

# The Computer is to Blame

## The Disruptive Potential of a CAD Curriculum in an Architecture Curriculum

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*In 2001 “DesignIntelligence” and the “Almanac of Architecture and Design” conducted a survey in which they interviewed over 800 leading U.S. architecture firms. The fundamental question was: “In your firm’s hiring experience within the past five years, which schools do you feel have best prepared students for the architecture profession?”*

*This survey produces one of the most respected rankings of schools of architecture in the U.S., but in addition to that critical question, the survey gathers data on a number of additional parameters that are of fundamental importance on why some schools are doing better than others.*

*If we compare current figures with figures of previous years we see that our students are improving in their computer skills at the same time that they are losing ground in other skills and fields of knowledge. For a non-inquisitive mind the reason is simple: “Our students are too busy working on the computer and are failing to put attention to other important stuff”.*

*This paper makes an attempt to understand the problem from a fair perspective and highlight ways in which our growth in the field of CAD, and the pervasive presence of computer technology in our classrooms, can be used to enhance our teaching / learning capabilities in fields that are currently failing to achieve excellence.*

*Keywords: CAD, Curriculum, Practice*

### Let us seek the truth...

What should be the prime objective of architectural education? For a professional program in architecture the most important objective should be the development of graduates that have the knowledge and skills required by architecture firms.

The follow-up question is... What is the knowledge and set of skills that design firms seek and value? As coordinator of a professional degree

program in architecture I make this question on a constant basis. The most common answer is: “We want students that know how to think in creative ways”... “We don’t care about their skills...we can help them develop those by means of in-house training”. Is this true? Are we reading this statement correctly? Do they mean it...?

In this paper we would like to put such a statement to the test of consistency with hard evidence and determine, once and for all, if our

emphasis on CAD training is relevant to the needs of the firms that hire our graduates.

### **Which schools do architectural firms like hiring from...?**

As mentioned in the abstract, in 2001 “DesignIntelligence” and the “Almanac of Architecture and Design” conducted a survey (Design Intelligence, 2001) in which they interviewed U.S. architecture firms. The fundamental question was: “In your firm’s hiring experience within the past five years, which schools do you feel have best prepared students for the architecture profession?”

The ranking generated by the answer of over 800 leading U.S. architecture firms looks like this:

01. Cornell University
02. Harvard University
03. University of Cincinnati
04. Syracuse University
05. Georgia Institute of Technology
05. University of Michigan
07. Iowa State University
08. University of Illinois at Urbana-Champaign
10. Texas A&M University
10. Yale University

The programs addressed by the ranking are 5 years and 4+2 years professional programs and are located in large cities as well as small towns. They are a diverse group of institutions. In closer analysis each program has peculiar implementations that make them unique but as a common denominator it is possible to say that all 10 programs profess a philosophy of “Knowledge-Based Design”.

Within a “Knowledge-Based Design” philosophy, students acknowledge as a fact that the field of architecture holds a knowledge base of its own and that we are not:

Scavengers of the knowledge of other disciplines.

Generalists that know a little about everything

but not a lot about anything.

Unpredictable artists that “will be finished when they are finished”.

From the general characteristics of the “top 10” it is clear that design firms are after not only students who “know how to think in creative ways”, but students that can deliver a sound product in time. It is interesting to see that in the requirements for licensing in the US and the Intern Development Program (IDP), for instance, ensure that the majority of experience earned will not be in design but in the preparation of technical documentation. Schematic design requires only 15 credits for IDP, while the category of construction documents requires 135 credits.

### **Where do we find our shortcomings...?**

As part of the same survey, design firms have also noted a number of deficiencies in their new graduate hires. These deficiencies can probably be divided into three groups:

The Bad:

90% of hires are deficient on their knowledge of how buildings are put together.

The OK:

16% of hires need to improve on their computer skills.

14% of hires can not hold a pencil with dignity.

The Good:

02% of hires have problems conducting research activities

02% have very limited design skills

From this response we can finally demystify the historical confrontation of digital and traditional design communication media. It is clear that for our students such a conflict is a non-issue and that they feel confident in the use of both digital and analogue media.

From the same set of data, it is very gratifying to read that the design firms that hire our students feel that we are providing good researchers and designers, but it is truly disturbing to find that

those same “good designers” have no idea of how buildings are put together.

In the United States we have about 120 schools of architecture that are accredited by the National Architecture Accreditation Board (NAAB). The “Top 10” schools of architecture listed by “DesignIntelligence” constitute less than 10% of the pool of new graduates and it is certainly coincidental that 90% of hires are deficient on their knowledge of how buildings are put together.

