COLLABORATION IN COMPREHENSIVE DESIGN: Towards an Increasingly Realistic Design Experience

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April 5, 2019
Overview

Longtime capstone course at OSU taken by ARCH and AE students together in a studio
Historically students worked independently

Course format revised to include:
• Collaboration of ARCH and AE students in teams for the Schematic Design phase
• Additional collaboration with Construction Management, Fire Protection, and Geology
• Introduced the use of Scrums into the studio
Assessment of course by students/professionals
Comprehensive Design Studio

4th year ARCH and 5th year AE students:
• 4 Faculty (2 ARCH, 1 Structures, and 1 MEP)
• 6 credit hour studio course
• 3 credit hour seminar course
• 3 credit hour management course

Project is designed and developed from initial concept phase through construction documents.
Teams during SD Phase of Project

Last year teams of ARCH and AE students combined to work on the Schematic Design phase of the project:

- **Teams** of 2 to 4 ARCH and 1 AE students
- Teams worked together for first 6 weeks - Then presented project to a jury of professionals.
Scrum Meetings

Beyond the team format, another addition to the course this year was including Scrums:

- **Scrums** are quick daily meetings to discuss status of various tasks being performed by team members
- Originally developed by software designers
- Marker board/ colored tabs used to track tasks
Student Collaboration

Also included in the capstone was student collaboration with other departments, including:

- Geology
- Construction Management
- Fire Protection

Collaboration occurs at various points in the semester as ARCH and AE students work with students from other departments to develop their designs.
Course Assessment

To assess the revisions to the course format, three categories were used for assessment:

- Faculty assessment (Grades)
- Practicing Professionals assessment of student presentation juries
- Student survey feedback
Faculty assessment of team format includes:

- With the team format to the course, while there were no extremely low grades in the SD phase, neither did student teams “hit one out of the park”.
- Further study needs to occur to see if team format skews the distribution of grades in the course.
Student Survey Results / Assessment

Table shows the percentage of students that answered yes to survey questions.

Results are broken into responses from ARCH, AE, and students combined.

<table>
<thead>
<tr>
<th>Question</th>
<th>AE</th>
<th>ARCH</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the semester began, were you excited about the team requirement?</td>
<td>53.6</td>
<td>75.0</td>
<td>70.3</td>
</tr>
<tr>
<td>After the team interaction, were you still excited about the team requirement?</td>
<td>71.4</td>
<td>73.3</td>
<td>72.9</td>
</tr>
<tr>
<td>Did your team utilize the scrum meetings to determine what was achieved the day before, that day's task, and to identify impediments?</td>
<td>78.6</td>
<td>62.0</td>
<td>65.6</td>
</tr>
<tr>
<td>Did the scrum process help manage team conflicts?</td>
<td>60.7</td>
<td>67.0</td>
<td>65.6</td>
</tr>
<tr>
<td>Did the scrum process help with the division of work?</td>
<td>71.4</td>
<td>73.0</td>
<td>72.7</td>
</tr>
<tr>
<td>Was the whiteboard provide to your team utilized?</td>
<td>71.4</td>
<td>57.5</td>
<td>60.5</td>
</tr>
</tbody>
</table>
Student Survey Results / Assessment

Assessment of the team/scrum format included:

- Students were less excited at the start of semester compared to after with team setting, but only slightly
  - AEs were initially more tentative about the team aspect than ARCHs but their excitement improved by the end
  - ARCHs excitement declined slightly from start to end
- Scrum meetings did enhance the team process
Written Feedback on Team Approach

Students gave favorable feedback on several issues:

• Communication
• Motivation of team
• Member strengths
• Developing ideas together as a team

Challenges were listed as well by the students:

• Contrasting ideas
• Work division fairness
• Computer issues
• Differing goals/values

<table>
<thead>
<tr>
<th>Student Survey of Architecture and Architectural Engineering Students on Team Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the process, what worked well on your team?</td>
</tr>
<tr>
<td>- Communication &amp; division of work</td>
</tr>
<tr>
<td>- How well individuals took on their tasks</td>
</tr>
<tr>
<td>- Having another motivated and driven teammate next to me helped</td>
</tr>
<tr>
<td>- Our communication was our best attribute</td>
</tr>
<tr>
<td>- People using their individual strengths to better the project as a whole</td>
</tr>
<tr>
<td>- Developing ideas together</td>
</tr>
</tbody>
</table>

What issue was the most challenging working on the team?

- Contrasting ideas and opinions to work through
- Teammates making decisions without consulting others
- Moving towards a design with which everyone could be happy
- Fair division of work
- Knowledge of computer programs was lacking for some team members
- Differing goals / main values between team members
Presentation Juries

Juries occur twice during the semester:

- At end of SD phase as a team presentation
- At end of the semester as an individual

Juries were asked to assess the students
Assessment of Presentation Juries

Professionals are invited for student presentations.

Verbal and written feedback is provided for use by students in design development phase of the project.

Assessment of the student work for 2017-18 is shown.

<table>
<thead>
<tr>
<th>Team</th>
<th>Survey of Practicing Professionals</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schematic and Design Development Jury</td>
<td>Student team’s ability to communicate design ideas</td>
<td>4.13</td>
<td>4.33</td>
</tr>
<tr>
<td></td>
<td>Student team's ability to integrate a variety of systems in solving architectural problems</td>
<td>4.07</td>
<td>4.40</td>
</tr>
<tr>
<td></td>
<td>Student team's understanding of the architectural design process</td>
<td>4.15</td>
<td>4.38</td>
</tr>
<tr>
<td>Architecture Students Design Development Phase</td>
<td>Student's ability to communicate design ideas</td>
<td>4.10</td>
<td>4.17</td>
</tr>
<tr>
<td></td>
<td>Student's ability to integrate a variety of systems in solving architectural problems</td>
<td>4.01</td>
<td>3.93</td>
</tr>
<tr>
<td></td>
<td>Student's understanding of the architectural design process</td>
<td>4.06</td>
<td>4.07</td>
</tr>
<tr>
<td>AE Students Design Development Phase</td>
<td>Student’s ability to develop a structural system</td>
<td>4.06</td>
<td>4.07</td>
</tr>
<tr>
<td></td>
<td>Student's understanding of relevant structural system issues</td>
<td>4.25</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Student's ability to integrate a variety of systems in solving architectural problems</td>
<td>3.97</td>
<td>3.96</td>
</tr>
</tbody>
</table>
Assessment of Presentation Juries

Evaluation of jury assessment included:

• Teams were assessed as better at communication, systems integration & ability to understand architectural design in the SD phase.

• However, once the students moved to the DD phase of project, the improvement was not as consistent.

• Add’l assessment in coming years may help to explain the cause.
What’s Next for the Capstone Course?

Continue to offer the team format for the course:

• Teams allow for interdisciplinary collaboration
• Students reacted positively to atmosphere of teams
• Use of Scrums will continue as their results are positive
• More in-depth crits from Professors can happen
• Chance to increase interdisciplinary aspect of course
The Endeavor Lab is a new undergraduate research facility at OSU:
• Opened in September 2018.
• 72,000 sf / $35 million
• 3 floors of labs/makerspaces for innovation, collaboration, assembly and fabrication.
• Industry-aligned labs, sponsored by corporations.
• Home to interdisciplinary capstone design projects in collaboration with industry.
Oklahoma State University

Goals of the collaboration process:

• Enhance the learning environment for students
• Allow students to better understand other majors
• Provide a near real-world experience for students