ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC   20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

2010-11 BIM/IPD SURVEY RESULTS—SUMMARY
May 2011

In November and December 2010 ACSA and Autodesk® partnered to survey administrators about the use of building information modeling (BIM) and integrated project delivery (IPD) content in architecture curricula. Administrators at more than 50 schools responded (37% of accredited or candidate programs), giving an initial picture of the inclusion of this emerging content in schools. Following is a summary of the results.

Use of BIM
- 75% use BIM in studio courses
- 60% of programs use BIM in non-studio, required courses
- 63% use BIM in elective courses.

For the non-studio courses, respondents were asked to name the courses in which BIM was used.
- 50% focused on computing, digital representation, modeling, or related topics
- 33% were courses devoted specifically to BIM.

Integrated Project Delivery
To assess this area of the curriculum the survey asked respondents how they are using collaborative design strategies in studios.
- 77% teamed architecture students at the same level
- 33% teamed architecture students at the different levels
- ~50% teamed architecture and non-architecture students
- 63% teamed architecture faculty in the same studio
- ~33% teamed architecture and non-architecture faculty
- ~50% used non-architect critics or instructors during the term (outside of reviews), with engineers being the most mentioned discipline of these students, faculty, or critics

In 28 comments on interdisciplinary courses, a third of respondents described design studios where multiple disciplines meet, either among students or faculty. Multiple people mentioned real-world projects involving clients, construction, or other projects carried on beyond academe.

The survey asked for ways IPD is incorporated into the professional practice curriculum.
68% used case studies or in-depth examples of IPD models
70% discussed contractual issues
47% discussed insurance issues
68% discussed working in teams
60% discussed using BIM software in the office

Resources Needed
Among the 18 comments provided about resources needed, many focused on case studies to illustrate IPD. Other comments questioned the focus on software to cover IPD issues, noting that a philosophical grasp of the issue is needed before software.

ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

BIM/IPD SURVEY RESULTS
May 2011

In November and December 2010 ACSA and Autodesk® partnered to survey administrators about the use of Building Information Modeling and Integrated Project Delivery content in architecture curricula. A paper survey was circulated at the 2010 ACSA Administrators Conference in Washington, DC, and all administrators were prompted by email to complete an online survey with the same questions.

Support for the survey was provided by Autodesk®.

1. Respondents

57 administrators filled out the survey from November 2010 to January 2011. Three respondents didn't identify their schools. The following 53 schools responded.

American University of Sharjah	Prairie View A&M University
Andrews University	Rensselaer Polytechnic Institute
Ball State University	Roger Williams University
California College of the Arts	Savannah College of Art and Design
Carnegie Mellon University	Southern Polytechnic State University
City College of New York	State University of New York at Alfred State
Cooper Union	College
Drexel University	Temple University
Dutchess Community College	Tulane University
Florida Agricultural and Mechanical University	University of Arizona
Florida International University	University of Houston
Frank Lloyd Wright School of Architecture	University of Idaho
Hampton University	University of Kansas
Howard University	University of Maryland
Illinois Institute of Technology	University of Memphis
Iowa State University	University of Minnesota
Kansas State University	University of Nevada, Las Vegas
Kent State University	University of North Carolina at Charlotte
Lawrence Technological University	University of Oklahoma
Louisiana State University	University of Southern California
Louisiana Tech University	University of Tennessee-Knoxville
Massachusetts College of Art and Design	University of Texas at Arlington
Miami University	University of Texas At San Antonio
Mississippi State University	University of Utah
New York Institute of Technology	University of Wisconsin-Milwaukee
Pennsylvania State University	Valencia Community College
Polytechnic University of Puerto Rico	Virginia Tech

2. Degree Programs

Which professional degrees do you offer? Check all that apply.

28 (49%): B.Arch programs.
44 (77%): M.Arch programs.
19 (33%): both B.Arch and M.Arch degrees.

3 respondents taught at community colleges, and one respondent didn't identify which degree program was offered.

ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC   20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

Note: This is a high percentage of programs saying they offer both B.Arch and M.Arch. The respondents may have checked B.Arch even though they offered only nonprofessional undergraduate architecture courses.

