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VOICES FROM THE FIELD

Problem-Based Learning as a Model for the Interior Design Classroom: Bridging the Skills Divide Between Academia and Practice

Gregory Galford, Susan Hawkins, and Mark Hertweck (Chatham University)

The addition of problem-based learning (PBL) pedagogy to studio-based learning (SBL) environments may help bridge the divide between traditional design education and initial postgraduate jobs. This paper demonstrates how one instructor adapted a PBL model to the interior design studio, including planning, execution, and evaluation. The relationship between PBL and SBL is explored. Two realistic design problems were created for use by interior design students who participated in PBL sessions. All of the groups adequately answered the client's design programmatic needs. Students learned to perform as team members, including how to collaborate and compromise while working toward an effective design product. The evaluation process was the most challenging component for students. The skills fostered by PBL would be valuable in the workplace.

Keywords: problem-based learning, interior design, studio-based learning, architecture, curriculum design, facilitator

Introduction

The challenge to interior design educators is how to create the apprenticeship experience in the interior design studio by utilizing a design problem. Traditionally, entry-level jobs have been the way for young graduates to learn the practice side of their profession. The frustration that many young architects and interior designers feel stems from their perception that their academic skills may not easily translate to the needs of the typical office (Lewis, 1998). Problem-based learning (PBL) helps prepare students with real-world skills, including critically listening to clients, critical evaluation of their own work and that of others, self-directed inquiry prompted by the design problem, and working as a team. By supplementing the studio-based learning (SBL) process, PBL can play a pivotal role by bridging the traditional design studio to the initial postgraduate job.

Cennamo et al. (2011) assert that studio-based learning is a component of PBL, rather than the common perception in the educational community that the two are essentially identical. Their work identifies the similarities between the two as well as the value of SBL both inside and outside of the education. They identified four norms of the SBL classroom that are shared with PBL: (1) employ an effective rea-

soning process; (2) be aware of knowledge limitations; (3) meet knowledge needs through self-directed learning and social knowledge construction; and (4) evaluate their learning and performances. The focus in SBL is on achieving the skills of design through a reflective process that includes collaboration with classmates in the form of incorporating feedback from peers and the instructor in the student's own design, giving and receiving feedback on a regular basis, and using self-directed learning to acquire knowledge identified as missing.

Boyer and Mitgang (1996) produced a significant report on the state of architectural education that has served as a starting point for subsequent research. In their work, they propose seven principles of action for an architectural design education model. Some of these principles, such as a curriculum that is better integrated with the profession, a more supportive climate for learning, and preparing young architects for more civic engagement, would be enhanced by the inclusion of PBL skills into an SBL format.

While both PBL and SBL promote life-long learning (Boyer & Mitgang, 1996), PBL requires a team-based approach and project solution. The focus of PBL is on the skills of shared decision-making as well as self-evaluation and peer-evaluation on work performance behaviors such as nonverbal and verbal communication skills (Barrows, 1994). The ability to

give and receive feedback on your skills as a team member is separate from the quality of the design project. This is feedback the novice practitioner is certain to receive in the workplace, but the student may be unprepared for this type of feedback if it is not integral to the design education process. While students receive copious feedback on the quality of their projects, there is not the opportunity to be evaluated on interpersonal skills because most of the work is individual rather than group-based.

For a PBL scenario, the interior design student must interview the prospective client and then ascertain how his or her desires translate to real programmatic needs. If the student interviews or listens poorly, he or she will miss a key piece of information that may lead to design failure from the client's point of view. This focus on client needs, as well as the design product in a PBL pedagogical approach, will enable the student to transition to professional practice more quickly. The investigatory nature of client interaction in PBL provides a different trajectory from the typical design studio problem. Rather than just fulfilling a given programmatic requirement, the student has to engage with the client's personality in a deeper way, enabling insights that can propel the client-designer dialogue. Understanding the personal issues that a client is experiencing can lead to further unanticipated questions that move the design solution to future areas of concern (Cuff, 1992).

The implementation of PBL within interior design education is not common. The similarity of PBL to the studio-based model requires examining the differences between the two models. Both rely on a reflexive questioning through creative experimentation, but PBL expands on that by giving the student less formal parameters for the problem solution. Major technical components of interior design education typically are taught in a lecture format with few that completely embrace a PBL curriculum.

One example of a PBL curriculum in architectural education is the University of Newcastle in Australia. The integration of technical courses and design studio courses, as shown by the University of Newcastle, can prove successful (Cowdroy & Maitland, 1994). To integrate PBL fully into a curriculum requires initial risk. Issues of faculty evaluation and accreditation oversight can impede the desire to make such a substantial change. Educators may be skeptical of a method that is self-directed as opposed to a teacher-centered methodology. The possibility exists that the reluctance to use PBL still stems from the way in which educators possess and transmit professional knowledge. Educators still may not trust the student to learn as much via PBL as in a lecture-based environment (Duch, Groh, & Allen, 2001).

This paper will describe classroom design projects utilizing a PBL method and discuss the difference between SBL

approaches to studio design projects and a PBL approach. Descriptions of an adaptation of the PBL model to the interior design studio, including planning, execution and evaluation, facilitator and mentor reflections, and areas for future exploration, will be shared. The goal of this paper is to demonstrate and discuss a method for using PBL in an SBL environment.

