

# Utilizing Emergency Departments as Learning Spaces through a Post-Occupancy Evaluation.

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This case study describes the use of an emergency department as a learning space for interior design students. Kolb's (1984; 2005) framework identifies the characteristics of experiential learning and learning spaces, serving as the bridge to unify learning styles and the learning environment. A post-occupancy evaluation was conducted with interior design students to engage them in a concrete learning experience, reflection on these experiences from a variety of viewpoints, and building theories or generalizations that are applied to actively solving practical problems. Learning is explored as a never-ending cyclical process within all environments, which will serve to inform future decision-making.

## Introduction

Current research in design processes and education supports the understanding that interior design students perceive and approach the learning process in a variety of ways. Knowing this presents an opportunity for design educators to explore new instructional methodologies so as to respond to the diverse needs of all students. In this case study, we examine the use of a post-occupancy evaluation (POE) of a hospital's emergency department to explore how the theories of critical thinking and experiential learning can be employed to enhance learning in interior design education. POEs focus on building occupants and their needs, and thus they provide insight into the consequences of past design decisions and the resulting building performance. Further, this research methodology can assess how well buildings match users' needs and identify ways to improve building design, performance, and fitness for the purpose for which they were designed.

An introduction of David Kolb's identified characteristics of experiential learning (1984) and learning spaces (2005) will serve as a framework for understanding the interface between student learning styles and the educational environment for interior design students. Use of the experiential learning framework is demonstrated through instructional methodologies that integrate experiential learning with multi-method observational research, triangulated research, group discussion and reflection, and more traditional methods of learning such as the lecture format.

## Review of Learning Theories

Learning is defined as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p.38). According to Nussbaumer (2001), all learning styles have been found among interior design students. Kolb (1984) describes these learning styles as diverging, assimilating, converging, and accommodating. The discovery, integration, and application of knowledge as defined by Kolb's framework leads to critical thinking skills (Carmel-Gilfilen & Portillo, 2010), which are fundamental to problem solving and conceptual development in the interior design profession.

All four learning styles need to be assimilated to arrive at critical thinking. The Kolb cyclical framework, and the supporting experiential learning theories central to it, can be observed as interior design students engage in the problem-solving process. Kolb's learning cycle defines *divergent thinkers* as those who integrate new knowledge by engaging in concrete experiences; *assimilators* reflect on experiences from a variety of view points; while *convergers* use these ideas or concepts to build theories or generalizations; and *accommodators* apply these theories or generalizations to actively solving practical problems. Further, Kolb has integrated these four types of learning styles into a theoretical model to illustrate how knowledge is gained through experiential learning. Divergent thinkers gain knowledge through Concrete Experience (CE) and transform it by Reflective Observation (RO) to understand the experience from different points of view. Assimilators gain knowledge through Reflective Observation (RO), which is then used to create theoretical models. Convergers gain knowledge through Abstract Conceptualization (AC), which may lead to the determination of one correct solution or answer. By contrast, accommodators take the knowledge gained through Concrete Experience (CE) and transform

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these ideas through Active Experimentation (AE). Problem solving through trial and error can best be used to describe the learning style of this fourth group (Kolb, 1984; Nussbaumer, 2001; Nussbaumer & Guerin, 2000; Carmel-Gilfilen, 2012). Figure 1 illustrates these interrelationships.

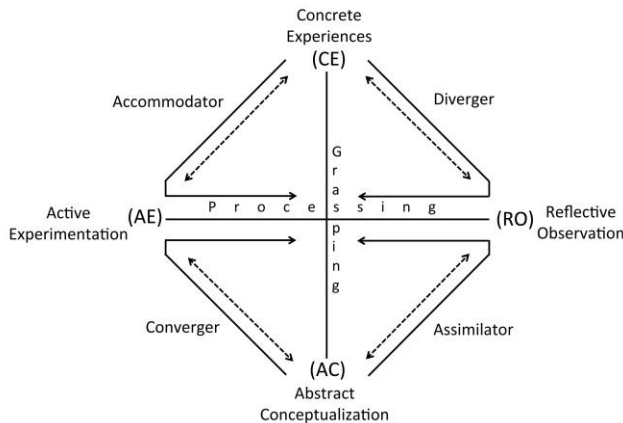


Figure 1. Kolb's Experiential Learning Theory with Learning Style Types, (Nussbaumer & Guerin, 2000, p.5).