3. **Use of BIM in Non-studio Courses**
   Is BIM used in any of the following courses? Check all that apply.
   a. Required architecture courses, excluding the design studio
      34 (60%): Yes   (B.Arch: 54%, M.Arch: 64%)

      Sample Course Names
      Advanced CAD, BIM, and 3D Visualization, Special Topics in CD: Parametric Modeling with BIM
      ARC 206 - Architectural Representation; ARC 418 - Professional Practice; ARC 430 - Digital Media
      arcc0403 - Advanced CAD
      Arch 20601, Arch
      ARCH 2223 AutoCAD (Brief BIM Intro); ARCH 4973 Special Topics: BIM; ARCH 4653 Alternative Energy Design
      Arch 488 Computer Applications for Professional Practice
      Architectural Design Studio
      BS - Architectural Technology
      Building Information Modeling
      Building Information Modeling, Digital Design & Fabrication
      Building Systems Integration (5th year - required), BIM Studio (5th year / grad - elective)
      Building Systems 1 & 2
      CAD II
      Communications Media, Advanced Digital Media, & Programming
      Communications, Digital Technology, and Integrated Studio
      Comprehensive Design Studio
      Computer Projects in Design
      Computing in Architecture and Architectural Design Studio 5
      Design Development Studio
      Digital Media & Advanced Modeling
      Electronic Design, Project Management, Digital Fabrication, Environmental Controls
      Electronic Methods 1
      electronic methods, maybe building construction
      Intermediate Digital, Advanced Digital
      Intro & Advanced Digital Technology
      Materials and Methods of Construction
      Net Zero House I, Net Zero House II
      New Technology of Building Materials
      Parametric Modeling
      Professional Concerns 2
      Representation: Information Modeling
      Research Design Studio
      Revit
      Solar Decathlon
      Technical Drawing

   b. Elective courses
      36 (63%): Yes   (B.Arch: 57%; M.Arch: 68%)

ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC 20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

4. Use of BIM in Studio Courses
Is BIM used in the design studio? Check all that apply.

Overall, 75% (43) of respondents indicated using BIM in a design studio course.

40 (70%) of all respondents use BIM in an undergraduate design studio. Of M.Arch programs 61% (28) use BIM in a graduate design studio.

In which levels is BIM used?
Undergraduate Studio (figures comprise all respondents, regardless of degrees offered)
1st; 2 (4%)
2nd: 12 (21%)
3rd: 20 (35%)
4th: 29 (51%)
5th: 15 (26%)

Graduate Studio (figures comprise all respondents, regardless of degrees offered)
1st; 13 (23%)
2nd: 18 (32%)
3rd: 15 (26%)
4th: 7 (51%)
5th: 1 (2%)

Note: Because of the variability of length in M.Arch programs—which range from 1 to 3.5 years—the results for this questions may be inconclusive.

5. Autodesk® Products
At the request of the sponsor, respondents were asked to indicate which Autodesk® products were used in required, studio, and courses.

Revit was the most prevalent product, used in courses at more than half of the schools responding, nearly matching the number of schools using AutoCAD.

Ecotect Analysis was used in studio and elective courses at nearly 25% of schools. Maya was used in elective courses at 25% of schools. 3ds Max was used in elective or studio courses at approximately 1/3 of responding schools.

Beyond Autodesk® products, Archicad was the most identified package used, based on written comments from respondents (identified 5 times in 15 comments. Bentley, Digital Project, Rhino, Sketch-up, and Vector works were also mentioned more than once.

6. Collaborative Design Strategies
Please indicate how you are using collaborative design strategies in design studios? Check all that apply

  a. Teaming architecture students at the same year level

ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC   20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

44 (77%)

b.   Teaming architecture students at different levels
19 (33%)

c.   Teaming architecture students with non-architecture students
27 (47%)

d.   Teaming architecture faculty in the same studio
36 (63%)

e.   Teaming at last one architecture faculty member with a non-architecture faculty member
18 (32%)

f.   Using non-architect critics or instructors during the term (not just during reviews)
29 (51%)

Open Ended: Please indicate disciplines of non-architecture students, faculty, critics or instructors

35 comments provided
Engineering (any discipline): 23 mentions
Other Discipline: 21 mentions
Landscape Architecture: 13 mentions
Interior Design: 11 mentions
Graphic or Industrial Design: 9 mentions
Urban Design or Planning: 8 mentions
Structural Engineering: 7 mentions
Mechanical Engineering: 5 mentions
Business: 5 mentions
Other Engineering Discipline: 5 mentions

Two quotes:
We are not using it collaboratively (unfortunately) we are only discussing.
We bring in consultants and professionals into the classroom in architecture, engineering, environmental experts, software experts (ie. GIS) to work with students and faculty as well as faculty from other disciplines (industrial design, interaction design and graphic design)

7. **Course Development**
For courses that use interdisciplinary students or faculty, please describe how the course is developed, including how shared goals.

