This paper describes our approach to the first year design studio and the way we employ, utilize and integrate digital media in the Architecture Program at Temple.

The first year studio design course at Temple emphasized spatial design and principles of concept, space, form and composition. The second half of the first semester and the beginning of the second semester were made up of relatively short design exercises which focused on isolated formal design concepts in an attempt to build a vocabulary of basic organizational and ordering strategies. The students were given design problems that dealt with the design issues used in this study. These design exercises were abstract spatial compositions with prescribed volumes and elements intended to engage the student in an exploration of design concepts, parti development, spatial organizations, ordering systems, space definitions, spatial relationships, planes, openings, object elements, perception and compositional concepts. A final design project of longer duration combined the lessons of the previously assigned design exercises and applied them to a problem of greater complexity and detail. The final project, which was evaluated in this study, was not a standalone project but an accumulative design problem.

Important to each design exercise was the use of design analysis as a reflective component of design. Design analysis was comprised of two components – case study research and project explanation. Both components addressed design concepts, and it was assumed in most cases that there was a two-way influence between research and project explanation (see Figure 1). The idea of using analysis as a reflective component of the creative process is not unique to architecture. Here, the consistency and frequency of use was similar to the use of techniques from other disciplines, such as the ‘course notebook’ used to teach beginning students in the humanities and social sciences. In the creative process, the use of reflective analysis parallel to the creative act has suggested to be a positive cognitive tool, and a means for excellent learning and memory on the part of the participating student (Baer 1993; Boden 1990; Kirk and Spreckelmeyer 1988; Naughton 1986; Wakefield 1992). Not only this, the use of reflective analysis allows each student to learn in his own manner, rather than in terms of the norm of the class.

The ability to quickly experiment with different modeling ‘languages’ presents the student with alternatives in how to ‘see’ the conceptual issues and problems of the design project. The difference, for example between a model of solid/void vs. planes/frames or skeletal structure can be viewed first hand and quickly. In the physical model the ability to build these three related kinds of spatial structures is time consuming, and sometimes impossible to construct with the limited experience of beginning design students. In the digital model, the use of these alternative spatial structures leads to a more inclusive kind of conceptual thinking from the very beginning. More complex conceptual principles of space making, such as the use of membranes/cores/envelopes, interlocking spaces, addition/subtraction of mass and volume, space as solid, etc. are more readily conceivable using parallel digital analysis to the design process (see Figure 2).

The term’s studio exercises began with the assumption that the use of an iterative field for posing design questions is necessary in establishing a relationship between the range of tools for beginning design and that parallel attention to the analysis of design would benefit the design process. The Cube Project, the final project for the year, was the first project to introduce a shift in the field for design. Whereas the prior 12 weeks spanning two semesters used a field of 1:7:7 ratio (h:w:l) with a limited variety of elements that could be used in the making of volumetric spatial compositions, the cube assumed a 1:1:1 ratio. Elements and scale for design were to be chosen by students. The assumption that students would first observe many constraints then choose their own, depended on the use of parallel design analysis as the basis for design reasoning (and therefore logical constraints) within the final project. The shift from semester controlled architectonic studies (see Figure 3) to final project also represents a transition from a general understanding of architectonics to recognition of particulars in concept formation, space-making, form-building, composition, scale, and proportions.

The cube project focused on the composition of volumetric spaces. Where the bulk of the semester used a field with a volumetric bias in the horizontal axis, the use of a field equal in the x, y, and z direction for the final project assumes a neutral non-hierarchical system. The goal of this project is to transform this given condition into an architectonic composition that defines a series of spaces (see Figure 4B & F).
The sequence here is in both the vertical and horizontal direction, addressing all axial relationships at the same time. The project, set up as phases, began with each student's compositional design proposition. Initial phases used planes and spaces in physical model form, but assumed the use of ‘space as solid’ in digital model form (see Figure 4B). Massing models showed divisions of the cube and characterized the configurations of spaces that were proposed. The use of digital models for analysis was important to the shaping of the spatial sequences in all design phases. Analytical models also included the use of planes, frames, etc (see Figure 4F). The opportunity for each student to begin with the ‘solid volume’ marked the importance of volumetric space as the basis for the project, and gave each student the opportunity to demonstrate what was gained from previous exercises throughout the semester.

