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Teaching through Doing: Post Occupancy Evaluation of Berkeley’s New David Brower Center

Galen Cranz  
*University of California - Berkeley*

Georgia Lindsay  
*University of Colorado Boulder, Georgia.Lindsay@Colorado.EDU*

Lusi Morhayim  
*Israel Institute of Technology*

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Title:
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Authors:
Galen Cranz (corresponding author)
Professor, Department of Architecture
University of California, Berkeley
232 Wurster Hall
Berkeley, CA 94720
(510) 658-9330
galen@berkeley.edu

Georgia Lindsay
Assisting Visiting Professor, Environmental Design Program
University of Colorado Boulder
gorgia.lindsay@gmail.com

Lusi Morhayim
lusimorhayim@gmail.com

Running Title:
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Teaching through Doing: Post Occupancy Evaluation of Berkeley’s New David Brower Center

Abstract
This paper offers a pedagogy for teaching post-occupancy evaluation (POE) research, which emphasizes learning by doing and offers an efficient division of labor. One of the two major assignments of a primary human factors course, the POE is assigned to 150 students in a single semester. Research is divided into six researchable questions to be answered by sections, of 25 students each. Each section is then broken into 5 teams, and each team is assigned one of the following 5 social science data collection techniques: (1) direct and indirect observation, (2) interviews, (3) questionnaires, (4) photo elicitation, or (5) archival analysis. This results in a matrix of questions and answers; each question is answered by 5 different data collection techniques, providing a comprehensive analysis with minimal effort from each student. This paper outlines class planning, student survey results, and the strengths and limitations faced in such assignments. The research project gives students hands-on experience, allows comparison and contrast for each data collection technique, and gives insights regarding user response to various building designs. At the same time, students are engaged in a public service as they are collecting data about a local building.

Keywords: teaching E&B, sustainable architecture, green architecture, post-occupancy evaluation, user feedback, NAAB requirements, service learning
Introduction

Researchers in person-environment studies understand the importance of taking the user into account when assessing a building’s performance; however, there is less consensus about how to teach this process to architecture students. This paper offers a pedagogy for fulfilling the NAAB requirements for Investigative Skills and Applied Research, through a project in which students conduct a post-occupancy evaluation, and which emphasizes learning by doing and an efficient division of labor. Our approach expands what has been called the “signature pedagogy” of environmental design education, that is, it expands programming research for design studios through what others have called “live projects” (Peel, 2011). One of the major assignments in the primary human factors course at Berkeley, "Social and Cultural Processes in Architecture and Urban Design," is a Post-Occupancy Evaluation (POE) of a local building. The site of a 2009 assignment, which serves as a demonstration of the process, was The David Brower Ecology Center, a competition-winning design and first LEED Platinum Certified building in Berkeley. The Center is part of mixed use complex that combines affordable housing, art and education spaces for environmental awareness, and offices for non-profits that work on sustainability related issues.

In this project, buildings are evaluated from the point of view of their various and multiple users. The teaching team, consisting of the instructor of record and three or four Graduate Student Instructors, meets with building managers and tenants to find out what questions are important to the users. The team then organizes those questions into themes, one for each of the discussion sections—in this case six sections with approximately twenty-five students each. Each discussion section is then broken into five data collection groups, and each is assigned to a different social science data collections technique—direct and indirect.
observation, interviews, questionnaires, photo elicitation, and archival analysis. This creates a matrix of questions by techniques; each of the major questions is answered from six different points of view, so that, over all, a multifaceted view of the building's performance is generated from the coordinated work of many students. Thereby, comprehensive feedback is acquired with minimal work on the part of any one researcher. The teaching team and sometimes a student volunteer do the work of coordinating the students’ research findings.

This paper reviews the literature on research in architectural education, then proceeds to describe (a) the preparation of the POE assignment, (b) methods of organizing and guiding approximately 150 students to conduct a comprehensive examination of an occupied building, (c) student response to the project based on a student survey, and (d) some of the complications that come with doing research in the real world, followed by concluding remarks on learning outcomes possible through this or similar projects.

