Inter-Actions: The Making of an Integrated Practice Studio

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Abstract

Integrated Project Delivery (IPD) and Integrated Practice are becoming the fastest growing form of project delivery[i], and architects are leading the way on the implementation of this process into their practice.[ii] Cultural barriers tend to cause friction between the allied disciplines in the AEC industry, therefore starting Integrated Practice-based studios with beginning design students will help educate the architects of the future from the earliest stages of their education. This paper will discuss an interdisciplinary design studio that uses different methodologies to encourage collaboration to dispel the cultural barriers that students carry as they enter the profession.

The studio teamed students from architecture, building construction science, and interior design in a three-week charette. This paper will discuss how IPD was implemented in this design studio charette, how the traits of Millennial students were utilized, and how the studio was structured. A series of surveys were given to the students during the three-week period of the charette to collect quantitative and qualitative data. The surveys were designed to gauge student knowledge and perceptions on IPD and the allied professions involved in this project. A comparative analysis of the professional structure of IPD and its applications to an integrated practice studio will be discussed, along with data on the use of IPD and BIM in AEC education.

There are many similarities between implementing IPD in the AEC profession and AEC education, including early involvement of all parties, shared risk and reward, multi-party agreements, collaborative decision-making and control, liability, and jointly developed and validated performance goals.[iii] Although using the themes found in professional applications of IPD cannot be expected to be perfectly simulated in education, the studio provides our students with a basis to not only begin to understand IPD and BIM, but also better understand the allied professions with which they will work. This is invaluable as learning a particular computer software is much easier than overcoming cultural ideas of others that may currently be perpetuated in both our programs and professions.

Qualitative data from the research on this studio shows that only 31% of students felt that responsibilities on the project were shared. Some of the reasons given were that team members did not equally share the workload due to their individual work ethic, instead of a shortcoming of the individual's discipline. However, the reasons and history behind the individual team member work ethic is unknown. This could be related to the "socio-technical practices" defined by Smith that assert that the allied professions have diverged so much since the Renaissance that there is no longer a shared culture as to what the built environment should be and what the roles of each member of the team should be.[iv] IPD and BIM are becoming the future of the tools and techniques of making and therefore we must address the perception of who and what makes up IPD to foster the successful making of space.

The Studio

This three week charette was conducted for the second time as an interdisciplinary project funded by the construction firm Brasfield & Gorrie General Contractors. They were interested in supporting research into implementing Integrated Project Delivery (IPD) into AEC education. The charette was conducted the previous year with students in the senior level studios of the Department of Building Construction Science, the School of Architecture, and the Interior Design Program. Based on lessons learned in that initial charette, the project was moved into the third year architecture studio to see if earlier contact with the allied professions would increase the ease with which the architecture students worked with their AEC peers in the future.

Two faculty, one from the Department of Building Construction Science, and one from the Interior Design Program, were part of the initial charette in the previous year and brought knowledge and experience on what worked, and did not work, in the past.

Organization

The students were broken up into fourteen interdisciplinary teams composed of at least two architecture students, one building construction science student, and one interior design student. This breakdown was due to the enrollment of each program, which was incredibly varied. The project was for a yearly competition among building construction science, architecture, and interior design students. The 2012 project was located on the site of the now-closed Aiken Village Graduate Family Housing. The site is located on the northwestern part of the campus near the Humphrey Coliseum. Highway 12 separates it from the main campus. The students were tasked not only with the renovation and conversion of Aiken Village to an eco-village, but also to reconnect the site with the main campus.

Initial assignments were developed to foster teamwork and camaraderie. This included site research, a site visit for verification of the Aiken Village housing and infrastructure, as well as precedent studies, market research on housing, and LEED requirements. (Figure 1) Not only did this preliminary work help the students to build team spirit, it also helped the students to learn about the skills and knowledge of their teammates while they got to know one another. This led into the second assignment where the students began to work in the same interdisciplinary teams from the research assignment to now create their solution for the charette.