To better understand the complex nature of these learning styles and experiences, it is essential to introduce the concept of learning spaces. According to Kolb (2005), "Knowledge resides not in the individual's head but in communities of practice. Learning is thus a process of becoming a member of a community of practice through legitimate peripheral participation" (p. 200). These learning spaces extend beyond the teacher and the classroom and provide a continuum or cycle of growth-producing experiences such as first-hand observations in a relevant environment. Through mentorship by individuals involved in the experiential learning community, students can grow in their expertise and knowledge of the learning space.

### *Characteristics of Experiential Learning:*

It is important to emphasize the central role experience plays in the learning process and to enhance this in higher education. According to Kolb (1984), there are six characteristics of experiential learning:

#### *1. Learning Is Best Conceived as a Process, Not in Terms of Outcomes*

With experiential learning, there is no endpoint. Ideas should be continually formed, tested, and re-formed through experience. Interior design educators generally emphasize the design process as opposed to the end product, as the process can stimulate more critical thinking and deepen a student's understanding of the

problem. As Kolb (1984) suggests, "The tendency to define learning in terms of outcomes can become a definition of nonlearning, in the process sense that the failure to modify ideas and habits as a result of experience is maladaptive" (p. 26).

#### *2. Learning Is a Continuous Process Grounded in Experience*

Students should be assigned real life design problems representative of the work they will be likely to encounter after graduation. This helps students hone their problem-solving (and problem-defining) skills and move their knowledge from the classroom to professional practice. Too often, faculty may ask students to design spaces with which the students have had no experience. Are students prepared to design a well-conceived emergency department if they have never spent time in one? Students may have preconceived ideas about interior spaces that may not hold true when tested in a real world situation. Upon testing, new ideas based on experience can then be integrated into the learning process or substituted for ideas or beliefs that are no longer valid. Physical interaction with an environment is essential to the design student for complete understanding.

#### *3. The Process of Learning Requires the Resolution of Conflicts Between Dialectically Opposed Modes of Adaptation to the World*

To be effective and yield creative results, experiential learning should integrate all four learning modes. Here, the student is challenged to deal with opposing ideas in belief systems, theories, and design resolutions. With this comes differences and conflicts where students must work through problems with opposing modes of reflection and action, and feeling and thinking. Students must be encouraged to leave their bias at the door while involving themselves in new experiences (CE). They must observe experiences from many perspectives and reflect on the meaning of these observations (RO). Concepts can then be created that can synthesize observations into sound theories (AC), and these theories can be used to make decisions and solve problems (AE). At the end of this process, the cycle begins again to take learning to yet a higher level (Kolb, 1984).

#### *4. Learning Is a Holistic Process of Adaptation to the World*

For true learning to occur, students must view subject matter from different perspectives. Further, learning can occur in all human settings and is a lifelong process encompassing the acts of thinking, feeling, perceiving, and behaving or what Kolb describes as "the integrated

functioning of the total organism” (Kolb, 1984, p. 31). Human behavior, which is central to the practice of interior design, can only be truly understood from a holistic point of view. When is behavior governed by thought and when by feeling? If one begins to understand learning from this holistic perspective, and the integration of the learning process and subprocesses is further analyzed, then the instructional methods can respond accordingly (Kolb, 1984).

##### 5. *Learning Involves Transactions Between the Person and the Environment*

There is a reciprocal relationship between people and their environment. Experiences within the environment are both objective and subjective. As Tucker (2007) suggests, “Physical interaction ... gives rise to learning in a continuous cycle in which the student forms abstract concepts, tests the implications of these concepts in new situations via concrete experience and then reflects on what they have observed” (p. 247). Experiences with real world environments are essential for learning to occur. How does the environment shape behavior, and how does behavior shape our physical environment?

##### 6. *Learning Is the Process of Creating Knowledge*

To achieve the best learning outcomes, both general and specialized knowledge must be synthesized to effectively arrive at well-conceived and justifiable design solutions. This can only occur along with a healthy dose of skepticism and engaging in critical thinking. Through this cyclical process, learning is stimulated and students create new knowledge. Every time the cycle is repeated, the level of knowledge gained is enhanced. “This process is portrayed as an idealized learning cycle or spiral where the learner ‘touches all the bases’ – experiencing, reflecting, thinking, and acting – in a recursive process that is responsive to the learning situation and what is being learned” (Kolb & Kolb, 2005, p. 194).

