# ADVANCING THE DIALOGUE ON COLLABORATIVE MODELS FOR GREEN BUILDING DESIGN

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Boyer and Mitgang identified that connecting architecture and other disciplines within an institution was a significant goal of architecture education for the twenty-first century. Although, this is still an important goal, their notion now inhibits fertile connections outside institutional boundaries. To support this claim, we explored the connections of nearly one hundred architecture and engineering students from three institutions. The connections were facilitated by exchanging Building Information Modeling (BIM) computer files through a file transfer protocol website. We performed a qualitative study in the exploratory tradition with a variant of a mixed methods research design. The purpose was to examine the nature of how distance students collaborated with other disciplines on a common comprehensive architectural design problem. We described the findings in the article, "Socially Responsible Collaborative Models for Green Building Design," located in the AIA Report on University Research, Volume 4. The results indicated why groups either chose the more difficult and unknown journey of completing a single architectural design with their distance partners, or returned to their local comfort zones and developed separate design responses. In this explanatory paper, we reveal the significance of the broader research idea, its position in the schema of our collaborative research with BIM and the integrated practice design process, and subsequent applications in academic and industry settings for advancing the dialogue on distance collaboration.

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## Introduction

"Making the connections, both *within* the architecture curriculum and *between* architecture and other disciplines on campus, is, we believe, the single most important challenge confronting architectural programs."

Boyer and Mitgang (1996)

We revisited this academic challenge of making disciplinary connections in light of recent constituent developments in industry and society. A new integrated practice philosophy is transforming how project stakeholders enter and participate in the design phase (Strong, 2005). The American Institute of Architects (AIA) Integrated Project Delivery (IPD) contractual agreements support the introduction of design consultants earlier during the new conceptualization phase (AIA CCA, 2007). All stakeholders are becoming equally accountable and contribute to potential architectural design outcomes. This philosophy is facilitated by the accessibility and interoperability of the Building Information Modeling (BIM) software platform. Laiserin noted that sustainability is dependent on BIM and performance simulations (2005). This platform responds to a larger societal concern regarding the built environment's contribution to climate change. With this heightened social consciousness and sense of accountability for the environment, we should find collaborative models that have a sustainable sensitivity.

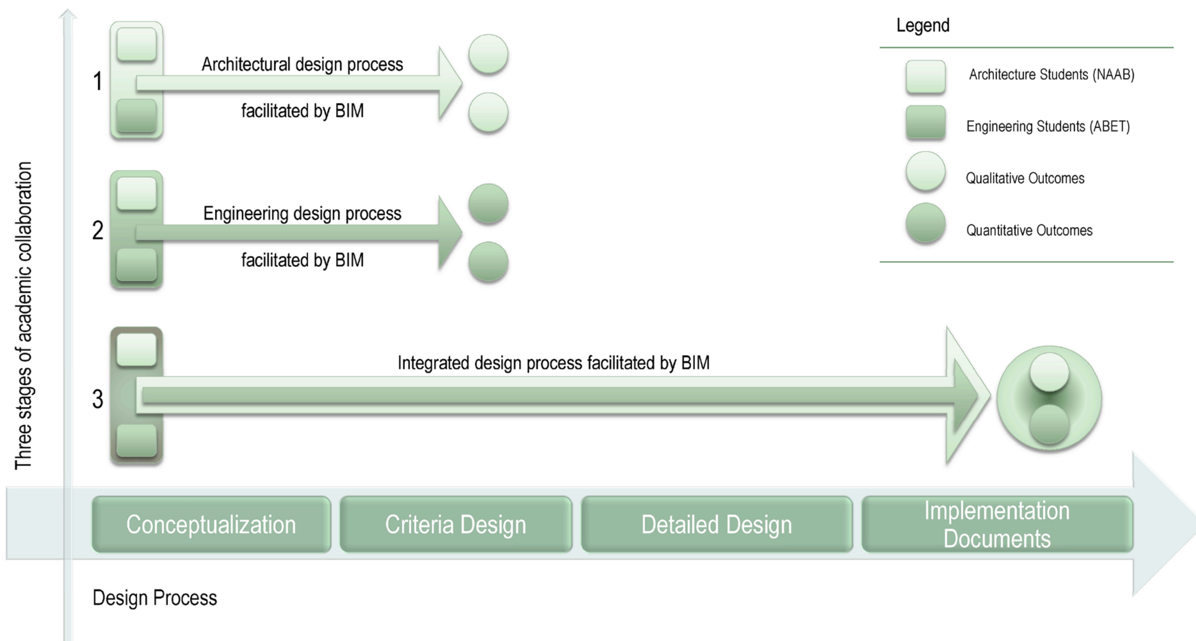


Figure 1: Stages of academic collaboration.

