Digital Design Pedagogy
Setting the Foundation for Digital Design in the Architecture Curriculum

Cameron Campbell
Iowa State University

Abstract

In this paper I will present the work of developing a digital media foundation course that addresses this need to give design students a digital design foundation that crosses over many design disciplines and navigates the inter-relationships of various software packages. These considerations do not preclude students from engaging in the analog-digital debate. Instead, the students become informed participants in understanding the differences, benefits, and liabilities of the mediums. Furthermore, by addressing digital technology at an early stage, the digital divide in architectural education is reduced, and more students have the opportunity to fold digital technology into their foundations of methodologies.

Introduction

The argument regarding the relationship between digital and analog methodologies in architecture has existed since computer applications were invented for architecture – it is a valid argument and worthy of continued discourse. Members of ACADIA share a similar position as stated in this paper, but the argument in the broader condition, however, is skewed because students are typically taught analog skills prior to learning digital skills. The analog issues of perceptual capabilities, hand-eye coordination, and tactility are ostensibly why many curriculums are developed with a focus on analog skills. Thus, when digital methodologies are brought into the curriculum, digital skills become an addition to an already formed methodology. I will argue that it is valid to have a contrast between mediums, but that it is necessary to provide a digital foundation prior to developing the opposition of digital versus analog.

We can assert traditional design skills and values against this development [of digital media] of course, much as John Ruskin and William Morris asserted traditional craft skills and values against the Industrial Revolution. That can be
defended as a principled and honorable position— but probably represents a losing bet with history. The alternative, if we care about architecture, cities, and the landscape, is to seek critical insight into the conditions that now structure a designer’s intellectual work and to find within them ways to extend the creative imagination. (Mitchell 1991).

In this paper I will present the work of developing a digital media foundation course that addresses this need to give design students a digital design foundation that crosses over many design disciplines and navigates the inter-relationships of various software packages. These considerations do not preclude students from engaging in the analog-digital debate. Instead, the students become informed participants in understanding the differences, benefits, and liabilities of the mediums. Furthermore, by addressing digital technology at an early stage, the digital divide in architectural education is reduced, and more students have the opportunity to fold digital technology into their foundations of methodologies.

**Loaded Argument**

By teaching manual skills prior to engaging the digital medium, faculty load the argument. Effectively, by teaching analog first, curriculums endorse analog methodologies. In my program we recently instituted a pedagogy related to Bauhaus. We teach design students through a core program that in the spirit of the Bauhaus “…strives to bring together all creative effort into one whole, to reunify all the disciplines of practical art – sculpture, painting, handicrafts, and the crafts – as inseparable components of a new architecture” (Wingler 1969). The core program we have developed, however, is entirely void of digital education – a distinction that could not exist in the Bauhaus. The message one can construe from this strategy, however, is that analog skills are desirable and necessary before one engages digital media; if one follows this argument to its conclusion, the resulting message is that digital skills are merely vehicles for delivery of the ideas and that all considerations of the media are held in reference (sometimes reverence) to traditional means. In his book D•2•A, Dennis Dollens responds to this concern:

> The potential of working in a digital world where an entire three-dimensional project is held in coded dataspace – all angles, views, materials, lights, dimensions, site, etc. – as an extension of visualization, as a link to the designer’s cognition – gets mucked up when seen in opposition to traditional visualization (Dollens 2001).

Our work to create a digital pedagogy is to remove the “opposition” by providing a digital design foundation in parallel to analog design foundation. The class that me and my colleagues have developed is currently in its experimental stage, and we intend to implement it within the ‘core’ program to enhance the digital aspect of design. Indeed, the intent is to deliver the foundation of digital design so that the student is informed when addressing the digital versus analog considerations when engaging architecture.
Interdisciplinary Necessity

The other pedagogical development of this class is its interdisciplinary nature. Indeed, it is a part of the core program and, therefore, the Bauhaus interdisciplinary ethos can apply to digital as well. The multiple disciplines have proven extremely valuable because the individual disciplines offer expertise in their respective areas, but more importantly, they offer cross-pollination between methodologies (e.g. architecture students engaging in graphic design, interior design students working with 3D, etc). Our team consists of a graphic designer, an illustrator/designer, an interior designer, an information technology designer, a landscape architect/planner, and an architect – all of whom are engaged directly in digital technology.