## Integration of Experiential Learning

According to the Council of Interior Design Accreditation as formulated in their 2007 Future Vision Forum, “The increased complexity of the world impacts interior design with a greater need for rigorous examination of problems in knowledge-based thinking in search for solutions” (as cited in Carmel-Gilfilen & Portillo, 2010, p. 2). Thus, the post-occupancy evaluation was selected as the means to expose interior design students to a learning experience that focuses on critical thinking within an experiential learning framework. POEs provide insight into the consequences of past design decisions and the resulting building performance and inform future design decisions. They

assess how well buildings match users’ needs and identify ways to improve building design, performance, and fitness for purpose (Preiser, Rabinowitz, & White, 1988).

To utilize a multi-method learning approach and before engaging in the POE and experiential learning process, a selected group of students read and reflected on evidence-based design research that suggested best practices in emergency department and healthcare design. Evidence-based design is defined as “the process of basing decisions about the built environment on credible research to achieve the best possible outcomes” (Center for Health Design, 2008, p. 4). The students could then analyze research findings against real world observations and resolve conflicts between the two. The ultimate goal of testing evidence-based design is to “understand something: to be able to identify relationships between concepts, to be able to define problems for investigation, to be able to collect relevant information, [and] to be able to research a question” (Kolb, 1984, p. 198). Thus a student can view the subject matter from various perspectives including literature reviews, personal experiences, and expert opinion. As suggested by the experiential learning framework, the student is left to resolve differences between these various forms of input and problem solving can begin to occur.

As noted, the use of a POE allows students to test and validate design hypotheses put forward in evidence-based design research and by the design firm during the pre-design process (Augustin & Coleman, 2012). Further, this methodology incorporates the inherently different learning approaches of students and explores transactions between people and their environment. With a POE, students can analyze user experiences and design performance within a real world setting. Through participation in evidence-based design research and experiential learning opportunities, students can identify the source of design problems and prioritize solutions, test innovations, and support strategic decision-making.

Since interior design students are both creative and visual, they draw on a variety of skills from multidisciplinary contexts (Nussbaumer, 2001). To help students develop critical thinking skills and expose them to an unfamiliar environment, we constructed a course that would be taught in conjunction with a local architectural firm seeking a post-occupancy evaluation of their recently constructed emergency department. By engaging students in a POE, they have opportunities to test their beliefs and theories and develop first-hand experience with the evidence-based design research process and environmental qualities of an emergency department.

According to Kolb (1984), “Immediate personal experience is the focal point for learning, giving life,

## EMERGENCY DEPARTMENTS AS LEARNING SPACES

texture, and subjective personal meaning to abstract concepts and at the same time providing a concrete, publicly shared reference point for testing the implications and validity of ideas created during the learning process. When human beings share an experience, they can share it fully, concretely, and abstractly” (p.21). Knowing this, the course was designed to utilize a seminar format where students individually read assigned evidence-based design articles and shared their findings via presentation and discussion formats on a weekly basis. This exposed students not only to information regarding healthcare settings and emergency departments, but also to research methodologies, which was the overarching learning objective of the course.

Research methodologies were first introduced via the traditional learning format; the instructors presented and a student discussion followed or was integrated into the lecture. This equipped students with an understanding of the broader context of research and its importance in the design process. After discussing weekly objectives with the design firm and emergency department administration, research tools were developed by the principal investigators (course instructors), pilot tested, and revised accordingly. Students were instructed in the use of the research instruments and tools, which encompassed a discussion of the importance of maintaining validity and reliability in data collection. Over the course of ten weeks, students had an opportunity to utilize a variety of methodologies in weekly observations of doctors, nurses, technicians, custodial staff, and patients and their families within the behavioral setting of the emergency department. During the data collection process, students were encouraged to make notes on problem areas within the facility, limitations of the data collection instruments, and observations based on comments from the medical staff and users of the facility. Students not only gained experience from their work within the emergency department, but also in collecting both quantitative and qualitative data for analysis.

