Improving Students’ Ability to Visualize Natural Forces in the Production of Higher Performing Buildings  Shannon Criss, Architecture

1. Background
 ARCH205: Introduction to Natural Forces (new title, Visualizing Natural Forces) advances empirical understanding of natural forces, including gravity, wind, light, heat, sound, and fluids, as they both shape and affect buildings. The course is required and is generally taken by Sophomores. The growing effects of global climate change have created increasing pressure to effectively teach natural forces/passive energy core principles early in the education of architecture majors, so that students can comprehend and apply these principles through the remaining years of their college education. In Fall 2014 I radically revised the course to promote greater student engagement with the material. I had previously been disappointed in the students’ ability to visualize and represent core principles through sketches and digital models.

2. Implementation
 My redesign goal for Fall 2014 was to increase students’ connections between core concepts and their integration/visualization, using five tactics:

**Hybridizing** the course (both outside of the course via Bb and inside the course via direct teaching in workshop and lab modes); assigned readings with sketch/notation responses + online tutorials to teach basic digital skills

**Flipping** the course (pre-class quiz to test reading comprehension; in-class integrating lecture, sketching, and discussions)

**Using Lab Groups** (lab instruction; developing the assignments in small groups)

**Integrating an Exhibit/Event:** each group was given space to exhibit their assignments and orally present them to faculty and upperclassmen for feedback and critical evaluation (right, top).

**Assigning a Portfolio/Reflection:** each student packaged all of the work they developed throughout the semester into one notebook and reflected, in writing, on both how they practiced active learning throughout the semester and how they applied the course’s core principles.

3. Student Work & Performance

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<th>Student Assignment Examples</th>
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<tr>
<td>Example of Sketch Analysis of Reading Assignment by Monica Ming.</td>
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<tr>
<td>Example of Second Assignment of the Semester: Student product by Doug Dawson illustrating performance controls for daylighting and shading control for a building.</td>
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4. Reflection
 The change in the approach to the readings and learning software was valuable. Students benefited from the pre-class reflective sketching process and from the pre-class instructions for developing digital drawings. The consistent format of the in-class quizzes and clear rubrics provided before, mid-way and as final evaluation helped the students internalize this framework. However, students felt that too much was expected from them prior to class, and requested better in-class exercises to reinforce core principles in a spatial and material way.