Diagnosis and Strategies for a Digital Design Studio

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Abstract. *Recent studies have shown that despite some isolated initiatives digital tools education in the most important architecture schools in São Paulo has been done as something disjointed from the regular design studio activities.*
Actually, the existence of specific disciplines dedicated to digital tools education themselves is a symptom that something is wrong.
In this Paper, we present a brief diagnosis and a first draft for the actions to be taken in order to supersede this situation.
Keywords: *Architectural design; Digital design; Digital teaching.*

Precedents

When we consider the enormous advances in digital technology in architecture it seems unbelievable how disconnected architectural education is from this digital realm in Brazil.

Indeed, recent studies (Nardelli, 2005, Vincent, 2006, 2007) have shown that despite some isolated initiatives digital tools education in the most important architecture schools in São Paulo has been done as something disjointed from the regular design studio activities.

Actually, the existence of specific disciplines dedicated to digital tools education themselves is a symptom that something is wrong.

As these studies suggest, those disciplines are seen only as auxiliary knowledge to support design practice despite the growing impact of digital tools in design processes themselves.

This impact can be acquainted by taking into account the theoretical framework proposed by Rivka Oxman (2006), where she defines four paradigmatic models of digital mediation in design. Beginning with earlier CAD systems till generative software those models show that digital technology evolved from simple graphic representation to sophisticated systems which interfere in the process, from design conception to architectural construction, inducing deep transformations in design methodology that should be considered in design education.

Thus, we identify three distinct moments in this process, each one with a twofold implication:

1. Regular studio work is taken to the laboratory and CAD drafted. As no significant input is generated in the Lab, no conflicts are aroused in the studio. But the issues entailed by CAD use, such as digital project coordination and communication are not discussed in the regular studio, compromising students comprehension of its impact in professional practice;

2. Regular studio work is taken to the laboratory and put into BIM software.
3. Significant input is generated in this process, since BIM software explicit complex relations in architectural ideas; conflicts are aroused in the studio. Moreover, phasing and information overload in project development is greatly modified in BIM software, and its implications in professional preparation are not tackled by instructors back in the studio;
4. Architectural ideation takes place in the lab by the use of generative and highly parametric software. Form complexity and diversity emerge in the process, demanding new approaches in project development, construction planning and fabrication. Thus, regular studio is displaced from architectural education.

Curiously enough, Papert (1993) had already anticipated this situation, when he pointed out that the segregation of digital technologies education would hinder their proper assimilation in their full potential. This statement should serve us as a clue for the reformulation of architectural studio education, i.e. the first step should be the integration of digital teaching into studio practice.

Such integration should respond to the already mentioned three distinct issues without throwing away previous achievements of an architectural education practice which has proven itself as efficient and significant for the education of proficient professionals.

This is not an easy task, requiring careful diagnosis and design of strategies for short, medium and long term actions.

Take one

The traditional architecture studio has been the sole means by which students have contact with design methods and practice. For the best or the worst, design ideas evolve though a series of interactions between student and studio coach.

Such interactions occur by a series of interviews between an assigned coach and the student. The coach sets the basic requisites of design development for each next interview and supervises the student progress throughout the process.

This method is regarded as the most efficient one as a certain degree of customer-architect relationship is mimetized.

Some of the characteristics in this process are:

- Graphic representation skills influence directly the student's ability to express his ideas, as relates from experiments put forth in design exercises connecting studio practice and lab work indicate (Nardelli, 2000).
- The study of design alternatives is scarce due to the intrinsically slow hand drafting process;

Figure 1
Paper based studio

Take two

At least since the nineties, our students started being trained in Computer Aided Drafting skills. That training involved 2D drafting techniques and soon after that, 3D modeling techniques.

