate the school and surrounding community?
- Try to find ways to bridge years; in 2016 a group of graduate students also worked on a portion of the project and then served as mentors for the second year students
- Build in and around the school; the further away you are, the fewer people in the program it will reach

Other Key Considerations for This Course
[Kubler] is startlingly alone among art historians in his claim that the significant meanings of this monument are to be sought in reconstructing the particular building activity - and not in a formal analysis of the architecture. I believe there are ‘forms’ to be found within the activity of making as much as within the end products. These are forms of behavior, aimed at testing the limits and possibilities involved in that particular interaction between one’s actions and the materials of the environment.

- Robert Morris