Before beginning data collection, students were required by the Institutional Review Board to become certified in human subjects research. They then toured the emergency department with members of the architectural firm to gain familiarity with the stated goals of the design firm and the integration of these goals into the designed facility. Each week in the process had a different focus and after each data collection period, time was allowed for discussion and reflection on observations to help students give context and relevancy to both the study and the broader framework of design research. In accordance with Kolb’s framework (1984), students observed experiences from many perspectives and were challenged to reflect on the meaning

of these observations from both a personal and experiential point of view, as well as through the lens of evidence-based design.

More specifically, among the research methods utilized were systematic observations including behavioral mapping, occupancy counts, observation of human behavior regarding patient privacy issues, staff interaction, equipment use, waiting times, and environmental studies including the use of positive distractions, and measurements of acoustic and lighting levels. Systematic observations are essential to the POE process, particularly since the process often utilizes multiple participants and a multi-method format. With this approach, specific research questions can be answered and design hypotheses developed during the pre-design phase can be tested. Training the students in the use of the research instruments and tools helped ensure reliability in the data collection process.

To illustrate this concept, the POE team collected data documenting staff behavior concerning the exchange of confidential patient information. Specific locations of informational exchange were recorded on a given map of the unit. It had been hypothesized by the design firm that utilizing an open-plan central core would focus staff communication to within the core and lessen breaches of patient confidentiality outside the core. By documenting specific locations where information was exchanged among staff members, the validity of this hypothesis could be analyzed and lessons can be learned for future design implementation (See Figures 2 & 3).



Figure 2. Open-plan central core with staff work areas. Photo by author.

In another methodology, observers used a behavioral mapping technique to indicate how people use space. According to Scott-Webber, behavioral mapping documents “how the environment impacts behavior, learning, and knowledge sharing.” She goes on to say that “the behavioral mapping process is used to better understand people’s behavior in an environmental setting. Often what people think they do and what they actually do

## EMERGENCY DEPARTMENTS AS LEARNING SPACES

are two different things” (as cited in Botti-Salitsky, 2009, p.58).

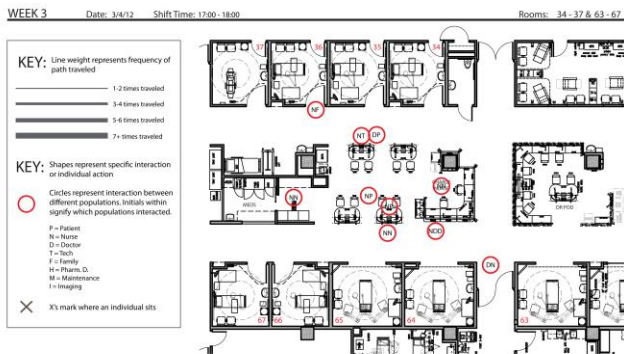


Figure 3. Data documenting staff behavior concerning the exchange of information in and around the central core.

The design firm had hypothesized that the open-plan central core would improve staff efficiency by decreasing walking time and increasing patient care time. To test this hypothesis, observers documented walking paths on a provided floor plan using a predetermined coding system. At the same time, those being observed wore pedometers to measure actual walking distance. To maintain readability, floor plans were changed every 30 minutes. Data were collected over the period of a week and at various times of the day to ensure an accurate picture of how the spaces were being used (See Figure 4).

After a compilation of the behavioral maps over a week’s

time, students could begin to assess how the space is being used and the validity of the hypothesis. In short, how did the design of the space facilitate or hinder user behavior? To further increase understanding, this process was carried out in various locations of the emergency department to allow for comparisons. This technique was useful to help students gain knowledge in an area where they may not have expertise, motivation, or accessibility to fully comprehend the ways in which various user groups interact with and behave in a specific space.

Again, reflection on these experiences occurred after each weekly observation. In addition to classroom discussions, students were asked to create and maintain a blog reflecting on their involvement in the process development, research techniques employed to answer the proposed questions, and their general impressions and observations on the design of the space. Reflection via web blogging is a useful tool to the research process, as it provides an informal vehicle for thought and reflection on process and documentation for future action. To further demonstrate evidence-based design and the importance it places on the integration of research into the public realm, several students created and presented a poster at an undergraduate research forum to document their learning experience. Unfortunately, time constraints of the course did not allow for the final piece of Kolb’s framework (1984), in which theories developed are then implemented, in this case into the design of a healthcare space.