Fig. 1 Student team site verification

The students worked together three days a week in the typical architecture studio environment, but in the School of Architecture instead of a space from one of the other disciplines. This was purely due to availability of space, but future ventures should find a neutral space for all of the students to identify with instead of one that only the architecture students can identify with. The

teams also presented developing work at a mid review with the university campus planner, the university sustainability coordinator, and the facilities director of the housing complex. This gave the student teams further opportunity to develop their teamwork and interdisciplinary skills as each student had to present the information they were responsible for based on their expertise, but they had to do it as part of a team and to describe the project they had worked on as a group.

Final presentations were a combination of gallery style open reviews and formal reviews for the top three teams chosen by the faculty teaching the studio. The gallery style reviews were important because the students again had to work as a team to describe their project to the variety of AEC professionals and faculty for the first half of the presentation time. The formal reviews required the top three teams to present as a group to the entire class and the collected AEC professionals and faculty. This allowed for both an open forum and structured forum and made sure that all sixty-seven students and fourteen teams were given feedback and the opportunity to explain their designs.

Demographics

Surveys were utilized throughout the charette to gather quantitative data on demographics and education, as well as qualitative data on past interdisciplinary experiences and the experience of this charette. The first survey was distributed the first day of class, at the beginning of class to collect data before the students began the project.

The demographic data showed that there were sixty-seven students participating in the charette with 37 being architecture students, 14 being building construction science students, and the remaining 16 interior design students. The gender distribution of the group was 40 males and 27 females and the majority of students were in-state at 67%. The age range of the students was from 19-29 with an average age of 21 years old. (Figure 2)

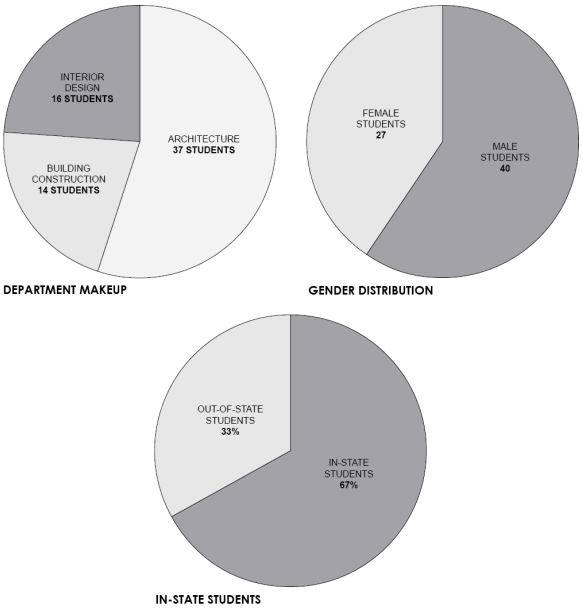

Fig. 2 Demographic Data

Additional demographic data showed that only 57% of students had ever worked on an interdisciplinary project in school while all students had at least worked on a group project. Collaborative work in the future was expected by 93% of students, and 49% expected the workload to be shared in their teams. Most importantly, 97% of the students believed that they would learn more about the allied disciplines that they were working with on the project and explanations of this response indicated that the students understood that each discipline had knowledge specific to their major that they would be able to contribute and share as part of the collaboration.

Various comments from the progress surveys over the course of the charette showed the range of experiences that the students were having. These varied from positive to negative:

> "…everyone is good at what they are responsible, and whatever a person does not know, other disciplines are there to aid each other"

> "The one weakness I have noticed is that each field's design process is very different…"

The interdisciplinary studio was helping students to see the limitations of IPD and to understand the issues that they have to address as a team to make their project successful.

BIM and IPD

BIM was used in the form of Autodesk Revit, and students were required to be knowledgeable in Revit for the charette. BIM is an integral part of IPD and allowed the teams to foster other important parts of IPD such as:

- Early involvement of all parties
- Shared risk and reward
- Multi-party agreements
- Collaborative decision-making and control
- Liability
- Jointly developed and validated performance goals[v]

Utilizing the points of ideal synthesis from "Notes on the Synthesis of BIM" by Deutsch the interdisciplinary student teams were able to work together from beginning to end to create a solution to a design problem.[vi] Not only was the synthesis of BIM important for the studio, but also the synthesis of information. This is extremely important to IPD and reflects the similarities between an interdisciplinary design studio and the use of IPD in the profession. Without the correct synthesis of information students and professionals will not be properly educated to create appropriate design solutions.