28 responses
Capstone course in Engineering paired with Design Development Studio - Teams of 2 architecture students are teamed with 2 engineering students 2. Seminar course with engineering and

ASSOCIATION OF COLLEGIATE SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC 20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

architecture students - covering a variety of building typologies and the relationship between engineering and architecture and including a joint A/E design project.

Abstracts, developed jointly by faculty & Learning outcomes, syllabi

Advanced level design studio is paired with MBA students from Vanderbilt for their capstone project in the real estate development degree program. The architecture students focus on transit oriented development concepts for areas near Nashville, while the business students concentrate on market analysis and pro-formas for the design--ACSA Northeast region presentation SOLAR DECATHALON: inherently interdisciplinary NEW NORRIS HOUSE: interdisciplinary team working to design and build house in a national competition sponsored by the EPA, which the University of Tennessee won.

Architecture and engineering faculty members collaborate in developing course

By the individual initiative of faculty. We are moving toward more interdisciplinary learning models, but nothing required yet except design foundations, first year. All students in the college of Art and Architecture take the same 6 credit requirements during first year. It is a pre-requisite for all subsequent courses.

Co-taught and/or integrated curriculum

common studio projects worked on in mixed teams

Coordinated by a full-time faculty team Through - Faculty buy-in and coordination is absolutely the critical aspect.

developed and taught by all faculty participating

Discussion are taking place on developing a collaborative design course between architecture, architecture engineering and civil engineering as a starting point. Currently we do not have a collaborative electronic network in place.

Faculty from architecture and landscape architecture develop the studio concept and typically move all of the students into one studio and co-teach the semester.

Faculty from the disciplines meet; proposal vetted through curriculum committee.

For our Interdisciplinary Collaborative BIM Studio each student design team has an architect, landscape architecture and structural, mechanical, lighting / electrical and construction engineer. They collaborate using integrated design process and BIM to design a project that has a real program, site, consulting team and client. Throughout the semester the BIM Studio team interface with the client and real project design team in workshops and reviews as well as benchmark the student designs against the actual design.

Health care: Construction Management paired Architecture & Interior Design

Identified goals by faculty - course syllabus primarily faculty with input from non-architecture Teaching varies but generally co-taught

ITAP - Integrated Technology in Architecture Program teams students and faculty in architecture, engineering and construction with industry to envision next generation sustainable strategies for the built environment.

Merge real estate development course with urban design studio for a final project.

Required Design-Build Studio includes same group of students, a design-build faculty, construction faculty, client(s), structural engineer. Elective design/construction courses may include 3D FA faculty and students, construction professionals Early studios combine graduate and undergraduate students in the same studios Most electives combine students from architecture in grad and undergrad program as well as students broadly from the campus = 3D FA, ID being the most common.

Some courses have a series of guest speakers, some are team taught, With students we have vertical studios.

Students work in teams to address projects with real clients to design and build affordable housing.

The course focuses on the grand challenges our society faces. This past year it focused on the unprecedented aging arc of our society and how demographic, technological and cultural assumptions of 100 years ago are now challenged by this shift. Students work in teams to begin to define the questions with the greatest palpability for design intervention. The course leverages the design thinking model of IDEO having students move through the three spaces of Inspiration, Ideation and Implementation.

The key word in Interdisciplinary is discipline. Educating future professionals requires creating disciplinary experts that can be contributing members to "Interdisciplinary teams". Courses that are interdisciplinary in nature are developed through two strategies: exploring commonalities and

ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC 20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

reinforcing disciplines specific topics. They are executed by requiring focused exploration and study while maintaining links to the common learning goals of the course.

The Macro Studio & The Macro Seismic: Large-scale issues, teaming architecture, international relations faculty and students. Designing the High-Performance Envelope: Teaming architecture, engineering, faculty and students.

These are either faculty team-taught studios/courses, cross-listed courses (that engage students from different disciplines), or courses where we schedule specific workshops or lectures during the course of the semester with outside experts in the field.

Topics covering BIM for building design, construction, and engineering are taught via classroom and software tutorials.