With very rare exceptions, 2D and 3D were used solely for 'representation' of already formed ideas. Most of the laboratory work was focused in expanding software use skills. A very brief description of those skills would typically encompass a broad review of geometry and its implementation in the software, followed by an introduction of 3D modeling, usually accomplished with solid primitive creation and Boolean operations. Some immediate consequences emerge:

- Design representation was greatly accelerated;
- In 3D, acceleration of the understanding of spacial issues emerges as a significant effect that contributes to design comprehension.
- On the other hand, the wonder of 3D visualization sometimes hides constructive issues thus producing a slight disruption between lab and studio work.

Take three

When students began employing CAAD and BIM software, professors and students felt that something different happened. The first noticeable impact in studio routine is that of simpler architectural software such as ADT and Vectorworks, by providing a simpler form of building simulation, permitted more sophisticated building representations which the students are not ready to master. Very soon in a project development constructive representations were being put at play, greatly confusing students and bringing issues that would otherwise surface later in a traditional studio sequence. Upon looking at a student's design in the notebook screen, some teachers might just misunderstand the software interface, be incapable of accompanying the fast 3d orbits and views interchange, lose the sense of scale for the model and so on.

Somehow, the apparent design development skills turn out to reveal an incomplete understanding of building requirements. The students' digital repertoire grows faster than their design and building knowledge. By greatly accelerating the drafting process, they jump through necessary developments in their designs and fail to meet studio requirements. The studio teachers, with their greater understanding both of design requirements and representation techniques, take the presentations by what they are, criticizing the projects for their lack of detail and absence of clarity in the formulation of solutions.

The clash between students and professors greatly derives from the disjunction between the apparent quality of presentations and the content presented. This clash should be taken under two distinct viewpoints. On one hand, a chance surfaces for the teachers to understand and deal with design issues earlier in project development, as a result from the faster pace made possible by digital tools. On the other hand the students, having acquired a false sense of mastery over representation and operational tools, feel lost when faced to direct criticism on their designs. For instance, sometimes the students depict partition walls using the ready made cavity walls, clearly missing the meaning of their functions in a building. Menu ready windows are employed without criticism to their fitness to the environment or building orientation.

Studio coaches were equally disturbed by this sudden appearance of superficially sophisticated drawings in preliminary designs, where only roughs and first drafts were asked for. Thus, a denial attitude developed in which instructors refused to accept such misinformed plans and presentations. Also, the traditional studio workflow was no more adequate in view of the somehow compressed workflow made possible by BIM software.

Summarizing, some issues surface:

- Students are not prepared to cope with the greater amount of detailing and construction information present in all the process, since the

earlier stages of design;
- Graphic standards provided by those software in design presentation don't follow traditional standards and lack in clarity and quality;
- Traditional workflows are not adequate in view of faster paced development.

As a response to these issues, some tentative approaches occurred in which lab coaches proposed design exercises devised to simultaneously teach the software – at the time Architectural Desktop –, and develop some basic digital design skills. Previous tentative approaches included exercises devised to guide students towards standards adoption – layering codes, external referenced drawings – in project contexts. Such trials were made both by integrating studio themes into lab exercises and by devising specific exercises to be accomplished in the laboratory (Vincent, 2004, 2006).