The currency of Boyer and Mitgang's challenge is the current capability to remove barriers and join "architecture curriculum and other disciplines" into a *holistic design* curricula, and transforming "on campus" connections into distance collaborations. This will recognize the interdependency of our disciplines and provide us with a greater sense of global awareness. In support of this broader research idea, Hedges, Denzer, Livingston, and Hoistad submitted that the most important challenge facing architecture programs today is, "Making the connections with design curricula" (2009, January 15). We believe that connecting design curricula will have a professional downstream impact on the built environment. Early academic collaboration will permit an architectural understanding that performance simulations by engineers should be considered as one criterion within the initial conceptualization phase in an integrated practice framework. The significance is that these students, and future project stakeholders, will be better equipped to collaborate between disciplines during the conceptualization and criteria design phases in an effort to minimize a building's contribution to climate change.

Our new academic challenge requires the early engagement of multiple disciplines. The engagement is the collaboration of architectural and engineering design students on a single architectural design problem. This collaborative schema has three distinct and sequential stages according to curricular outcomes: (1) Architects informing engineers about the architectural design process; (2) Engineers informing architects about the engineering design process; and (3) Architects and engineers partnering inside their respective disciplines. Stage three should be informed by the previous qualitative and quantitative processes with spatial and numerical sensibilities, respectively. Figure 1 illustrates the relationship between the three stages and the integrated design process timeline (AIA CCA, 2007).

## The RFP Project

We articulated the nature of collaboration into hallmarks for best practice strategies to guide collaborative models into higher levels of disciplinarity. A higher disciplinarity involves a greater degree of cooperation and coordination amongst its team members. Our hallmarks were designed to help facilitate the earliest design phase communications to build a common collaborative language between disciplines. The nuances behind the procedures and reliable research standards or hallmarks are revealed in this section.

Our Research for Practice (RFP) project was, “Socially Responsible Collaborative Models for Green Building Design” (2009). The purpose of this study was to examine the nature of a stage one collaboration in the BIM domain when distance students design green buildings. We performed a qualitative study in the exploratory tradition with a variant of a mixed methods research design (Creswell, 2005). We connected 97 architecture and engineering students into 23 teams from four courses at the University of Wyoming, Montana State University, and the University of Nebraska-Lincoln. The project was the comprehensive architectural design of a performing arts center. The design problem had backdrop conditions implementing industry methods and societal concerns. The integrated practice backdrop condition was the use of its facilitator technology, BIM. This knowledge resource was exchanged between student teams through a secured file transfer protocol (ftp) website. The sustainability backdrop was meeting the certified standard for Leadership in Energy and Environmental Design (LEED) building as defined by the U.S. Green Building Council (USGBC). The collaborative process was informed by BIM and LEED.

The findings included three tiers of reliable standards. The first tier was composed of fifteen strength and weakness attributes of stage one academic collaboration: mutual respect, mentor-protégé relationships, he said she said, where have you been?, in BIM we trust, casting call, on the outside looking in, too many cooks in the kitchen, *Finding Nemo*, where’s Waldo?, vision quest, single point of contact, mistaken identity, lost in translation, and *The little engine that could (I think I can)*. The catchphrase approach was used for a broader audience. The fifteen attributes established the second tier constituting the four hallmarks of collaboration: academic performance, managing the knowledge gap, establishing identities, and negotiating the design idea. The third tier differentiated between collaborative success and failure. We discovered that groups either chose the more difficult and unknown journey of completing a single architectural design with their distance partners, or returned to their local comfort zones and developed separate design responses. We allowed failure as an option; thereby, if the collaboration deteriorated, the student teams could redefine themselves. In these circumstances, the teams generally maintained their local collaboration, and discontinued the distance collaboration. These groups had the lowest level of cooperation and coordination (or several weakness attributes). Similarly, the successful teams that made it to the finish line together generally had several strength attributes and resolved the four hallmarks of collaboration. The tier three standard of success or deterioration was subsequently addressed by an accreditation board.