Context

The use of PBL in an SBL environment has potentially unique benefits that require further study. The design process is difficult to quantify. In contrast to the medical world, where a patient with an illness either improves or worsens, the qualitative evaluation of design is more difficult to measure. Zeisel (2006) discusses the design process in terms of the three intangible elements of intuition, imagination, and creativity. He also discusses how the processes of imaging, presenting, and testing are key components of the design process. While Zeisel's process illustrates the typical studio-based environment, its success may be enhanced with a PBL component that further emphasizes intuition, imagination, and creativity, which are student-generated qualities. PBL can be a bridge that connects Zeisel's theories of design for the studio-based environment to the professional work environment where the ability to be self-directed is important.

The dialogue between academia and practice reveals common characteristics, yet differs according to discipline. Design practice and studio education do not progress in a linear manner, but rather in a back-and-forth testing scenario that is more synthetic than purely analytic (Ledewitz, 1985). Schon (1983) also describes this motion as reflection-in-action, which relies on independence, critical thinking, and evaluation. For this model of design practice, PBL specifically develops the skills that enhance this reflection through its self-directed nature and emphasis on self-evaluation and critical thinking. The SBL environment relies on these processes of reflection and action from different perspectives to advance a design. This process is not linear, but a series of loops (Zeisel, 2006). This nonlinear process can disguise other aspects of the studio environment that are not positive, such as a teacher-centered hierarchy. Those aspects promote competition and focus on the teacher's point of view rather than the development of confidence in the students' own abilities. Other disciplines have studied the aspects of a "hidden curriculum" involving not only explicit course aspects but also unspoken agendas in a teacher-centric learning environment. The power dynamics and hierarchy of the typical design studio have not been examined as extensively as in other professional education settings (Dutton, 1987).

Preparation for Real-World Application

A focus on design theories in the absence of actual client interaction divorces the student from real-world situations that would enhance their ability to function in the workplace (Ward, 1990). A major client criticism of the design professions is the lack of critical listening skills (Nicol & Piling, 2000), the importance of which is emphasized in PBL. The use of PBL as an additional tool in the studio environment may decrease studio isolation and help students learn to engage outside factors and perspectives as they define their own design process. The education of architects and interior designers inhabits a rather unique place in academia. The traditional model of design education, prior to the rise of formalized education, was one of apprenticeship or study with a master practitioner (Kostof, 1977). These professions still require a period of internship or apprenticeship in preparation for licensing exams as an acknowledgement of the limitations of university professional preparation. The current system of the design studio supported by lecture-based courses derives from the integration of the Beaux Arts apprenticeship model into the lecture-based curricula of American universities in the nineteenth century (Burroughs, Brocato, & Franz, 2009; Kostof, 1977). Prior to the formalization of architectural education, young architects worked under the tutelage of a master architect in an atelier that trained a designer in both academic and professional skills (Cuff, 1992).

With most current models of design education, most students have limited interaction with real clients, impeding professional development (Gutman, 2010). Students in the studio typically work on projects individually, rather than as members of a design team, which will be the norm for their future professional lives (Cuff, 1992). Gutman (2010) writes about the tendency of design schools to focus largely on the formal aspects of design. He is highly critical of design students not being taught critical listening skills. He also sees the lack of connection between their work and the needs of the general public as a significant problem. He directly challenges the heavy reliance on the studio method for the education of architects (Gutman, 2010).

Integrating SBL

The studio-based environment relies largely on the jury-based review system that utilizes outside professionals to provide feedback for students. While this model is useful for developing the ability to receive and incorporate outside feedback, it does not provide the student with the opportunity to develop skills in evaluation of self or peers. Continually honing their personal evaluation skills would quicken the design process and should be used by both teacher and

student (West, Williams, & Williams, 2013). Studies have looked at the relationship between SBL and PBL in more depth. PBL methodology incorporates aspects of the SBL model with an additional student-centered focus (Cennamo et al., 2011). The two models are not typically used together, but the study authors argue that linkage between the two may provide enhanced benefit for the student. Neither system should necessarily replace the other, but a nuanced and entwined use of both in the studio environment may provide the best model for student interior design education. A key difference between the PBL model and the SBL model is the attachment to the place of activity. With PBL, students meet for tasks of collaboration and communication. In a studio-based model, the physical place of work becomes important. This is an important distinction for interior design education. Its visual nature requires a place to gather inspirational images and do exploratory work that can be viewed by and discussed with peers (Burroughs et al., 2009).

There are increasing demands on academic institutions to provide students with an educational experience that readies them for a professional career. The increased outsourcing of entry-level work reduces the number of jobs available to new graduates (Tombesi, Dave, & Scriver, 2003). With low employment rates for graduates as well as increasing overall tuition costs (Ehrenberg, 2000), the future architect or interior designer may prefer a program of study that provides a competitive foothold in a difficult job market. A major reason for the limited use of PBL in interior design and architecture schools may be the assumption that the SBL model is the same as PBL. However, there are important differences between the two models of design education. While SBL models are recognized by other disciplines as a useful tool (Kuhn, 2001), PBL can help the student enter the work environment with honed listening skills that reflect society's needs versus design theory (Gutman, 2010).