Issues arose with the inequality of training and knowledge of both Revit and other digital tools needed to synthesize the project information. The Adobe Creative Suite was another important program and the Building Construction Science students especially were not versed in the use of these programs. This reflects the issue that will be discussed later about the culture of each AEC field and how a similar language is needed to rebuild the schisms of the past.

Millennial Students

Since the students in this studio are Millennials, and since Millennials will be the future of the AEC professions, studying their traits to enhance the teaching of an IPD studio was important. Interestingly there are certain Millennial traits that can be engaged and enhanced with the use of IPD points of synthesis.

Due to the influence of Postmodernism on Millennials they tend to be pessimistic due to the lack of certainty that their parents and grandparents are used to. This can be assuaged with the real-time environment of BIM and IPD that allows the flow of information more freely from each AEC partner in the interdisciplinary group. Other Millennial traits that have become a concern to higher education in general, and architecture education specifically are:

- Consumer orientation – *The "customer" is always right*
- Entertainment orientation – *Education should be fun!*
- Entitlement – *You get what you pay for…or at least show up for*
- Instant gratification – *A reflection of the fast food culture of the United States*
- Short event horizon – *Lack of long-term planning, critical thinking, and problem solving skills (which happen to be a requirement for architects and architecture education)*
- Adaptability and pragmatism – *Flexibility and open-mindedness*
- Excellence – *Grade inflation and little effort for much reward*
- Skepticism – *Postmodern trait that puts personal experience over information*
- Cynicism – *Right and wrong does not matter as much as someone's agenda*
- Safety issues – *Overprotected, Millennials do not take responsibility for their own safety*
- Stressed – *Not currently able to handle the stress of higher education*
- Civility issues – *Emotionally repressed and difficult to engage, "Are you talkin' to me?"*
- Intellectually disengaged – *Bored, constantly tardy, and only concerned with what they will be graded on*[vii]

IDP can positively influence these traits through two constructs, one specific to a general collaborative studio, and one specific to this particular Integrated Practice Studio:

Useful in a General Collaborative Studio

- Preparing students to enter the workforce
- Harnessing their digital dependence by using BIM
- Using a design competition to foster significant effort
- Introducing IPD to encourage respect for the knowledge and authority of others
- Project presentations to allow for the civil exchange of reasoned ideas
- Exposure to IPD and the allied professions to give students a better understanding of their future
- Collaborative teams to allow students to be adaptable and pragmatic

Specific to this Integrated Practice Studio

- Site, precedent, market, and LEED research to show that facts do matter and are important to synthesizing information needed in IPD
- A project of a campus facility to further engage the students and address their possible consumer and entertainment orientation by being able to better their surroundings
- A project duration of only three weeks to challenge instant gratification and short event horizon by having the students see the positive and negative of short project periods

IPD and BIM in AEC Education

Starting with the challenge from Boyer and Mitgang to the architecture community in their report *Building Community: A New Future for Architecture Education and Practice: A Special Report*, and continuing through the *NCARB 2007 Practice Analysis of Architecture* to the more recent *2010-2011 BIM/IPD Survey Results* collaboration, BIM, and IPD are becoming more important and more relevant to architecture education. General use of BIM, Integrated Project Delivery, and Collaborative Design Strategies are being used more and more.[viii] However, building construction education has been struggling to implement IPD and BIM despite the data that shows an expected increase of the use of BIM in the AEC marketplace over the next five years.[ix] This shows the importance of keeping the momentum going in architecture education while enhancing the development in building construction education.

Comparative Analysis

This studio used the basic themes of IPD to structure the project, and to encourage a more in-depth involvement by the students from the three allied disciplines. This was meant to help the beginning design students see the importance of collaboration early in their education to allow them to bring these ideas forward into the rest of their education. The reason this is important is due to the current cultural issues that are causing so much friction between current AEC teams that may hinder the further development of IPD in the profession.