Our first act was to map the structure of digital design education (Figure 1). The purpose of this mapping exercise was to raise the various concerns that the individual disciplines have regarding what is appropriate or simply possible to teach to beginning design students. The first priority was to remove what is not important to teach as a digital design foundation and to add what we all take for granted when we address digital media.

The mapping process also helped to identify the critical overlaps of software inter-relationships. A particular powerful example of this is how AutoCAD® has the potential to transfer files to Illustrator® – the CAD file maintains the properties of drafting and manipulations of the drafting document while the transfer allows a graphic interface that encourages presentation manipulation. This issue applies to many software packages not just the two aforementioned. We discovered, during the recent delivery of this class, that the students gain much from realizing this potential early in the education rather than as an advanced technique.

Finally, the students are from multiple disciplines. Therefore the audience does not consist solely of architecture students, rather the students come from all represented design disciplines in our college. By diversifying the audience, the message does not apply as an end result that corresponds to a particular discipline, but rather students see the application of similar software in other disciplines, know students and faculty in other disciplines that can be used as a resource, and ultimately are inspired by applications outside of typical delivery.

![Figure 1. Mapping the Digital Media Concepts for a Foundation Course](image-url)
Keeping Digital Nascent

It is important to consider how digital media foundation material is part of a core program. Students that are in a beginning design program need beginning digital media design material. The digital experts involved in making and delivering the class had to be cognizant of the depth to which material is delivered. Therefore, skills and concepts become the content of the lecture rather than advanced application. As designers and as educators we are on tenuous ground because teaching digital technology risks becoming simply tutorials that only present how one can achieve a specific goal. We chose not to simply provide tutorials and to avoid lofty abstract concepts of digital media. In effect we addressed fundamental concepts that applied across mediums (both digital and analog) and how they applied specifically to digital technology. Such simple concepts of additive versus subtractive color space allowed students to understand the difference between how a computer screen or scanner relates to color as opposed to a printed page (Figure 2).

Alan Hashimoto, in his book Visual Design Fundamentals: A Digital Approach, outlines the “principles of design” and his understanding of the “fundamentals of design” both of which are concepts that apply to digital and analog mediums (Hashimoto 2004). We have referenced these concepts to reinforce the fact that design considerations transcend mediums. Regardless of media we wish to emphasize the importance of the principles of design in order to remind students that the principles of design do not apply only to analog techniques. This is an important foundation concept because historically, principles of design are considered in the analog foundation courses and rarely revisited when digital pedagogy is introduced.

Raster Vector

The application of this pedagogy is structured with the fundamental concept of raster and vector in the digital medium. We have constructed the class to address the difference between the two core elements of the medium because every application of the digital medium is made-up of either raster or vector and sometimes both. However, one can mistakenly equate concepts of digital

Figure 2. Additive Versus Subtractive Color Space.
media with an analog counterpart. William Mitchell responds to such a scenario when comparing an analog photograph with its (raster) digital replacement:

We might, of course, choose to regard the digitally encoded, computer-processable image as simply a new, nonchemical form of photograph...just as the automobile was initially seen as a horseless carriage...But such metaphors obscure the importance of this new information format and its far-reaching consequences (Mitchell 1998).

Raster is indeed a more complex concept than first understood—it is not merely a replacement for the analog version. Primarily its differences are in the ability to manipulate each pixel of data. The digital image has finite resolution, but it has infinite manipulation and replication capabilities that result in a completely different way to understand the use and manipulation of the image created from pixels.

Vectors are equally concept driven. One could find its analog partner to be drafting. However, in digital media a vector is infinitely scaleable, numerically accurate, and able to be digitally manipulated. Conceptually, the analog equivalent of ink drafting on Mylar is similar to the digital version with the use of layers—Mylar has two layers (the front and the back). Digital drafting employs a theoretical infinite number of layers, thereby increasing the number of places to work and increasing the number and ways of manipulating the layers.