## Academic and Industry Applications

The National Council of Architectural Accrediting Boards, Inc. (NAAB) previously recognized collaboration as student performance criterion 7, Collaborative Skills. This states that the student must possess an, "*Ability* to recognize the varied talent found in interdisciplinary design projects teams in professional practice and work in collaboration with other students as members of a design team" (NAAB, 2004). The failure of a team to uniformly complete a project would have met this low expectation. In 2009, the NAAB raised its expectations by renaming, repositioning, and recalibrating the notion of collaboration. The name was changed from Collaborative Skills to Collaboration and is housed within a new criteria cluster titled Leadership and Practice. The NAAB now dictates that students must possess an, "*Ability* to work in collaboration with others and in multidisciplinary teams to successfully complete design projects" (NAAB, 2009). This performance criterion is a definitive improvement. The standard recognizes that working within a team does not necessarily equate to completing a successful project. Students must now navigate their way through challenging collaborative situations. In addition, teams must include non-Architect students. To readily meet the Collaboration criterion, architecture programs should consider our RFP project as a reliable standard for recognizing the virtues and pitfalls of group work. This will provide curricula an opportunity to forecast and mitigate any potential hazards that may lead to a breakdown in collaboration. These collaborative hallmarks are not exclusively reserved for academia, as they may also occur in industry.

As the design industry responds to societal needs, we anticipate growth in IPD ventures for firms of all sizes. Our collaborative model offers the students a unique skill set prior to entering into professional practice. We foresee our students pursuing firms who fully embrace BIM and are in the process of adopting IPD practices. These firms tend to embrace new technologies and methods in a way that mirrors our curricular assertiveness. These firms should note the following group dynamics that may translate from university into industry. For teams that found collaborative success:

- Students recognized green design as a reason for collaboration. Due to the complexity of the project, the students were reliant on one another for discovering sustainable opportunities. These students understood that sustainability is not isolated within a single discipline.

- Students naturally migrated to a single point of contact within both disciplines. Academically, this is contrary to the cooperation and coordination required to meet the highest level of disciplinarity in stage one and two collaborations. Professionally, this strategy does mirror the chain of contractual communications.

- Students with mutual respect dissolved their disciplinary boundaries and exhibited an atmosphere of trust. These students chose not to protect their degree program roles and did not partition the BIM worksets based on discipline. This would apply to stage one and two, but a stage three collaboration would most likely partition the work in a manner consistent with industry. Industry necessitates boundaries for legal liability purposes, but encourages expanding intellectual horizons. "Nimble thinking and a willingness to think and work outside 'your' discipline are important to IPD; critically it requires relinquishing 'rigid control' " (Sive & Hays, 2009).

- Students that taught and circulated their respective design processes within their teams established mentor-protégé relationships. This allowed the students to successfully navigate through and manage their knowledge gaps in stage one. Stage two should reverse the roles, wherein both the architecture and engineering processes would be familiar prior to engaging stage three collaborations.

Figure 2: Making connections with design curricula.

## Honors and Awards

In our subsequent collaboration, we submitted a competition entry titled, “Making connections with design curricula” (2009). The entry was based on the RFP model. This entry garnered significant national recognition in professional practice. The AIA bestowed us with an honorable mention at the Fifth Annual AIA Technology in Practice (TAP) BIM Awards. This was nationally recognized where Prof. Livingston was able to receive our award at the 2009 AIA National Convention. This creative entry highlighted the integrated design process and student outcomes (see Figure 2). The jury commented on our project’s significance to academia and professional practice, “Linking multiple schools with a single course highlights the real world problems of design and the benefits of BIM in a manner we hope to see repeated” (AIA TAP, 2009). This statement validates our initial premise that connections must be responsive to society and industry developments. In order to adequately advance knowledge, any repetition should be coordinated in a manner that collects data from all three stages of collaboration. We should footnote that the TAP recognition makes the University of Wyoming the only two-time recipient for the category of academic program or curriculum (2008 award citation).

## Acknowledgements

We would like to acknowledge Anthony S. Denzer and Mark Hoistad for their participation in the original RFP project. Without their efforts, the RFP project would not have achieved its fullest potential.

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