There has been minimal integration of PBL into architectural education thus far. One example of a program utilizing PBL is the University of Newcastle in Australia (Cordrey, 1994). The use of PBL has not been significant in the design professions, although some critics have called for its use (Fisher, 2000). The Newcastle program has been successfully operating with an entirely PBL-based curriculum for approximately thirty years with substantiated success (Duch et al., 2001). Boud and Feletti (1998) address the work done at the University of Newcastle in developing uniquely comprehensive PBL curricula. The Newcastle architectural graduates tested highest in overall satisfaction with their architectural education amongst their national peers (Duch et al., 2001). The integration of design studio and technical classes across the whole curriculum enables the students to utilize PBL as a comprehensive method rather than as a component of a

blended program. The authors state that although the design studio does have components of PBL in its design problems, architectural education fails by not integrating that system with supporting technical courses (Boud & Feletti, 1998). The program at Newcastle addresses that problem by utilizing PBL across the curriculum. The 1984 redesign of the Newcastle program was based on three different components. One was the integration of design and technical subjects into shared project outcomes, another was to strengthen student work by following curricular course sequences, and the third was an integration of critiques by the multidisciplinary faculty (Boud & Feletti, 1998).

The change in the curriculum also forced a change in the way that faculty were used by the school. The teacher was not used as a lecturer but rather in ways that reflected three roles in PBL. One was to act as a consultant to the students in particular areas of technical expertise, one was as a group tutor for several students, and one was as an overall coordinator for a particular year of study (Boud & Feletti, 1998). Other programs have used PBL for architectural or interior design studios, but none at the scale of the Newcastle program (Nabih, 2010).

Implementation of PBL Design Problem

One of the authors (Galford), an interior design educator and a registered architect, was selected by Chatham University, a small northeastern U.S. university, to be part of a PBL faculty fellowship program. PBL training was conducted by two experienced PBL facilitators/trainers (Hawkins and Hertweck) in order to enable him to transfer his role from teacher to facilitator. The role of the facilitator is to model strategies for learning and thinking as opposed to providing content-specific expertise (Hmelo-Silver, 2006). All PBL sessions were conducted at Chatham University's accredited interior design program and were adapted from their physician assistant program's methodology, based on the Barrows model (Barrows, 1988, 1994) developed at Southern Illinois University Medical School.

Two realistic client profiles and design problems were created for use in studio-based courses in order to meet the PBL goal of being a real-world problem generating authentic experiences (Burroughs, Brocato, & Franz, 2009). The first profile of a fictional elderly client was created with a series of lifestyle and health issues that would affect the design of her new assisted living environment. A weekend resident grandson was added to increase complexity in living requirements. The client was in the process of altering her living situation and the students had to integrate her lifestyle desires with medical necessities.

The potential client was an elderly widow who was downsizing from a large family home to an assisted living facil-

ity. She had specific lifestyle activities that needed to be addressed, and was suffering from the onset of several health problems linked to Type II diabetes mellitus. One of these was peripheral neuropathy. This required the students to research the very painful health condition and understand that the hardness of the floor surface directly impacted the level of pain. At the same time, they also had to consider the possible use of a wheelchair in the future, and how that would prohibit the selection of certain soft walking surfaces. The patient also has early diabetic retinopathy, necessitating alterations in lighting design, which fit the goals of the lighting and acoustics course in which this case was conducted. Investigating the real problems of a client with health ramifications lets students link design to the tangible needs of a client and develop strong skills of listening and empathy as a designer. The instructor based this profile on personal family members with similar conditions who had faced these issues. He was able to base his design problem on his professional experience in the architectural development of similar independent and assisted living environments. The design problem was used in three lighting and acoustics courses.

A second client profile utilized a retired couple wanting to renovate an urban building into an art gallery. This design problem was used in two lighting and acoustics courses; the case lasted two weeks in one course and four weeks in the other course. The timing was varied to ascertain whether length of time made a difference in project outcome. This design problem involved urban land use and historic preservation issues. Rather than health care conditions, this profile focused more on the proper use of material, lighting design, retail design, and public accessibility/universal design. The clients had specific backgrounds that influenced their decision-making, and the students spent time tailoring their presentations to the specific personalities involved. The intention was to expand beyond the first client profile to incorporate other professional design concerns that the students would have to investigate.

The PBL design project was situated in the middle of each course in order to introduce material related to the topics prior to the beginning of the project. The role of the client was filled by different interior design faculty members and teaching assistants. The decision to use faculty, all experienced practitioners, was based on their professional ability to understand the ramifications of the situation and their availability. The graduate student groups contained a small number of male participants with the majority being female. The undergraduate groups were all female, as the undergraduate body of Chatham University was all female at the time of the study. All groups ranged from seven to ten students. One class was divided into two PBL groups due to class size being too large for one PBL

group. (See Table 1 for individual group composition and client profiles used.)

Each group was given a brief client problem statement and then had the opportunity to brainstorm ideas prior to interviewing the client. The notes from the brainstorming and the interview were documented by one of the students on a whiteboard under the following specified headings. These were adapted by the facilitator from the Barrows medical model (1994).