Students are challenged to understand the flexibility of vectors and to see the various ways vectors are manipulated through software: graphic software is two-dimensional and implements various vector modification tools; three-dimensional software considers the vector in the X,Y,Z axis; and GIS software manipulates vector information and relates tabulated data to the vector information.

It is surprising how many students do not understand the difference between the concept of raster and vector when entering into digital design media. Many do not understand the unique properties of each method and how important it is to consider how the raster or vector technique may impact the design. The following chart shows how we introduce the concepts into the class (Figure 3).

Rather than structuring a class based on particular software packages, the above chart shows the development of concepts that are then transferred into the appropriate software. Raster and vector become the foundation on which...

![Flexibility Chart for Skill Nodes and Modules](image)

Figure 3. Raster Vector Concepts Chart.
the class is built rather than particular software packages. This method allows the interrelationships of software to be addressed in a more conceptual manner.

**Delivery**

As mentioned previously, we chose not to lecture about how to use the software; however, we recognized that it was important to teach students how to specifically apply some of the concepts. This proved the pivotal point in our work on this class because we needed to address the challenge of how one teaches software to design students. We all agreed that it does not work to simply show software manipulation in the lecture format—students are unable to keep up while others may be disengaged because of boredom. Our response to this problem was a module format that could be delivered via the web for teaching the software manipulation. We would subdivide application into pieces (e.g., opening a file, or the tool palette, etc.). As a result, the benefit is that students can work at their own pace, at any time of day, and they could stop or rewind the module in order to revisit a specific step. In addition, students can open the actual application next to the web module on the computer screen and can apply the lessons learning in both the module and the class lecture to an exercise designed to practice the learning outcomes of the entire lesson.

The lecture is then freed to focus on the principles of design and how they relate to digital methodologies. A simple digital collage (Figure 4) can take advantage of digital opportunities, but the student must also consider how the page is constructed. Does it have balance, repetition, rhythm, focal point, and variety?

![Figure 4. Digital collage by Andrew Schmidt (used with permission).](image-url)
(Hashimoto 2004)? We can illustrate to the student how to complete a digital collage, but to keep them considering the larger context of the artistic work is the ultimate goal of how we use the lectures.

The lecture is also an opportunity to illustrate ways that software can be brought together with other applications to gain the benefits of each and show examples of the products of such a use. The example portion is also used to simply stimulate and inspire the students, to train their eye to see applications design principles and to increase their archive of visual memory.

**Assessment**

While the first class was a success, only time will tell the long-term results for how educating in this manner impacts the relationship between digital and analog communication mediums and how this type of design education impacts their career. Students immediately recognized the value of learning digital techniques and were able to discourse on what that meant relative to the analog skills-based classes that they take concurrently. The dialog, despite its conclusions in favor or disfavor for the digital medium, allows the student to be critical of how they use media for communication. The following text is reproduced from the student evaluation of the class (student name is kept anonymous):

The most important thing I want to say is that, if I would have been opened up to the world of half the topics of this class as a freshman, I would have felt so much more prepared to develop a freshman portfolio, let alone tackle the world of design. Even as a second year, I learned a multitude of things that I can further explore and use in my daily activities. Starting out, I had no idea of all the resources that were available to me – not only programs, but professors and peers from other majors, etc. As designers, I felt it is so important for us to share our strengths with each other so we can each have a well-rounded view – because, after all, a design must be a complete package to be complete. So, I think the presence of profs. from all majors is really important, and I would love to see this program worked into the core.

Methods of assessment will continue to be the challenge. Specifically, we have used non-scientific questionnaire, we have had informal discussions during the course delivery, and we use the standard student course evaluations (quoted previously). One particular place where opinions and feedback in the academic community offer significant value is ACADIA. The presentation of this paper will hopefully stimulate response and inspiration as this class evolves into its next iteration.

**References**