With the common framework established the project proceeded in both digital and physical model form. In the physical model, students used planes to establish the limits of the project’s field and spatial sequences in composition. The analytical digital models gave rise to the nature of composition. The planes could remain in the digital model, but the added use of translucent solids to demarcate spatial boundaries not only showed the intent of the project, it also led to alternatives and design solutions to support the intent. This way, we hypothesized that the exploration of more complex ideas of spatial configuration could be achieved. The relationship between the unit of space and the whole was easily grasped by the student and explained. For example, the addition/subtraction of volumes through the use of planar elements and sub-elements could drive the intention of design. Fine-tuning of a project to include the use of ‘membranes’ or ‘interlocking spaces’ between volumes as an expression of joining and/or separation was now possible because of an understanding of the partial unit of space in relation to the whole field. Where a student might start in the physical model (according to the project description) with spatial divisions based on planar configurations, he might find through volumetric analysis that the use of a core system or a skeletal system is more appropriate to the design process (see Figure 4B, F & K).

The final phases of the Cube Project included the introduction of scalar objects within the spatial composition. Students were asked to consider some of the more quantitative aspects of design at this stage. A transition from a general understanding of architectonics to recognition of particulars in concept formation, space-making, form-building, composition, scale, etc. were addressed. Along with this, the introduction of the envelope could be achieved. It was as-
umed that the overall configuration of spaces was in place and that the decisions about the use of scalar elements (i.e., stairs, ramps, openings) and façade elements would enhance what was already in place. At best, this demonstrates a consistency in design thinking on the part of the individual student and an understanding of the use of a systematic approach to design. In addition to consideration of scale, the use of light and shadow in space making became a focus. Light qualities as a major contributor in the perception of space were introduced. It was assumed that the use of light and shadow was complementary to the use of circulation and scalar elements, and that the introduction of these was obvious because of the pre-formed compositional decisions arrived at through the combination of analysis and design (see Figure 4 A, C and D).

The use of hybrid media – physical and digital models – proved to be essential to this shift in perception from compositional emphasis and concept formation in the design process to representational solution and demonstration of architectonic knowledge in the final presentation. To this end, the physical model allowed each student to grasp the scalar implications of spaces and elements, while the digital model best showed the overall composition.

Through the process of systematic thinking, ideas about architecture were explored. As the project progressed, the volumetric analysis gave each student the opportunity to explore different systems in architectonics. The use of planes and frames could be presented in a digital analysis alongside the use of solid massing models. Spatial separations were characterized through the languages that each of these kinds of systems represented. The use of the frame as a transition element, for example, was given as a first order separation, the use of walls, openings, etc., was a second order of detail in making the transition readable (see Figure 4 A, C, E).

Past cycles of this project had shown it to be very successful in confronting beginning students with questions of architectonic form in conjunction with constraints of program, site, and construction. Although abstract in detail, the nuances of the exercise elicited a rich array of design solutions, which served to inform students that despite the numerous restrictions and parameters, placed on the problem, many formal design possibilities still abound.

When confronted with a project with few parameters, it is through the continued use of analysis that these are able to have a clear design logic. The analyses, done in digital model format can be presented with numerous languages – planes, frames, and solids. Design actions – subtraction, addition, interlocking of form and space, layering, etc. – are more easily realizable with these comparisons. The use of physical and digital media compensated for periods of slow activity in the design process and periods where rapid and successive demonstrations of thought needed expression. The recording of design ideas is at best expressed through visual means. The process of analytical thinking in beginning design, when guided by visual images allows the student to express himself verbally in a precise manner, avoiding a superficial use of written language to demonstrate ideas in design. The use of digital tools for visualization has a significant impact on cognitive development in design, if it is accepted that the beginnings have a visual base. The rapid production of visual ideas that is possible in the use of digital modeling complements the speed of design thinking for basic concepts of design, thereby giving us the ability to use analysis as a major part of spatial thinking.

References

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