The Place of Research in Architectural Education

Studio practice is a unique experience, one in which students learn to think about design (Dorrian & Hawker, 2003; Frank, 2008; for examples, see Westfall, 2008; Wheelwright, 2004). Yet, in a hectic studio environment that privileges artistic creativity, students barely find time to use existing research data to feed their design. However, the profession of architecture is changing, with building performance evaluation becoming the “world-wide practice of many researchers, practitioners, organizations and public agencies” (Mallory-Hill et al., 2011a, 11). With those changes come calls for changes in education. Boyer and Mitang (1996) called for more liberal arts, flexibility, integration, and service in architectural curriculum. Criticisms have been leveled not just at how architecture is taught, but also at the explicit content, which
often values appearance and style at the expense of evidence derived from research. However, because the profession is increasingly market-driven, designers need to be able to justify their decisions to non-designers and market-driven clients; education increasingly emphasizes meeting user and client expectations that are beyond aesthetics (Lawrence, 2000).

One major change is the move to evidence-based design from both energy and social standpoints. Because buildings consume such a large percentage of energy usage, architects, while still in school, need to learn about case studies of a building’s impact on the environment (Riley, Grommes, & Thatcher, 2007). From a social standpoint, design education has traditionally focused on studio courses where the teacher is the arbiter of taste, leaving the students’ taste and researchers’ findings outside of the equation. To remedy the situation, research must be “brought to the center of the architectural curriculum, providing the basis for a cycle of continuous reflection, learning, and improvement. We need a deep research ethic to guide the art of intuition” (Kieran, 2007, p. 31).

Research has long been required in architectural education; the National Architectural Accrediting Board has requirements for Investigative Skills and Applied Research (NAAB, 2009). Some studio instructors have responded to the call for more research with a research studio, where students assess existing conditions or building performance to not only learn for themselves, but also to add to the discipline’s understanding of the results of building and design (Armstrong, 2000; Hinson, 2007; Kieran, 2007). Some famous examples of this include Rem Koolhaas’ Project on the City courses or Venturi Scott Brown’s Learning from Las Vegas studio (Varnelis, 2007).

This paper presumes that dedication to research must go beyond studio classrooms and permeate the entire curriculum. Educators in a fields including construction management,
architecture, design, and building science introduce ideas of building performance evaluation and task students with small assignments relating to post-occupancy evaluation in countries such as Germany, Brazil, and the United States (for a collection of examples of teaching practices, see section V of Mallory-Hill et al., 2011b). Although one study using a checklist for students conducting a walk-through found that “the results of implementing evaluation research as a form of inquiry based learning were not extraordinary” (Salama, 2011, 284), the research presented here goes beyond a short survey or a checklist and asks students to more comprehensively create a research project with the client’s questions in mind. Combining on-site data collection with library research, as this project has students do, can help students learn to access “social science literature with an eye to making it relevant to architectural design” (Pavlides and Cranz, 2011, 308).

The project described here is conducted in a non-studio class and fulfills many NAAB requirements. As an in-the-field research project, it fulfills A.5, Investigative Skills, helping students learn to “gather, assess, record, apply, and comparatively evaluate relevant information.” Similarly, as its own applied research project, it helps students understand “the role of applied research in determining function, form, and systems and their impact on human conditions and behavior,” educational outcome A.11. As a study of a single-case precedent, this project also response to A.7, Use of Precedents, and in its attention to the user, it partially fulfills C.3, Client Role in Architecture, as well. Finally, because of the nature of the building chosen, this project also helped at a rudimentary stage of B.3, Sustainability. Thus, careful choosing of the building could address other NAAB requirements; for example, choosing an apartment building where recent immigrants live could help support A-10, Cultural Diversity.
In addition to fulfilling the NAAB criteria, POE studies let students know early in their professional development at least two things. One, architect’s intentions are not always apprehended or appreciated by those who live in and use the buildings. Two, there are always unintended consequences of design decisions. Establishing the practice of paying attention to users’ actual experience of buildings can have both aesthetic and financial benefits. POE feeds data into evidence-based design, and that creates user and client satisfaction, which leads to repeat business and referrals. Moreover, teaching POE has the potential for faculty to collaborate with one another to evaluate local buildings done by colleagues or for enriching town-gown relations by receiving nominations or requests for building assessments from the local chapter of the AIA.