1. The *Goals* section reflected broader outcomes for the project as envisioned by students prior to the design work. This sets the expectation that what the student wants to accomplish helps to drive the process, rather than the project having the goal of pleasing the instructor. Examples of goals made by the students are “learning to work together,” “explain ideas efficiently,” and “learning how to delegate.”
2. The *Ideas* section contained initial thoughts about the design directions in which the project could proceed. Students listed design concepts and relevant design theories that could be applied to the project. Examples of ideas are “incorporating sustainability,” “emphasizing versatility,” and “effective space use.”
3. The *Information* section was the category where students listed data gathered from their interview of the client to compile the “program” that would affect all aspects of design. Examples include the patient’s diagnosis of diabetes and her live-in nephew.
4. The *Learning Issues* section contained information that required further research to help solve the design problem. Students then researched these topics outside of class. Examples include “diabetic retinopathy,” “universal design,” “acoustic design for those with impaired hearing,” and “mid-century design.”
5. The final heading of *Design Diagnosis* was initiated by the instructor/facilitator as an adaption from the medical PBL model to design. This was a place for the students to list more specific thoughts about the design solutions that would be required to satisfy the client’s needs. This heading gave the students a place to conceptually connect data from the interview to broader categories of design. Many students begin with a concept that is not adequately connected to supporting data. This category helped them to make that critical connection.

Develop personal values for ethical behavior; The tools used for this work were within the standards used in the students’ existing interior design studios. No presentation standards were prescribed, so most groups gravitated toward representational skills with which they were familiar. These

consisted of hand renderings, digital representations, both two-dimensional and three-dimensional as well as digital slide presentations.

A student acted as scribe and wrote all ideas on the board for all to see. Private note-taking was not allowed as the team had to work collaboratively. The design schemes were judged by the “client” (an outside faculty/practitioner) in each of the design presentations. The “client” reviewed the schemes against the original client profile to ascertain if the team had matched the design work to the specific design needs of the client.

In all of these PBL implementations, the initial session consisted of the client interview with the information written publicly for the group to utilize. In the longer projects (Groups 4 and 5), periodic updates were given to the “client” by the student PBL team. All students had to complete a self-evaluation, a peer evaluation, and a facilitator evaluation. Group 4, the other graduate group, was unique in that they also completed a second evaluation at the end of the semester that reflected their thoughts on the entire process.

Feedback was provided regarding the design product as well as PBL student behaviors observed by the faculty member acting as “client.” In the particular course that had two simultaneous PBL groups, the client “hired” one of the design groups over the other. At the end of each group design presentation, a survey instrument using a five-point Likert scale was completed and discussed. A fourth group also completed a written survey of questions developed by the author.

Interpretation

The facilitator (Galford) and the faculty “clients,” being both practitioners and educators, judged that all of the undergraduate and graduate groups adequately answered the client’s health and lifestyle needs with varying degrees of architectural sophistication. Variables such as educational level or age/life experience were not significant factors in the design schemes produced. All of them presented their ideas using media with which they were comfortable at that point in their academic career. They were generally successful in understanding the translation of specific health needs to design implications. They were also successful in understanding the client’s goals and made appropriate design selections. Despite being the youngest cohort, Group 3’s design scheme was seen by the faculty member who acted as judge to be as good, if not better, than the other schemes. Their relative youth and inexperience did not translate into creating a product of inferior quality. Groups 4 and 5, who had more time to complete the project than the other groups, had more comprehensive design solutions.

Regarding group communication, Group 1 was the only group that struggled with management of tasks and communi-

cation issues throughout the process. Because two group members were travelling during the project, the group used phone and electronic mail to communicate with each other, rather than meeting face-to-face as a whole group. Group members reported communication problems in their evaluations. The members of Group 3, the only first-year group, quickly established a page on social media as a means to communicate with

each other, and were the only group to do so. Their identification of social media as a communication tool seemed to avoid the communication problem experienced by Group 1.

Despite their successful communication, Group 3 struggled most with the evaluation process. Younger, undergraduate groups could produce work comparable to the graduate level, but seemed to emotionally struggle with

Table 1. Client profiles and corresponding courses.

Group	Number & Type of Students	Course	Length of Time	Design Problem/ Client Profile	Comment
1	7-Graduate	Lighting & Acoustics	5 Days	Client Profile 1	This group had communication issues as two members were out of town. Breakdown in duties among team. Self-appointed project manager stated that he didn't manage well enough. Presentation roles were decided at last minute. Design was competent and met needs.
2A (class split into 2 PBL groups due to size)	7-Undergraduate	Lighting & Acoustics	7 Days	Client Profile 1	Team produced competent design and seemed to not have communication issues.
2B (class split into 2 PBL groups due to size)	6-Undergraduate	Lighting & Acoustics	7 Days	Client Profile 1	Team provided competent design but thought beyond program to provide outside space for resident and won competition.
3	7-Undergraduate	Residential Design	7 Days	Client Profile 1	First year student team produced as competent a design as graduate teams. Relied on social media for communication. Worked well for them. Struggled hardest with evaluation phase of PBL. Team leader felt overly criticized by team. Facilitator learned to prepare students better for goals of evaluation phase.
4	8-Graduate	Lighting & Acoustics	28 Days	Client Profile 2	This group produced a competent design and gave periodic team updates to the facilitator. They struggled with evaluation phase, but were better prepared by facilitator, and handled it better than many groups, even though the group had strong personalities. This group uniquely had a second interview session at the end of the semester. They saw value of PBL skills for their career path once they had distance from the PBL session.
5	10-Undergraduate	Lighting & Acoustics	28 Days	Client Profile 2	This group embraced art client scenario and produced a competent design that met all criteria. They had no significant issues with the evaluation phase.