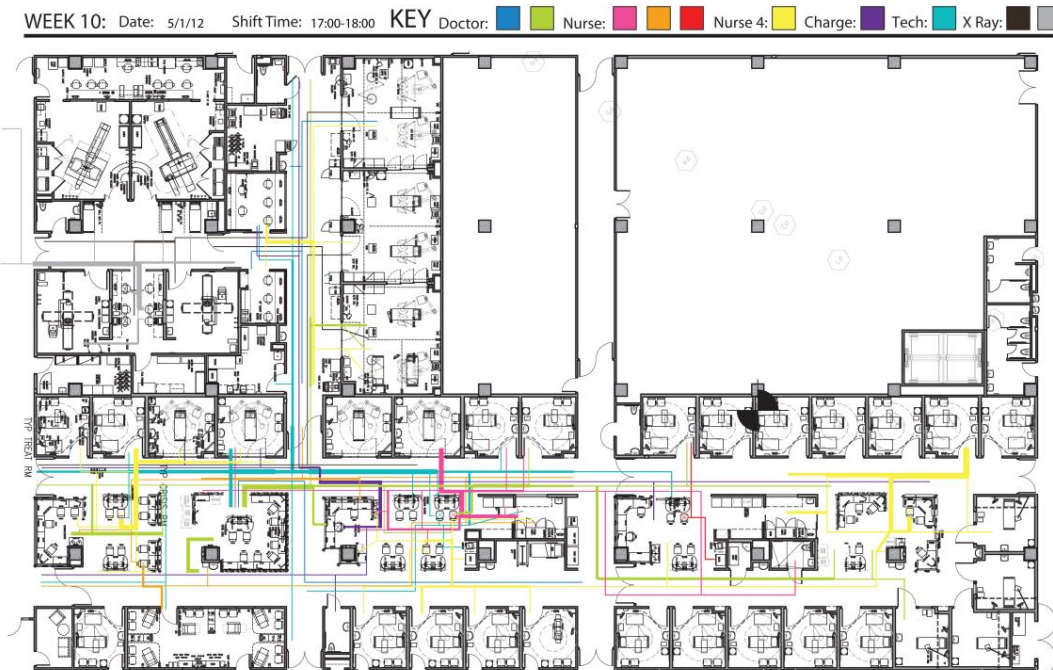


Figure 4. Behavior Mapping Technique

## Conclusion

The case study of the emergency department provides an example of one learning opportunity, among many, where students can engage in experiential learning through an analysis of their environment. Knowing this, learning spaces can be found almost anywhere. The post-occupancy evaluation was the vehicle used to engage students actively with the designed environment. As confirmed by Augustin and Coleman (2012), "The built environment is a valuable source of information for design research, acting as a living lab for user-experience and design performance. The post-occupancy evaluation as a research initiative is focused on evaluating and measuring the performance of the built environment relative to the design objectives" (p. 255).

As suggested by Kolb (1984), students' preconceived ideas about interior spaces need to be tested in real-world situations. Learning spaces offer places where students can test hypotheses put forward in evidence-based design research. Evidence-based design utilizes rigorous research to help support decision-making and achieve the best possible design outcomes. Yet as Hamilton notes, "In many ways design based on supporting evidence is nothing new." (p. 29). The interior design process has always relied on the studies of psychology, sociology and geometry, among other disciplines, to arrive at informed design outcomes. "What is different today is the emphasis on increased rigor, along with the imperative to explore new domains of knowledge outside [a student's] own field" (Hamilton, 2007 p. 30).

Kolb's experiential framework (1984) supports all learning styles in that students engage in concrete experiences, reflect on these experiences from a variety of viewpoints, build theories or generalizations, and then apply these theories or generalizations to actively solving practical problems. This framework supports the design process and the variety of learning styles found in the interior design classroom. It also confirms that learning is a cyclical process that can take place in any environment where ideas are continually formed, tested and re-formed through experience. Therefore, learning truly never ends.

The proper design and evaluation of our built environment, along with a culture that prioritizes the health, safety and welfare of all users, is essential. Through experiential learning, exposing students to these viewpoints, evaluative methodologies, and the designed environment better situates them to enter the design profession and will lead to the creation of informed decision making and environments that are more responsive to user needs.

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