It is our working believe that “Top 10” schools have been able to articulate curricula in which courses on the tectonics of architecture have not been displaced by CAD courses.

### **Our hypothesis...**

We already know that all “Top 10” Schools of Architecture profess a “Knowledge-Based Design” philosophy. Can we demonstrate that within such a context these schools have managed to maintain control on the propagation of required CAD courses in benefit of a more balanced curriculum that continues to address the tectonics of architectural design?

From the review of the curriculum of each school listed as “Top 10” we can arrive to the following communalities:

All schools have at least one required course on Materials and Methods. Some may even have two.

All schools have three courses on Structures.

All schools have at least two courses on Environmental Systems. In most cases they have three.

At most, this group of schools will have one required course on Digital Media. In several cases CAD is completely integrated in mainstream Design Communication Media courses (Vásquez de Velasco, G., 2001).

In contras with this, if we look at some schools that have not achieved full term accreditation by the National Architecture Accreditation

Board we will find that in most cases their curriculum includes one or more required courses that are specific on the subject of CAD and at the same time tend to lack on the field of architectural tectonics. In particular, many schools have cut down on their Materials and Methods courses.

### **An important additional factor...**

As an important additional factor we need to underline the importance of applying newly acquired knowledge in design. In that regard, schools that profess a Knowledge-Based Design philosophy are in particular careful about the introduction of not only CAD skills into their design studios but also the inclusion of tectonic knowledge. On this issue we would like to illustrate the case of a design studio at Texas A&M University where Architectural Conceptual Design, Architectural Tectonic Design and Digital Design Communication Media have been integrated successfully.

The studio of reference is the second design studio of the Master of Architecture Program. In order to promote the inclusion of tectonic knowledge, this studio will always address a student design competition that makes direct reference to building materials and methods. One year the studio may participate in the ACSA/Wood Products Council Student Design Competition, the following year it may be the ACSA/Steel Construction Consortium Student Design Competition, and so on year after year. At the same time, local students work in collaboration with Distance Education students based in Mexico and therefore the use of digital media finds prominent usage (Vélez, G. and Vásquez de Velasco, G., 2001). See Figure 1.

The following illustrations put on evidence the level of tectonic input in the design solutions and the level of sophistication achieved in the use of digital media. See Figures 2.

Figure 2. Image of entry to the ACSA/Steel Construction Consortium Student Design Competition. The project was awarded an Honorable Mention.

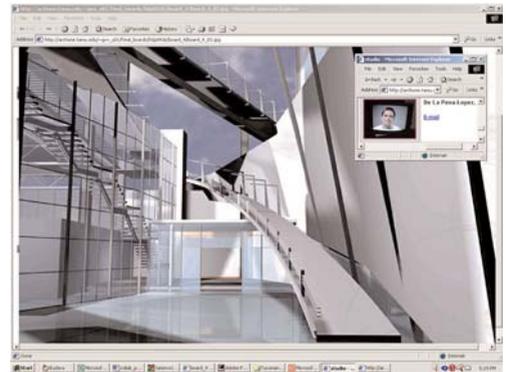


Figure 1. Front-end of Design Studio showing participants and their geographic location

### Interim conclusions...

We don't think that this paper is conclusive on the issue of determining an ideal path towards a CAD curriculum in our architecture curricula. Nevertheless, we have identified a number of patterns that may be valuable in achieving such a goal. In an itemized list these may be:

It is a fact that our students are proficient in both analogue and digital design communication



media. The issue of choosing between the support of one or the other in our curricula is a non-issue.

Design firms seek students that "can think in creative ways... in the long run". At the same time they need well-rounded graduates that may be productive in the development of design documentation on an immediate basis.

Schools of Architecture listed as "Top 10" are integrating the use of computer into the content of courses and by doing so have minimized the displacement of content matter.

The following historical pattern is apparent:

The curriculum is impacted by courses on CAD and a number of required courses (mainly in the area of architectural tectonics) are displaced.

The student population becomes computer literate and the use of CAD starts to permeate the design studios.

Faculty embraces computing in their own subject matter and the use of computers becomes pervasive.

CAD courses start to come down in number and initially displaced courses return to the curriculum.

In institutions that have already gone full-circle in the implementation of architectural computing we find that the use of computers within subject matter courses tends to facilitate the delivery of content and permits certain level of curricular

compression.

In many instances, CAD skills are established in High School and our college freshman do not need courses on CAD. Most of their additional learning is on-demand within subject matter courses or design studios.

It is of critical importance that students are stimulated to apply their CAD knowledge in their design studios. Most schools ranking high are explicit on the identification of opportunities for CAD applications in design studios.

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