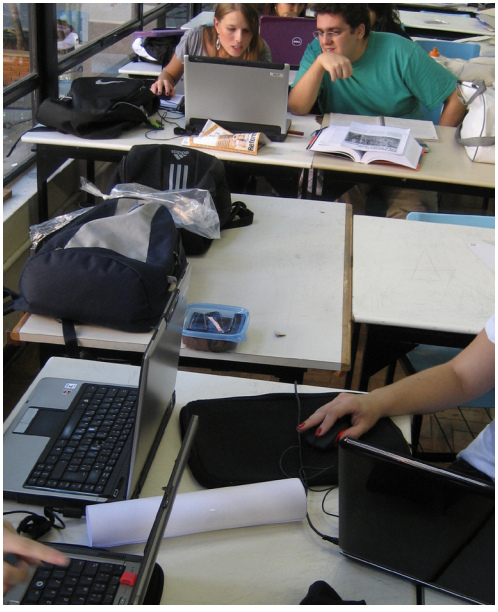

Figure 2
Notebooks cluster (and clutter) in the studio

The general impression resulting from those experiments is that the correct approach involves teaching digital tools in a design ambience, i.e. proposing designs where the impact of digital tools is decisive in the formation and development of concepts. This has not been adopted as the school's standard practice, however. Most of the laboratory teachers rely on the more common practice of software training based on ready made designs, precluding any design development instruction and greatly precluding the necessary abandonment of a 'representational' attitude in favor of the more contemporary 'digital design' attitude.

Conclusions

Clearly our students have a strong initiative toward the use of digital tools, but they are being refrained from a deeper employment of those tools due to varied difficulties and conflicts arising in the process. Velasco has described recently an analogue situation, where the students' initiative is to be seen as key for the introduction of BIM software (Velasco, Angulo, 2007). It seems to be a common understanding that we should be offering them both better chances for digital design practice and their coaches should encompass an understanding of the growing impact those tools exert on professional practice.

There's also an underlying question that requires careful addressing: the expertise studio coaches have in issues regarding real world professional practice cannot be put away. Even so, departing from a more common view that the solution implies better laboratories and computing tools, we dare to suggest that rescuing traditional coaches into the digital realm might be a clear alternative…

In view of this state of affairs, two situations emerge.The state of art of digital tools is still to be accounted in the row of exceptional cases, in which a small number of students entail research into more advanced practices, experimenting with software and devising new methodologies. Those students are being incorporated into research groups and

given the chance to investigate and study in an orderly fashion, even if their findings cannot be immediately incorporated into day to day studio work.

The other, which is to be taken with a sense of urgency, is that where average students are using somewhat 'traditional' digital techniques and yet don't find responses to the issues that result from their use. Those are the majority of cases and require actions both in the concept of digital teaching and in the way studio coaches tackle with differing design strategies.

Both their real life knowledge should be taken into account and some of the emerging issues in Digital Design should be incorporated into curricula.

Another tack would be the incorporation of digital tools – both hardware and software – in the studio space itself. After the very basic training with software in the lab, students would have a chance to develop their projects in the studio using a mix of both traditional and digital media and, at the same time, being coached by a mix of traditional and more contemporary professors.

All in all, there are some immediate actions which should be implemented:

- Digital disciplines should be offered in the initial semesters;
- Geometry and drafting classes should be absorbed into CAD, CADD and parametric computing ones.
- A Digital Design Studio should be offered either as an elective or as a mandatory course.

In the Digital Practice Studio, issues such as project coordination, standards enforcement and more traditional CAD and BIM practices would be presented in the context of project development.

In the Digital Design Studio, the issue of emerging technologies such as parametric and generative design should set the tone for exercises in architectural design, along with some experimenting with rapid prototyping and fabrication.

Note 1: Secondary education has suffered from a lack of geometry, drafting and general arts formation. The absence of visual language education impacts heavily on the quality of incoming undergraduate students.

Current opinion among studio instructors indicate that AEC secondary courses' students are some of our best architecture undergraduates and, at the same time, students from more generalist secondary curricula are, in general, weaker.

Note 2: Upon consulting with the principals in offices with a marked presence in the AEC marketplace a strong impression surfaces that our recently graduated architects lack a clear understanding both of the common professional practices and the more advanced digital skills.

Typical down time before a recently graduated architect attains some proficiency is one year and this alone means a great burden on the practice.

Note 3: The shifting paradigm from industrial repetition to serial mass customization poses questions too important to be discussed exclusively at the computing lab, requiring the most careful attention from the whole school corpus. As Patricia Muñoz puts it, "After overcoming this initial state of fascination, it is important to reflect on the mutual contributions between the pre digital knowledge and the new instruments, to recover a productive communication." (2007)

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