DESIGN THEORY (7C)

BIM AND COMPREHENSIVE DESIGN STUDIO EDUCATION

Integrated Practice and BIM Challenge Studio Pedagogy

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Abstract. Building Information Modeling (BIM) has the potential to fundamentally alter the way composition, scale and abstraction are addressed in today's comprehensive design studio by displacing the primacy of abstract conventions of representation with a methodology based on systems thinking and virtual simulation. BIM viewed as provocateur of design education provides great potential for the critical analysis of how architectural design is taught. The design studio project reflects new ways of teaching and addressing BIM methods and processes, and critically evaluating their effects and possibilities on architectural production.

Keywords. Education; design theory; design studies; animation.

1. Introduction

The application of digital technologies beyond CAD, such as, BIM, and parametric design, and digital fabrication are fundamentally altering the *how* and *what* of architectural design. The how of *how we do* is changing, and the what of *what we do* is changing. The *way we make architecture* is being transformed through the digital tools, processes and applications used today.

How studio education evolves to reflect, interpret, translate, or challenge the multiplicitous modes of contemporary practice presents opportunity and risk to this generation of digital scholars and digital practitioners. The possibilities afforded by BIM and parametric technologies are increasingly affecting not only *what we make* but simultaneously *how we make* as architects.

Integrating BIM into the way students are educated will necessitate innovative thinking (Cheng, 2006) about the generation and definition of new forms of representational conventions. New conventions will develop, not based on the abstract biases of the past, but instead on emergent ones based in systems of simulation and information management. As the conventions of communication and representation of the past were determinant factors in those architectures the new conventions will propose new architectures. The design studio that embraces these new conventions in the age of BIM will transform the architectural design product as much as the architectural design process.

This model for a comprehensive design studio examines the relationship between the scale of design (or lack there of) and the scale of representation (or lack there of) and how this relationship undermines the primacy of abstract representation in architectural design. The future of architectural production vis-à-vis architectural representation in practice and concept is at a crossroads between Parametric Modeling (PM) and Building Information Modeling (BIM) as the profession moves beyond traditional practice and its drawing-centric model into a dynamic process/component oriented model for digital practice and the subsequent re-definition of professional services and contractual deliverables.

Perhaps a design studio in this new era might not end with the design of a building but might begin with a model of one already designed. The lessons might have to do with 4D logistical planning for construction and staged building processes. Perhaps detailed investigations or analyses of structural, electrical or mechanical systems in consultation with allied disciplines or consultants would set the agenda for a design studio. Fabrication of steel frame and composite wall systems at 1:1 scale from CNC processes would be the conceptual vehicle for the pedagogical lessons instead of drawing or modeling design ideas. The promise of BIM applications is that simulated and actual construction might be the products derived from the design studio. The possibility of starting with *building* rather than ending with *building* would fundamentally challenge design pedagogy and open new possibilities for students in the comprehensive design studio.

2. Comprehensive Design Studio Model

Contemporary architectural education assumes a traditional set of communicative visual conventions, orthographic projections, at varied scales and levels of detail, that when taken in concert signifies a whole, complete idea of a building. Contemporary architectural practice assumes a simple one-to-one correspondence between design intent and interpretation, between the representation of ideas and the interpretation of the design of buildings.

Contemporary construction documents reveal this assumption, these abstract, fragmented representations of the building and its components rely on reductive syntactic connections (Pérez-Gómez and Pelletier, 1997) where by each abstraction is part of a dissected whole and when taken as a summation these fragments exceed their individual abstraction and constitute a literal description of the complete building. BIM conversely begins with the virtual construction (simulation) of the whole, which is then viewed as a series of synthetic assemblies of constituent components. BIM represents a design process that does not prioritize abstract representation or fragmented conventions of communication but instead privileges the contextual construction of a formal/spatial systemic *intelligent* simulation.

3. Cause for Optimism...

The conceptual and practical advantages and consequences of BIM provide a unique catalyst for a critical analysis of architectural design and design process and how they are fundamentally conceived and taught. Focused on the virtual building model simulation as the primary means of communication and representation in the emerging concept of *Integrated Practice*, architectural educators must take pause to critically engage and conceive outcome driven educational models. Pedagogical positions must be evaluated relative to the conceptual shift away from abstraction as the *modus operandi* embedded in current models of education revealed in the primacy of the traditional projected conventions of plan, section, and elevation. The foundation issues, conventions and fundamental pedagogies of architectural education all need to be reconceived.

The consequences of digitally driven processes and thinking on architectural education will be profound. The underlying premise for design processes, fabrication and construction will increasingly challenge the historic relationships between architecture and its means of production (Kolarevic, 2003) leading to new demands of the profession on education to adapt and prepare students for digitally enabled *Integrated Practice*. Academia must completely revisit the curricula and imagine a system that acknowledges the obsolescence of the how and what of that which is taught in today's schools of architecture. BIM represents a shift in thinking that calls large segments (Clayton, 2006) of contemporary architectural education into question.

4. Conclusion

The possibility of starting with *building* rather than ending with *building* might radically reposition curricular goals, concepts and knowledge in the design

studio. The design studio must now reflect new ways of teaching and addressing emergent digital design methods and processes, and critically evaluate their effects and possibilities in architectural production.

References

Cheng, R.: 2006, Suggestions for an Integrative Education. *In:* M. Broshar, N. Strong, and D.S. Friedman 2006. *American Institute of Architects: Report on Integrated Practice.* Washington DC: The American Institute of Architects. Section 5, 1-10.

Clayton, M.J.: 2006, Replacing the 1950's Curriculum. *In:* G.A. Luhan, P. Anzalone, et. al. 2006. *Synthetic Landscapes – ACADIA 2006 Conference Proceedings.* Mansfield: The Association for Computer-Aided Design in Architecture. 48-52.

Guidera, S.G.: 2006, BIM applications in Design Studio. *In:* G.A. Luhan, P. Anzalone, et. al. 2006. *Synthetic Landscapes – ACADIA 2006 Conference Proceedings.* Mansfield: The Association for Computer-Aided Design in Architecture. 213-227.

Kolarevic, B.: 2003, *Architecture in the Digital Age – Design and Manufacturing.* New York: Spoon Press. 3-10.

Pérez-Gómez, A. and Pelletier, L.: 1997, *Architectural Representation and the Perspective Hinge.* Cambridge: The MIT Press.