Replacing the 1950's Curriculum

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Introduction

Trends such as technological innovation, demographic and social transformation, telecommunications, globalization, sustainability, mass customization, and intelligent artifacts confront the ancient profession of architecture with threats and opportunities. However, the typical architecture curriculum was formed in the 1950's and is little affected by the sweeping changes of the latter half of the twentieth century. The members of the Association for Computer Aided Design in Architecture are uniquely qualified to contribute to revamping architectural education to prepare students for creating the built environment of the 21st century. Many of the innovations that are transforming practice were first presented to the profession by ACADIA members experimenting in the schools or the profession.

How we teach now

Most curricula of architecture schools are striking in their careful attention to the issues of the 1950's. An architecture degree requires study of design, construction, drafting, environmental control systems, structures, architectural history, professional practice, and a few electives in topics related to architecture. Rarely is there any acknowledgement in the curriculum of the Information Age, globalization, climate change, alternative delivery systems, or anything else of burning interest in the 21st century.

Fundamental design courses often retain an emphasis on abstraction, proportion, and Bauhaus principles of graphic design. In the 1950's, the American architecture schools were adjusting to the Bauhaus model that had been recently imported from Europe. Yet the American version of the Bauhaus often carried a Beaux Arts subtext of authoritarian respect for one's superiors and historical precedents. The heroic interpretation of

design history teaches students to aspire to the greatness of Mies, Le Corbusier, and Wright, even while being reminded that they can never reach such a level of preeminence. Gehry, Calatrava, and Foster are often admired for their formal inventiveness rather than their technical and management innovation. Design is sometimes an excuse for technical mediocrity, social irrelevance, and self-absorbed nepotism.

Construction and detailing are often taught strictly according to convention. Students are expected to know the fundamentals of masonry construction, wood and metal stick built framing, steel frames, poured-in-place and precast concrete, and other technologies that reached a plateau in the 1950's. The ubiquitous strip mall reflects this utterly conventional way of thinking about construction.

Although the conventions of drafting are centuries old, the 1950's represent the culmination of manual drafting. Watercolor, perspective rendering, and other centuries-old technologies were unavoidable at that time. By the 1960's, photocopying, new methods of reproduction, and computer-aided drafting were being adopted, but the craft of drafting and drawing remained the same. The craft is now quaint and anachronistic, but is often still an important component of education.

The typical curriculum also places great importance on environmental control systems (ECS) courses that are often dominated by the concerns mechanical heating, ventilating, and air conditioning (HVAC) systems. Air conditioning did not become a popular amenity until the 1950's and 1960's. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) was founded in 1959. It was progressive in the 1950's to provide students with extensive knowledge of ECS. However, the nearing Post-Petroleum Era may diminish the importance of this 20th century topic or at least challenge us to rethink the standard texts.

Similarly, structural engineering courses for architects often display a 1950's outlook. Before World War II, structural engineering, particularly with steel frames, had emerged as a serious concern in the field of architecture, replacing simple trabeated construction of stone and masonry. The 1950's brought unprecedented opportunities to rebuild cities at an even grander scale of soaring skylines and breathtaking structural gymnastics. The concerns of the 1950's granted structure courses focused on tall buildings a privileged place in the architectural curriculum.

As the United States reached victory in the Second World War, it was confronted with an enormous need to rebuild the continent from which its own culture derived. It seemed natural and obvious that architecture history should continue to focus on Italy and other Western European nations, just as the Beaux-Arts canon had done before the war. To this day, many "History of Architecture" courses remain "History of European Architecture" in content, with minor attention given to Eurocentric developments in the United States. Little attention is accorded to Latin America, East Asia, India, the Arab countries, or Africa.

Among some faculty, the norm for professional practice remains stuck in the 1950's. The gentlemen architect attended cocktail parties with the doctors, lawyers,

and bankers who were his clients. He and it was invariably a "he," held strict authority over the rough tradesmen and contractors who did the construction. In this retro model, design-bid-build remains the standard for delivery, while design-build, construction management, negotiated price, infrastructure management, or other ways of meeting space needs are ignored or viewed with dismay.

It is self-evident that the world has changed so dramatically since the era of Buddy Holly that we are overdue to rethink what we teach. The recognition that the curriculum is stuck in the 1950's, invites a proposal to change it. By acknowledging the courage of our predecessors in inventing such a daring and enduring curriculum, we may also gain the courage to envision a transformed curriculum that addresses contemporary issues, challenges, and crises.

The issues of the 21st century

Young designers certainly need to learn timeless principles of drawing, design, engineering, and historical architecture, but they also need to be prepared for careers that will span a time period that will include breathtaking change. Globalization, climate change, the end of the Petroleum Era, technical innovation, demographic shifts, bio-engineering advances, and other trends will change how we use our homes, offices, factories, and cities. Our students will reach their point of influence in the second or third decade of the 21st century. We have an obligation to prepare them to make wise decisions in the climate of 2020.