Usually by the architecture faculty in collaboration with a community partner or university partner. Courses are taught in the architecture facilities or on site in the community.

We are still working things out but this year we experimented with having our entering graduate students mixed with entering Landscape students. The course is very fundamental and the assignments worked for both disciplines.

We have LINC courses in which students take Design 3 studio followed by Intro to Digital Arch the same days. The Faculty overlap their schedules to team teach for 30 minutes, and some of the assignments use BIM (REVIT).

8. Professional Practice Courses

Please indicate how you address integrated practice In your professional practice curriculum. Check all that apply.

a. Case studies or in-depth examples of integrated project delivery models (beyond basic descriptions such as design-bid-build, design-build, etc.)
39 (68/%)

b. Discussions of contractual issues
40 (70/%)   B.Arch programs: 57% only

c. Discussions of insurance issues
27 (47/%)   B.Arch programs: 32% only

d. Discussions of working in teams
39 (68/%)   B.Arch programs: 50% only

e. Discussions of using BIM software in the office
34 (60/%)   B.Arch programs: 46% only

9. Resources Needed

Please provide comments on what course materials would be most helpful to teach IPD, or any other comments about these topics.

18 responses

AIA 2007 IPD Guide is inaccessible for students as is the Lean Project Delivery System by the LCI. I therefore use my own writings and discussion. A primer on contracts, building information modeling and integrated practice would be helpful for context. This could be introduced at the beginning level with theory and gradually move to technique. Would be happy to work on something like this with Autodesk.

BIM software, Revit in particular, is not welcome in my design studio. This is because Revit is a production tool (a very powerful tool) but not a design tool. It makes too many decisions, automatically, that

ACSA
ASSOCIATION OF COLLEGIATE
SCHOOLS OF ARCHITECTURE

1735 New York Ave. NW
Washington, DC   20006
Tel: 202.785.2324
Fax: 202.628.0448
Web: www.acsa-arch.org

students need to make consciously. I would almost never use this tool in a design course and I specifically ask that you not encourage this. It's a mistake.

Case Studies Student segment of AIA.org for IPD & Practice Issues

Case studies (what works and what does not), involvement of other partners in design and construction.

Case study materials

First we need a larger philosophical grasp of the issue; then a simplified Revit software.

Focus on the core pedagogical issues (collaboration, interdisciplinary) rather than this professional/business model.

Good Question

model curricula, typical projects,

Online resources with plug-ins/modules for learning management systems such as Moodle & Blackboard.

Students, no matter the level or experience, do not grasp issues of professional liability, thus miss the importance of contractual discussions. If example contracts were provided along with case studies of how IPD contracts were implemented it would help.   Any white papers on IPD processes would help greatly.

The University of Tennessee revamped its REQUIRED curriculum in a four course sequence related to representation. This curriculum change looks holistically at the representation series, as a sequence of four 2 credit hour courses. While maintaining the traditional emphasis on drawing in the first year (121,122),the proposal adjusts course content, by introducing basic DTP (desktop publishing) portfolio skills in first year (122), by reducing credit and streamlining content in the second year digital course utilizing digital vector based programs (221) and by introducing a new required course in fourth year related to building information modeling (BIM) and building performance (421), in alignment with the mission of the comprehensive building design studio.

To further Integrated Project Delivery, BIM, the continuing evolution of the profession and the integrity of the academy the ACSA should not limit its associations and initiatives to a single corporation or imply that a corporation owns any particular technique

Videos on case studies of IPD / BIM projects would be helpful for pro practice

We are currently offering Intro to REVIT and Advanced REVIT as electives, as there is no room for an extra BIM class in the required degree curriculum.

We are in the process of re-designing our curriculum to accommodate a sequence of technology/design studio integration culminating in a BIM-centered comprehensive design studio.

We require laptops computers for all students but do not specify the operating system that a student must use. This means that students using the MacOS do not have access to Revit without emulation or some advanced computer knowledge. The introduction of AutoCAD back to the Macintosh platform is an encouraging sign that Revit will also me migrated over, please!.

We stress the importance of actual experience, and therefore a real design-build experience that also includes at times fund-raising, brochure design, as well as on-site construction. Students hire their own structural engineers and work directly with a client group on a real project. Students provide cost estimates, material take-offs and purchase the project materials for construction, seeking sustainable solutions and helping client to understand these issues, they become teachers in the field.