peer evaluation more than graduate students. In the peer evaluation process, undergraduates often remained safely neutral in their evaluations of each other, leaving significant criticism to team leaders or facilitators. The facilitator had informed them of the face-to-face process, but the team members were hesitant to give anyone critical feedback until the team leader, who was slightly older, was evaluated and confronted with negative feedback from the other team members. Once one team member was critical of the team leader's performance, the other team members joined in the criticism, although they had not been critical of each other. This left the team leader appearing demoralized. Because the interior design students move through the curriculum as a cohort, underlying emotional dynamics of the group influenced the evaluation phase. The facilitator noted that the evaluation sessions seemed to be somewhat traumatic to those students who were inexperienced in the process. He realized that preparatory explanation of the process and transmitting the importance and practice relevance of evaluation was essential to any successful PBL scenario. He spent more time with subsequent groups explaining the evaluation process and its value.

Group 4 was the only group to have a second evaluation session several weeks after the completion of the project. While initially hesitant to engage in this face-to-face process, they ultimately agreed that it had been helpful to get constructive feedback from their peers and would enable them to work differently in subsequent teamwork environments. They could see the difficulty of constructively providing and receiving criticism, but also that the value of being able to do this would set them apart in a professional setting. The distance from the actual evaluation seemed to be critical. This was the only group that had this insight, but also was the only one interviewed after a significant time period had passed.

The facilitator observed that students with higher average grades in other courses with very structured tasks and expectations did not necessarily enjoy the PBL process, whereas students with more average grades in the traditional academic setting appreciated the practice-oriented nature of the tasks. In Group 1, the student with the highest grade point average seemed frustrated with the loose structure of the exercise and was highly critical of the process during evaluations. Another student, with a somewhat lower grade point average, very much liked the loose structure, as it seemed to her to mimic a professional work experience. Skills that allow a student to excel in a teacher-driven setting may not always be the same skills to enable them to excel in practice.

There may be a significant lack of connection between academia and practice, which can be extremely challenging for an intern architect or interior designer. Having PBL as part of their educational background can ease this transition and

quicken their professional maturity. What may be a jolting experience as the student moves from school to work may be lessened with practice in PBL sessions that prepare them for similarly unstructured and spontaneous work requirements. PBL also can be done at all levels of a curriculum, wherever it can be of maximum benefit. PBL may promote "practice-ready" students, and could help build those skills not readily developed in lecture-driven situations.

Facilitator Reflections

These five projects in the interior design studio were an initial attempt, by me (Galford) as both teacher and facilitator, to discern the difference between the different pedagogical approaches of SBL versus a PBL approach. These were initial attempts to master a version of PBL for the interior design studio, but there are variations and refinements of the process that I would like to pursue. Timing of the projects, length of time spent on each project, and integration of PBL into the curriculum as a whole are all areas for further exploration.

The face-to-face nature of the evaluation process was challenging to most of the students, as evidenced by emotional nonverbal distress observed most acutely in Group 3. Evaluations in the workplace are typically difficult for all, as there is little training in school or practice to deal with these potentially uncomfortable interactions. It is very important to frame the evaluation process for the students, as this is difficult for students inexperienced in the giving and receiving of direct feedback from peers. With more preparation, students might confront this difficult situation more successfully. More emphasis and sensitivity needs to be given to existing personal and emotional dynamics of student cohorts. The evaluation phase may be connected to personality issues outside the immediate PBL experience. The ability to objectively evaluate the performance of themselves and their peers can be extremely valuable for their future career growth. Young architects or interior designers who can deliver constructive criticism with solutions and who can absorb critical feedback and use it to improve performance would be strong candidates for professional advancement. This may position them for future managerial roles. In an SBL format, criticism from professional jurors resonates differently from peer evaluations in the PBL format. The power differential between professional jurors and students, while valuable in terms of communicating professional knowledge and expectations, may intimidate a student, thus impeding the ability to absorb the feedback. Peer-to-peer evaluation limits the power differential while additionally empowering the student to develop skills such as teamwork and communication. The ongoing nature of the peer-to-peer relationship requires the continual examination and modification of

these skills. From my experience, seeing evaluation as a tool to help rather than an attack is a key to the success of PBL in the interior design studio.

The timing of the PBL project was very important. The more successful PBL sessions were conducted earlier in the semester and had longer time durations. The students in the groups with less time often did not see the value of the project in the overall context of the course, as expressed during the peer-to-peer evaluation phase of the project that I facilitated. Students were critical of the project when it occurred near semester deadlines. When scheduled near the end of the semester, students stated that it was an additional pressure, and an extra assignment on their existing workload. While the desire may be to use this project nearer the end of a class due to enhanced knowledge, the students' perceptions of their workload may be more important to consider. Conducting PBL earlier in the semester may enhance success. These PBL experiences were done within the confines of one course and not integrated across the students' curriculum. Thus, it may be perceived as an additional task that doesn't enhance their greater studio work, and resentment may ensue. The most successful group may have been Group 4, primarily because they had more time to do the project, it was more integrated into their workload, they were better prepared for their evaluation, and they were evaluated a second time when a significant time period has passed.

