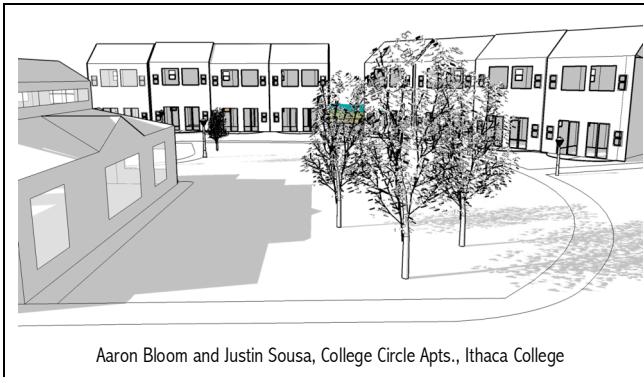


3-D Modeling in the Liberal Arts Classroom: Visualizing 'Great Spaces' in Google SketchUp



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ABSTRACT We describe a successful experiment with the integration of a powerfully simple 3-D modeling tool in a general education course on the history of urban design. Students without prior experience produced attractive and convincing models of local urban and campus spaces and used them to propose improvements applying principles learned in the course. The project generated considerably more student engagement and collaboration than conventional methods and is applicable across disciplines, wherever students might benefit from the ability to visualize objects or environments in three-dimensions.

PROJECT DESCRIPTION

Part 1: Space Analysis and Documentation. Students are asked to describe their space verbally and visually and to write about the impact of the designer's choices on the "feel" of the place. Verbal description includes ground plane (topography, materials, organization) and vertical edge (depth, height, subdivision, materials and continuity).

Visual description includes a sketch plan of the space on an 8 1/2 X 11" sheet which:

- shows building edges clearly,
- is drawn roughly to scale, using pacing method,
- includes measurements of at least one bounding building

Students also sketch cross sections and elevation views to study topography and façade arrangements.

Part 2: Space Evaluation and Redesign. Students use Google SketchUp 6 (free download from <http://sketchup.google.com/download.html>) to translate their 2-D drawings into 3-D digital models. They use the models to analyze the space according to course principles and their reading of Kevin Lynch's classic of urban design, *Image of the City* (e.g., form simplicity, singularity, directional differentiation, visual scope). Based on this analysis, they then propose design alterations to improve the space. Part 2 requirements:

As-Is Model. Models are to be approximately to scale, and give the viewer a reasonable feel for materials, plantings, and contents, and the architectural arrangement of facades.

Design Diagnosis. Based on observations made in Part 1 and further thoughts based on in-class learning and the study of Lynch's desirable "form qualities," students identify features of the design that do not work well, either functionally and/or aesthetically.

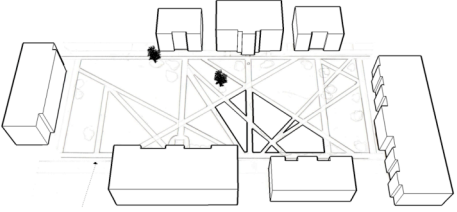
Remedy Model. Students propose their own modest redesign of the space, introducing, deleting, or modifying elements (materials, contents, building edges, etc.) in order to remedy the drawbacks identified. They then produce a new SketchUp model showing how the space might look as redesigned.

PEDAGOGICAL ADVANTAGES/SURVEY RESULTS

- *Seeing Space*: Students with no prior artistic training often find it difficult to "see" urban spaces as three-dimensional voids defined by floor and walls.
 - The hands-on activity of creating a digital model isolates its elements from the clutter of the surrounding visual field, allowing students to visualize it more clearly. 71% of students reported that the modeling process helped them with visualization.
 - The ability to rotate the model on multiple axes and thus to examine the space from angles and at scales not available in real life further improves their understanding

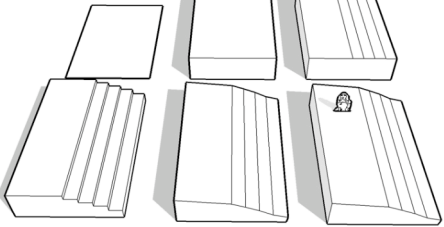
- *Applying course principles:* Because they are better able to visualize it, students are more effective at correlating course principles and historical concepts with their own real world space.
- *Student engagement:* Students overwhelmingly found the project challenging and rewarding. 74% found it either “pretty challenging” (41%) or “quite difficult” (33%) but both groups found the process rewarding once they got the hang of it (and 24% found the program “relatively easy”). Only 1 of 46 reported that it was “very difficult.” A full 93% responded that their level of interest in peer presentations was heightened by the visual appeal of the models and the challenges they had collectively faced in producing them.

THE MODELING PROCESS

<p>The diagram shows a midpoint stage in the process</p>  <p>Plan by Christopher Allen and Halley See</p>	<p>The student’s hand-drawn plan has been imported into SketchUp, and shapes of buildings represented in the plan have been traced over using the Pencil and Rectangle tools. These shapes have been “extruded” using the Push/Pull tool (and their dimensions have been defined, based on measurements taken in the field). Pathways shown in the plan have begun to be traced over using the Pencil tool; the grassy triangles between them are beginning to be “painted” with color and texture; tree “components” are being added.</p>
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CHALLENGES

- Differing digital abilities among students. Solution: identify students with some graphics experience (we found 6 of 56); they assist with instruction and trouble-shooting on in-class “workshop” days.
- Representing topography. SketchUp is conceived with solid buildings in mind but urban spaces are voids in which the “lay of the land” can be a significant characteristic. SketchUp’s topographic modeling feature (Sandbox) is too advanced for novices, but simpler strategies to represent slopes can be effective, as shown.

	<p>Beginning at top left, a rectangle is drawn and extruded (top center). Parallel lines are introduced (top right) approximating contour lines; these are then pressed down (using Push/Pull) in a series of steps (lower left). They are smoothed into a continuous slope (lower center) using the Move tool. In the final step (lower right), grassy color and texture are added (not shown in black and white), and a puppy is added for scale.</p>
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- Model slowness. Models with many inserted elements can be difficult to manipulate, and urban spaces are “component” intensive (trees, street furniture, etc.). “Layers” and “Hide” features alleviate this problem.

REFERENCES

SketchUp’s Self-Paced Tutorials (Help menu) provide the best starting point, covering basic viewing tools and modeling techniques. Our students worked through these before the first workshop session; basics were also reviewed by the professor. SEE ALSO: Chopra, Aidan, w/Laura Town. (2007) *Introduction to Google SketchUp*. Wiley; and Johnson, Tim. (2007). Lessons from the Studio: Get the Most out of SketchUp as a Design and Visualization Tool. *Landscape Architecture*, 70-77.

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