Service-learning, another aspect of the POE project, is used in classrooms as a way to give students hands-on experience with design skills working in real-world situations and simultaneously interacting with the surrounding community (Forsyth, Lu, & McGirr, 1999; for recent examples, please see Hardin, Eribes, & Poster, 2006; Huge, 2009; Winterbottom, 2002). Salama, a widely published writer on architectural pedagogy, calls for experiential learning in architectural education, classes that involve field visits to sites where students can observe behavior and interact with the environment (2006). Other authors call the process reality-based, but the idea is the same: get architecture students out of the halls of the academy and move into real-world situations and problems, a pedagogy often justified by references to Piaget’s model of learning (Pati, Park, & Augenbroe, 2006). The post-occupancy evaluation project laid out here responds to the need for “evaluation as a valuable research vehicle,” to help students establish “a knowledge base about the built environment that has the capability of endowing students with
more control over their learning, knowledge acquisition, assimilation, and utilization in future experiences” (Salama, 2008, p. 119).

Over the years students in "Social and Cultural Processes in Architecture and Urban Design," a junior level undergraduate course taught in Berkeley, have assessed the new Music Library, the new East Asian Library, the venerable Hearst Gymnasium for a planned renovation and addition, the Manville Student Apartments, the Hearst Field Annex as the temporary headquarters for departments being seismically upgraded elsewhere on campus, the Hass School of Business both as a new building and then again five years later, and the Redwood Gardens Senior Housing complex. Some of these studies have been published as a contribution to the accumulating fund of knowledge about how these building types work for their local community (Cranz et al., 1997; Cranz and Young, 2006; Cranz, 2007).

This pedagogy for teaching post-occupancy evaluation is based on this accumulated experience, but the examples are based on the 2009 study site, The Brower Center. In this case the students learned not only about research methods, but also about an innovative green design and about user response to a LEED certificate building.

A. Preparing the assignment

Preparing the assignment is the first step in making this research doable in a single semester for approximately 150 students.

1. Forming research questions with users

Research questions in each POE research project are almost always generated in collaboration with stake holders at the site, in this case the building manager and representative tenants. They define what issues are important to them and those concerns are organized by the
teaching team into six to eight questions depending on the number of discussion section groups in the course that year. With this approach we hope to model to students, practitioners, and other teachers how design education can be nourished by a robust connection with users.

In the case of the Brower Center, building managers and key tenants outlined the main goals of the building. The building was praised for its use of sustainable building technologies and ecological materials and for educating public about sustainability through its exhibitions. In addition to being a good example of sustainable architecture, the building was claimed to be a technological device to stabilize and support tenant connections. From these intentions the following 6 questions for different locations within the building were generated:

1. How does the Center engage and inspire the public about sustainability through the gallery and lobby space?
2. How does the Center engage and inspire the public about sustainability rentable spaces?
3. How does the Center stabilize and support tenant connections through offices and shared tenant spaces?
4. How does the Center stabilize and support tenant connections through public areas?
5. How does the Center connect to downtown Berkeley through non-tenant use of public spaces?
6. How does the Center connect to downtown Berkeley through its urban context?

2. Teaching research methods comparatively

After the questions have been defined, each question is assigned to one of the sections. Then, each discussion section is broken into five teams, and each team is assigned to one of the following five social science data collection techniques, each of which is explained more fully
below: (1) direct and indirect observation, (2) interviews, (3) questionnaires, (4) photo elicitation, or (5) archival analysis, resulting in the matrix shown in Table 1.

<table>
<thead>
<tr>
<th>Data Collection Techniques</th>
<th>Users &amp; spaces</th>
<th>Observation</th>
<th>Interviews</th>
<th>Questionnaires</th>
<th>Photo elicitation</th>
<th>Archival and precedents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilize and support tenant connections</td>
<td>Tenants in gallery and lobby, meeting rooms, elevators, stairs, courtyard</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilize and support tenant connections</td>
<td>Tenants in offices and shared tenant spaces</td>
<td></td>
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</tr>
<tr>
<td>Engage and Inspire the public about sustainability in the gallery and lobby space</td>
<td>Visitors in gallery and lobby</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Engage and Inspire the public about sustainability (rentable spaces)</td>
<td>Guests of temporary renters in (lockable) public spaces</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Connect to downtown Berkeley through non-tenant use of public spaces</td>
<td>Temporary renter (including UCB, other NGOs, businesses) lobby, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect to downtown Berkeley through the urban context</td>
<td>Everyone</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 1: The empty issue-data collection matrix. Each group of 3-5 students fills one square.

1. Observation

Students conduct observations of people in the building, using either their own maps or copies of official floor plans. Depending on the question they are answering, students record different types of uses (such as waiting, chatting, looking at art, looking at the building).