Because PBL is likely to be unfamiliar to most students, I need to explain the goals of PBL more fully, which are linked to critical analytic and listening skills that will enhance their future careers. Students may perceive the project as a more realistic portrayal of design practice because it involves the entire design process from client interview to design presentation. Students are more likely to invest personal time and interest in self-directed learning. It is also important to stress the value of the PBL experience for their design portfolio and resume as discussion points in a future professional interview. My experience as the teacher of the portfolio preparation class, and as a former interviewer, gave me insight into this future need. This experience constitutes a strong professional skill that is not typically addressed in an academic environment. Communication and teamwork are critical in the design workplace, and are addressed in the PBL process. Students brainstorm ideas together, decide on plans of action, and execute the development and presentation of the final product. From my experience in traditional design studios, students typically develop their own design solutions independent of their colleagues. Having this collaborative experience may enhance their transition from academia to the workplace. Design education and practice focus on development of a product, such that the development of interpersonal office

skills may get less emphasis than in other professions. My professional experience as a registered architect gave me several opportunities to interview prospective intern architects and interior designers. In my opinion, the clear articulation of the team skills attained during PBL sessions would be a positive factor in any interview situation.

Mentor Reflections

Two graduate health science programs, physical therapy (PT) and physician assistant (PA), have been utilizing PBL as a major didactic pedagogy since the inception of these programs at Chatham University more than twenty years ago. The Dean was responsible for the creation of the health sciences programs, and a physical therapist was familiar with and promoted the utilization of the McMaster model of PBL (Lee & Kwan, 1997). The initial program director of the PA program attended the SIU Medical School and was familiar with that model of PBL. In meeting with the founding faculty of the PA program (including the PA authors), the decision was made to use the SIU Barrows model (Barrows, 1994) of PBL in the PA program.

One aspect of the Barrows model that met the objectives of the PA curriculum was the emphasis on free inquiry of the patient, such that students do not get answers to questions that they have not asked. The PA faculty wanted students to be very confident in their ability to take a problem-focused history tailored to different patients and problems; the mentors believed that this emphasis would accomplish that objective. Another important aspect was the emphasis on probing the student for depth of knowledge throughout the process. In the clinical phase of PA education, supervising physicians and PAs serving as preceptors frequently questioned students in a similar manner, without the benefit of using resources to seek answers. We have found that the process of questioning students for depth of knowledge helped them to make the transition to clinical education, where they must be able to state clearly when their knowledge is insufficient to the task at hand and how to find that missing information without necessarily being guided by the preceptor for every question. Additionally, the model met the behavioral objectives of the curriculum with the emphasis on frequent and specific evaluation in the small-group setting. Students and, eventually, practitioners did undergo frequent evaluation and helped students become facile with all aspects of the evaluation process that would benefit their transition to clinical practice.

All founding faculty received PBL training from an SIU trainer, and we (Hawkins and Hertweck) received additional mentoring to become trainers ourselves. We have conducted numerous PBL trainings in the ensuing years, not only for

PA faculty but also for varied faculty at multiple institutions such as PT, EMT, nursing, ophthalmology, audiology, public health, and even a group of middle school science teachers.

Because of the success of the Chatham University PA program, based on board passage rate, admissions applications and enrollment, and the available expertise of our years of facilitation and training experience, the administration created a PBL fellowship to promote the integration of PBL into other academic programs. The administration was interested in seeing whether the success of PBL in the PA program could be transferred to other academic areas. This initiative recognized the importance of training and support for faculty to make this transition, which required restructuring and skill acquisition for its successful implementation. The University provided training, a small stipend for faculty, appropriate class size, and encouragement to use the transition to enhance scholarly activity.

The PBL fellowship began with two days of PBL training for the PBL fellows. On the first day, participants completed a medical PBL case of the type used in our curriculum. Because everyone has been to a health care provider in their lifetime, they were able to complete the case even without medical training. At the end of the day, each was given an outline of the process, a summary of the case, and had the opportunity to ask us questions. On the second day of training, the fellows facilitated the same case with a group of students new to the PBL process. These students were recruited from university applicants. While the fellows facilitated the case in 15-minute intervals, they were given the opportunity to self-evaluate and to receive feedback from the other fellows and from us. As is common with novice facilitators, the fellows were given feedback to make their statements less directive, to ask clear and concise questions, and to look at the students for nonverbal feedback as to their understanding.

One-time training is certainly the minimum requirement for new facilitators because PBL facilitation requires changing a teacher-centered point of view, in addition to learning a series of techniques and processes. However, to truly develop a PBL facilitator, ongoing mentoring helps the process progress more quickly.

Following the studio instructor's (Galford) initial PBL training, we discussed what his goals were for the initial target course. Although we were not experts in interior design, we guided him in the development of a real-world problem for students to solve. The studio instructor was encouraged to develop a case based on a real client that would require the students to engage in free inquiry, as they would in an architectural or interior design firm. The case went through several iterations as we asked questions about how students could acquire the necessary information, what resources they would have, and what would make it interesting and

challenging enough to capture the enthusiasm for learning in the students.

