Chapter 7

Advancing BIM in Academia:
Explorations in Curricular Integration

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ABSTRACT

In the early stages of the adoption of Building Information Modeling (BIM), the AEC (Architecture, Engineering, Construction) professionals were often the leaders, and some university faculty were caught unprepared. More recently, many universities have responded to the adoption of BIM technologies in the profession. No single approach to BIM curricula will suffice; each academic program is different, with unique and often innovative ways in accomplishing its goals of BIM integration. At USC, School of Architecture, rather than concentrating on a single strategy, multi-dimensional approaches are being developed that include at their core the recognition that the building delivery professions and academia must be better integrated, communication and interoperability are key components, and that BIM is one step, albeit with flaws, towards developing fully parametric design solutions. BIM technology should be broadly integrated throughout the curriculum; advanced seminars should stress interoperability and sustainability components; and the schools have a mission to outreach to the profession through conference hosting and executive education while being receptive to professionals’ advice. Not everyone is in agreement as to how this can be done or what methods should be implemented, and similar to the integration of CAD software and 3D modeling over the past 20 years, dissenting voices, heated dialogues, and solutions born in the crucible of academic/professional debate will accompany change.

BACKGROUND

“A computer-aided design system is most useful when the structured design inside the computer can be used for something besides merely producing a picture. As soon as the process of computer-aided design is considered as building a description of the object being designed rather than as a process of simply drawing the object, horizons become tremendously expanded.” Ivan E. Sutherland (1973) – quoted from Mark Smith (about 1986)
Ivan Sutherland was one of the earliest developers of computer graphics through his invention of Sketchpad and other systems. Still over 35 years ago, he was looking beyond the merely pictorial aspects of his creations to what would eventually become object based modeling, user-defined parametrics, and the current concept of the virtual building or Building Information Modeling (BIM, although an inaccurate term, will be used to refer to a 3D modeling program where objects are parametrically driven with data attached). Key players that assisted in the development of 3D solid modeling were often from engineering fields such as aerospace and electrical design, “where early concepts of product modeling and integrated analysis and simulation were developed” (Eastman et. al. 2008, pg. 27). Ironically, in many schools it was 2D CAD and not 3D modeling, let alone parametric design, where architecture students experienced their first interaction with mouse and monitor in developing their designs. As late as 2007, when 2D and 3D modeling, rendering, and animation software were in use by a majority of architecture students, and BIM software was available, it was lamented that although CAD was everywhere, and students saw it as an essential tool towards getting a job in the profession, BIM was harder to find in the curriculum (Ibrahim 2007, p. 653).

As more firms use BIM software, increasing numbers of students and faculty are realizing that this enabling technology should be explored at the university level, not only as just another software package, but as a way to investigate the changing nature of the architecture and construction professions with regards to Integrated Project Delivery (IPD), collaboration, sustainable design, and even facilities management and “smart” occupancy of buildings. (Becerik-Gerber and Kensek 2010, p. 146). This chapter outlines some goals within a university environment and specifically three strategies to incorporate BIM into the curriculum of a school of architecture. By no means are these presented as the only methods; there are additional exciting and innovative approaches occurring at other universities. These examples are partly based on the successes and failures that have been achieved in the past twenty years for the integration of other digital technologies.

The three strategies being pursued are:

- **BIM Technology**: Broad integration throughout the curriculum. This section has examples from an introductory seminar, a required professional practice course, and reflections about integration in the design studios.
- **Advanced Seminars**: Interoperability and professional connections. This section traces the evolution of an advanced course on BIM over several years.
- **Engaging the Profession**: Executive education and conference hosting. This section summarizes two methods of continuing education for professionals and how professional education is reflected back into academic courses. One special topic seminar is summarized that demonstrates this feedback loop.

**STRATEGY 1: BIM TECHNOLOGY: BROAD INTEGRATION IN THE CURRICULUM**

To be enthusiastically accepted by students, BIM education must be presented as an integrated part of the full curriculum of the architecture program. It is important to integrate BIM into the course work from the earliest stages, especially in non-computing courses, but also not neglecting advanced elective courses where teaching can go into more depth without the overload associated with the design studio. Although this goal has not yet been fully realized, this section briefly summarizes an introductory computer course, a required professional practice course, and different approaches to integrating BIM in the design studio.
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