The development of professional relationships and the overcoming of cultural barriers can be seen again in the article "Notes on the Synthesis of BIM" by Deutsch. He quotes Charles Hardy and his idea that "BIM is about 10% technology and 90% sociology." This is important considering the research Smith also puts forward on the evolution of the views of the various team players in building design and construction. He notes that the erosion of the past relationship between architect and builder came from the divergence of the AEC fields along with the traditional construction contracts what focus on winning the project rather than creating the best building possible. This can ideally be remedied by defining the boundaries and knowledge of each partner in the team, which translates to the development of this studio as well where the students learned what the boundaries and knowledge of their classmates were.

Conclusion

Since this is only the second year of this Integrated Practice studio there is more work to be done to develop the Integrated Practice

aspects of the course. It will be conducted for the next three years at least and affords opportunities to build on ideas and correct mistakes. The architecture students who participated in this charette are currently working with a group of second year building construction science students on their studio project and the results are very positive. The students came into the studio with more knowledge as to what the building construction science students know and could accomplish. The building construction science students also worked with second year architecture students last semester so they had some knowledge of the skills and abilities of architecture students prior to this new collaboration as well. This prior knowledge and experience supports the ideas of this project that early integration of students from the allied disciplines, no matter how cursory, or how early, seems to help in the collaborative process. There has been no data collected on the current studio since it is underway, but the researchers hope to have supportive data in the future.

That being said faculty still need to define the scope of the project, specific project goals, clearly define roles for each student in the teams, as well as their responsibilities. This is what is done in a professional IPD relationship and must also be done in an Integrated Practice collaborative studio. Additional issues that educators can address are cultural ones such as barriers to change, lack of IPD awareness, and limitations of technology.

All of this data on what IPD currently is in the profession, and what our students can offer as future practitioners shows a promising future for IPD in both the profession and education. We have an opportunity to harness these ideas and continue to develop architecture education to serve both our students and the profession. There is a bright future for IPD and BIM in architecture education and we have only begun to start the "inter-actions" to foster this important work for the future.

Notes

[i] Sabongi, Farid J. "The Integration of BIM in the Undergraduate Curriculum: An Analysis of Undergraduate Courses." *International Proceedings of the 45th Annual Conference*. Associated Schools of Construction, (April 2009), http://ascpro0.ascweb.org/archives/2009/CEUE90002009.pdf, (accessed October 23, 2012), 1.

[ii] Kent, David C., and Burcin Becerik-Gerber. "Understanding Construction Industry Experience and Attitudes toward Integrated Project Delivery." *Journal of Construction Engineering and Management* 136.8 (2010): 815-25. *Understanding Construction Industry Experience and Attitudes toward Integrated Project Delivery.* Journal of Construction Engineering and Management, (January 16, 2010), http://ascelibrary.org/action/showAbstract?page=815&volume=136&issue=8&journalCode=jcemd4, (accessed October, 23 2012), 4.

[iii] Ibid, 2.

[iv] Smith, Ryan E. "Socio-Technical Practices." – *Center for Integrated Practice*. American Institute of Architects, (August 18 2011), http://network.aia.org/CenterforIntegratedPractice/Resources/ViewDocument/?DocumentKey=ee286a4c-45ae-4560-a2c7-9aecbd0b98c0, (accessed October 23, 2012). 3.

[v] Ibid.

[vi] Deutsch, Randy. "Notes on the Synthesis of BIM." *AECbytes Viewpoint #51.* Dr. Lachmi Khemlani, 7 (Apr. 2010) <http://www.aecbytes.com/viewpoint/2010/issue_51.html>, (accessed October 23, 2012).

[vii] Taylor, Mark L. "Generation NeXt Comes to College: 2006 Updates and Emerging Issues." *A Collection of Papers on Self-Study and Institutional Improvement*, 2, (2006) 2:48.

[viii] "2010-11 BIM/IPD SURVEY RESULTS—SUMMARY." 2010-11 BIM/IPD SURVEY RESULTS—SUMMARY. Association of Collegiate Schools of Architecture (ACSA), (May 2011), https://www.acsa-arch.org/docs/resources/bimipdsurvey2010.pdf?sfvrsn=1, 11-12. (accessed September 13, 2011).

[ix] Sabongi.