We assisted in case development by assuring the instructor that students did not need to be given a great deal of information up front, and that students would be able to interview the "client" and look up information about materials and regulations to inform their design strategy. We supported the introduction of a relative of the "client" to add more nuance to the design requirements. After three meetings, the case was finalized.

After the case was developed, we discussed evaluation, both of the project and of the experience. Although the specifics of an interior design problem are different from a health care problem, there are many common aspects: (1) questioning the client versus patient; (2) brainstorming possible solutions versus diagnoses; (3) discovering new materials and methods versus diagnostic tests; and (4) analyzing resources. Costs and client/patient satisfaction with the solution are relevant to both types of problems. Evaluation in a PBL setting can also include behavioral aspects of performance in the problem. If a student exhibits a behavior that would be negatively viewed in the internship/apprentice situation, the facilitator can give immediate feedback that is directly related to the student's future practice, which may be more easily internalized than feedback viewed as general and not related directly to practice. Students may view feedback as helping them to build their professional persona and not as attacking them as an individual. Both professions are service-oriented, thus the ability to behave appropriately, both individually and as a member of a team, are valued characteristics in the professions. The ability to give behavioral feedback to a student and the student's ability to receive constructive behavioral feedback about his/her performance on the project can be helpful in ways that might not be observable in the traditional SBL setting.

The studio instructor's enthusiasm for embracing a new teaching methodology made the mentoring process easier. Factors that made the support valuable were our PBL experience and confidence in the PBL process, sharing of our teaching materials for him to adapt to his needs, willingness to be available for questioning and observation of class, as well as intention to include this transition as part of his and our scholarly agenda. Some of the barriers to the ongoing support were conflicting work schedules and lack of release time for the purpose of ongoing supervision.

We observed several sessions of the first implementation of PBL into the lighting and acoustics course. We took notes on the studio instructor and facilitator's (Galford) technique and gave him feedback on the specific wording and timing of questions. We offered alternative questions to those that were too long or seemed to confuse the students. We noted missed

opportunities to probe students for depth of knowledge and suggested ways to do so. We also noted where we saw non-verbal behaviors of the students that he might have missed and what our interpretation of those behaviors might be. For example, when a student crossed her arms and pushed herself back from the table, we encouraged him to see such a behavior as worthy of asking the student to articulate what she might be thinking or feeling in the moment. Although it is dangerous to assert that the facilitator knows what the student is thinking, letting a student know that a behavior is noticed allows her the opportunity to comment on and potentially modify a group dynamic. Facilitator nonverbal behaviors, such as frowning when a student gives an incorrect answer or nodding encouragingly when a student is correct, were pointed out in the feedback. In this model, students are responsible for deciding whether comments from themselves and other students are accurate and complete enough to solve the problem. If the facilitator validates or criticizes a statement, students do not have to be responsible for their own depth of knowledge. We believe it is important for mentors to reassure the novice PBL facilitator that giving the students more control of their educational process does not lead to chaos or diminished skill acquisition. Rather, the more you can encourage a faculty member to make the experience real-world and convey the subtleties of real professional practice to the student, the more enthusiastic students can become about self-directed learning. Once a novice facilitator sees students solving problems and gaining skills, it becomes easier for the facilitator to release concerns and trust the process.

Early in the implementation of PBL, facilitators must give the majority of their attention to the structure of the process. Just remembering not to give information to the students can require concentrated effort. Encouraging students to brainstorm ideas rather than rushing into the information-gathering section can require patience and trust of the process. From our experience training novice facilitators, questioning students to determine the depth of their acquired knowledge can be challenging. Students might view the questions as confrontational, particularly if it is their first PBL experience. Students typically are used to being given project parameters rather than having to figure out what information they need to solve a problem, and therefore also need to build confidence in themselves and the process. Once facilitators are more comfortable with the structure of PBL, they can tolerate discussions that are more divergent, while easily being able to return to that structure to resume the process. As mentors, it is important to have compassion and empathy for the novice facilitator, who is likely grappling with new skills and demands that may be outside of his/her previous lecturer/professor experience. The mentor communicates

experience and trust in the process, which is an important aspect of supervision. Novice facilitators must be encouraged to have patience with themselves and with the process. This mimics what the mentor is requiring of the facilitator—to trust the process in order to develop facilitating skills that will enhance the students' professional readiness.

During the early implementation of PBL into his interior design course, Galford, the studio instructor, was not confident enough to change the model to suit the specifics of interior design as opposed to medical problems. As he repeated the process in subsequent courses, he was able to adapt the model to be more design-specific without abandoning the student-centered focus. One change was adding more time for the problems, which made the process smoother. Being able to deviate from the specific medical model and allow conversations to arise naturally was an evolution over time. Having simulated clients was an adaptation to the studio process that is similar to, but not identical to, the practitioner/patient experience.

During the PBL training process, as well as the ongoing mentoring process, we modeled giving feedback to the novice facilitator, who then could model giving and receiving feedback for his students. By crafting critical feedback that is directly related to the practicing interior designer rather than directed toward them only as students, the future practitioners will have a greater appreciation of the feedback. Students can also respond to learning how to give and receive feedback when they are reminded of the potential supervisory roles they may have as design professionals.