I suggest rethinking the curriculum along the following dominant themes. Computer-generated design; digital fabrication, materials science, and smart buildings; Building Information Modeling; simulation; Internet-mediated global practice, and evidence-based sustainability can serve as an alternative structure to an architecture curriculum that may better equip students for the coming challenges.

A 21st century curriculum

In the new curriculum, design remains paramount but alters focus to include computer-generated design. Creativity, collaboration, evidence-based decision making, form-making, and problem-solving are fundamental skills not only for architects, but nearly any practitioner of any profession. However, tools such as shape grammars, genetic algorithms, and kit-oriented mass customization are topics of particular relevance to architects that should be integrated into the mainstream design curriculum. The adoption of these tools offers hope that both routine design and novel design reach higher levels of performance.

Knowledge of construction is fundamental, but need not be limited to conventional methods. Instead of focusing upon construction systems that have existed for centuries, a more appropriate curriculum could introduce carbon fiber composites, nano-tube materials, active foundation systems, photovoltaic systems, and plastics. Construction innovation goes beyond materials science to include smart products. Students should learn about smart buildings that adapt themselves to the needs of their occupants.

Drafting and drawing are changing profoundly. Building Information Modeling (BIM) is a profound change in how

architecture is documented. Just as hand drafting was made obsolete by computer methods, now computer-aided drafting has been made obsolete. The entire process of delivering paper documents that collect orthogonal projections at various scales is now a foolish waste of effort. BIM empowers the user of the model to project whatever drawings are needed, extract the quantities and relations required for analysis, and accurately illustrate the design in rendered perspective for the benefit of constituents. BIM calls into question large segments of the curriculum. Because of its enormous potential to speed and enrich the process, BIM should be the default way of teaching the craft of building and documenting design work.

Simulation can replace formula driven engineering analysis and evaluation. Rather than subject students to tedious and repetitive calculations, book them into a virtual reality environment where they can see the stresses on beams, the deflection and failure patterns under earthquakes, or the air and heat flow across a space. Finite element analysis, computational fluid dynamics, 4D CAD, walk-through animations, and human behavior simulation could enable students to acquire expert judgment from experiencing simulated reality.

Our graduates must be able to function in a global marketplace. The supply chain for building products circles the world. The architectural services market has become a global market as U.S. design services are outsourced to India and China and the best contracts are often available overseas. An architect must understand, or at least acknowledge, the local cultures in the global marketplace. Architectural history should include historical precedents in Asia, India, Australia, Africa, and South America, and also the study of contemporary cultures.

The concepts of practice are also changing. The design/bid/build/sue process is rarely acceptable. Building owners are alarmed at the gross inefficiency of the industry and are eager to find contractual arrangements that optimize effort, risk, and profit among all parties with the hope of increasing efficiency. BIM, simulation, and computer-mediated communications (such as Buzzsaw and other Web-based project management systems) are changing the nature of contracts and services. Courses in practice must integrate topics developed as management innovations of the dot-com era. Web sites, chat rooms, streaming video, audio content and other Information and Communications Technology (ITC) are the infrastructure that can bring a global cultural experience into the classroom.

The Petroleum Era is coming to a close. Through global warming, Mother Nature is ruthlessly altering our coastlines and actuary tables. It is imperative that we find new ways of living and building that are sustainable within new meteorological climates, resources climates, and business climates. The triple bottom-line of social justice, environmental stewardship, and economic fairness can only be achieved by the application of enhanced knowledge and intelligence within a context of communalist ethics. Application of the principles of evidence-based design can produce real solutions.

Leadership from ACADIA

Reflecting upon the contributions of ACADIA members in the last twenty-

five years, I have come to the startling conclusion that our organization may be the most influential and crucial association in the discipline of architecture during that time. ACADIA members coined and refined the vision that has led to both computer-aided rendering and Building Information Modeling. ACADIA members pioneered the Virtual Design Studio as a precursor to Internet-enabled global practice. Through software development, ACADIA members have pushed forward the art of building simulation. ACADIA members were the early adopters of the Web and promulgated that information rich resource into the architecture schools and the profession. ACADIA members have provided leadership in computer-controlled fabrication and mass customization. Through our research and teaching, ACADIA members have introduced an enormous number of innovations and experiments into both the schools and practice.

Perhaps now we have an expanded role to play. Among the ACADIA membership are the architects and architectural educators who are most closely aligned with the technological innovations that are transforming our future and represent our best hope for survival. By producing a curriculum for the 21st century, we can rise to the level of courage shown by those who transformed the architectural curriculum in the 1950's.