The mentoring process includes highlighting teachable moments for the facilitator, such as encouraging the facilitator to ask further questions to probe for depth of knowledge on a topic, rather than accepting a more superficial answer. Encouraging the facilitator to ask questions specifically related to how situations unfold in the professional setting allows facilitators to listen for teachable moments that are related to professional practice. We encouraged the facilitator to recognize that his architectural practice experience informs his questioning such that he contributes that experience to the student without directly answering questions/providing information. Transmitting his knowledge to the student is less important than having the student develop self-directed learning skills.

Use of an evaluation rubric is a crucial piece of the project. It formalizes the feedback, yet can be similar to the kinds of feedback a young professional might expect to receive from a supervisor in the workplace. Feedback helps prepare the student for the reality of evaluation, or if feedback is not being provided, the student will seek out quality feedback. Students learn to ask questions that provide feedback and to recognize good feedback when they receive it (Cennamo et al., 2011).

Mentoring sets the expectation that a developing facilitator is also a developing mentor. They have a responsibility for the learning continuity within the profession. If more than one faculty member is doing PBL, then observing and providing feedback for each other will be helpful even as novices build their mentoring skills. Mentors outside of one's profession can still give good feedback. In the current project, even though we were from a medical rather than a design background, we were still able to provide useful feedback about technique and problem design and evaluation, as these are universal concepts that are recognizable in the process, regardless of discipline. For example, there is not a direct equivalent to the artistic aspect of the design process within medical diagnosis and treatment. However, there are presentations to supervisory medical professionals and presentations to patients that are analogous to presentations to design supervisors and presentations to clients.

Next Steps

In future PBL exercises, the use of research methodology to guide the study of the impact of PBL on outcome measures would be useful to encourage other programs to consider integration of PBL into their curricula. The research methodology would be designed into the actual classroom work. One area of subsequent study is to measure student confidence regarding their skill acquisition before and after participation in PBL-based courses. The Likert scale used currently as a survey instrument needs to be enhanced or substituted. Beyond the group discussion and evaluation, individual interviews may be conducted as well as observations from other experienced PBL facilitators. Another area of study could focus on evaluation specifically related to interior design. Yet another area of study would be to survey new graduates and assess their perception of whether their PBL experiences enhanced their transition from school to practice.

For future research, more advanced quantitative tools should be utilized to measure the comparison of learning outcomes in both PBL and traditional design studio formats. The use of PBL in the design disciplines is unique from its use in medicine. Specific outcomes need to be measured, discussed among participating faculty, and incorporated into the curriculum. This could be done in conjunction with accreditation requirements such as understanding and application of design principles and skills. These studies should also be done longitudinally to evaluate how graduates of PBL design programs fare in practice compared to those who did not participate.

An obstacle to better integration of PBL into existing curricula is the resistance of faculty members (Barrows, 1994).

A way to ease this transition is through observation of the process, where the design practitioner/faculty member could see the direct benefit of the skills to eventual practice. The use of outcome data may reassure faculty that students experiencing PBL in the curriculum will perform as well as, if not better than, students without that experience. Training of faculty members by experienced facilitators will provide an additional skill set for the classroom. Within professionally accredited programs such as this one, the fear of exercises that are not viewed positively by a future accreditation team may be used as an excuse to not experiment with novel pedagogical approaches.

The example set by the architectural program at the University of Newcastle may provide a good template for the next step in the integration of PBL into the design classroom. Their adaptation of the lecture versus studio structure into an integrated PBL format has direct implications for design students. The combination of an SBL design studio with the supporting technical courses could lead to much stronger professional skill outcomes. More professionals and "real clients" could be introduced to the PBL classroom to heighten the sense of reality to the exercise. This would provide the student with the University's best attempt at mimicking the real-world professional situations that they will encounter, and develop a sense of intellectual independence that will enable them to face future professional challenges more adroitly.

The National Council of Architectural Registration Boards (NCARB) (Anderson, 2014) has initiated a task force to investigate a faster path to licensure for young architects that would transfer more of the internship experience and practice-based knowledge to architectural education programs. The addition of some variation of PBL to SBL could provide a valuable bridge to practice by focusing on interpersonal team-based skills that are required in office practice.

Evaluation skills have broad implications for future professional development. While initially uncomfortable, the ability to grow by giving and receiving constructive feedback could be seen as a key leadership quality in most work settings. The challenge now is to begin to integrate one instructor's classroom with additional classes to see if student outcomes are enhanced by PBL. Metrics utilizing a greater variety of survey instruments need to be established to ascertain whether the method is successful or not.

In conclusion, the PBL sessions that were conducted in these interior design classrooms provided insight that the PBL model could be adapted for use by student design professionals. By using this model with groups of students that varied according to age and education level, the evidence suggests that there is merit in continuing to refine how this teaching model is used. It is the authors' belief that the

tool could be an effective one to promote increased professional skills. The criticisms that the design professions have of intern practitioners could be lessened if they entered the workforce with enhanced critical listening and problem-solving skills that were more directly related to real client needs, with less emphasis on formal solutions. Ideally, the best of SBL and PBL could be integrated to develop professionals with project design skills as well as team-based skills. SBL is an excellent model for design studio education, but the integration and addition of PBL to its structure would enhance the power of design education by refining the relationship between human needs and building form.

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