Students are required to observe users at different times of day and on different days of the week to get a good cross-section of users and behaviors. Some questions are difficult to answer with direct observation, so students are encouraged to be creative in devising indicators. For example,
the students who were attempting to answer “How does the building connect to downtown Berkeley” by observing people within the Brower Center decided to record racial demographics of the visitors and compare those to the racial demographics of the City of Berkeley as a whole.

2. Interviews

Students design structured and semi-structured interview questions regarding their section’s question. The interviews are designed to take between 15 and 20 minutes, and be a mix of closed- and open-ended questions. The groups interviewing visitors worked to stagger their interviews at different times of the day and different days of the week in order to capture the opinions of as wide a variety of users as possible. Regardless of their focus question, most groups also collect some demographic information from their interviewees. Each group is supposed to interview twenty users (thus, 120 people total); however, at the Brower Center, those interviewing the tenants and the renters had limited access to their target group, and were forced to be inventive regarding whom they interviewed. For example, the group interviewing renters identified potential renters, such as UC Berkeley student groups or nearby non-profits, to interview.

3. Questionnaires

Students design their own questionnaires, focused around their specific question. Closed-ended questions are encouraged for ease of data analysis. A general recommendation is that each group collect sixty questionnaires, but again the Brower Center proved more complicated here, as with interviews: some identified user groups were simply unavailable to the students, and again the students had to be creative in how they defined their user group. Although students in previous years had no trouble collecting the minimum required questionnaires, at the Brower Center, few student researchers were able to collect the targeted number of questionnaires:
response rates were less than one third of those asked, so the number of responses ranged from twenty to forty.

4. Photo Elicitation Interviews

Students design structured and semi-structured interview guides regarding photographs they have taken of the site. Student researchers ask questions about each image, such as, “Do you recognize this place? What activities do you use it for, or you see others use it for? In what ways is this a good place for these activities? In what ways is this a bad place for these activities? If you could change it, how would you change it?” Students are not required to use this protocol, and although some groups do, many groups instead created their own. For example, at the Brower Center, one group took photographs of various parts of the building and asked people to choose and then rank the top five most sustainable features, and then followed up with questions about why respondents chose each feature. The number of respondents varied depending on the size of the group, with none having more than fifteen respondents.

5. Archives and Precedents

Here, student researchers are encouraged to narrow their question in a way that can be answered through archival research. They come up with a set of criteria and keywords to look for in their searches. Archival groups also conduct an architectural precedent study. Students search for buildings that related to the research questions that groups were answering. The findings generated by this group vary each year depending on how much access the students are granted to institutional design archives. Some years the emphasis is more on precedents and literature review, and some years it is more focused on the archives of the building. In fact, some years a separate student group reviews the literature in addition to an archival group. But, in this study, because the Brower Center is a recently completed building, archival materials
were limited to what the Brower Center was able to provide. Thus, in 2009 the archival groups were asked to include archives, precedents, and reviews of existing research related to their research question. Archival groups were given access to the archives, which included grants written, rental records, mission statements, and design documents. This group also included the Center’s own website and journal articles on related topics in their search.

B. Guiding students

Often, this assignment is the first time that students have conducted interviews, designed questionnaires, or devised plans for observation. On the one hand, strong support and direction from the instructor can help students define manageable questions, acquire manageable data, and develop meaningful findings through analysis. This can avoid frustrating delays and foster significant results, so that students can understand and appreciate the benefits of this type of research. On the other hand, students should not simply be data collectors; they also need to have the opportunity to learn through the experience of succeeding and failing with their own research designs. This struggle—between control and flexibility—is a continuous one, and renegotiated every semester.

Before embarking on research, each methods group is required to read about their assigned data collection technique from *Inquiry by Design* (Zeisel, 2006) or *A Practical Guide to Behavioral Research* (Sommer and Sommer, 2002). Discussion sections of twenty to twenty-five people meet with the Graduate Student Instructors (GSIs) each week. During those meetings students ask questions, practice, and share what they learn. During the third week, the whole section brainstorm about the question they will answer in the POE research. They think about what precisely they want to know, when to conduct their research, for how long, and with how
many people. Another week is devoted to practicing how to analyze research results, and how to present them with diagrams and graphs.

Students have a lot of latitude in deciding exactly how they will collect their data. If they are asked to learn how a building is used, but they have to decide what “use” means: they have to operationalize the concepts, like community, use, or perception that would remain abstractions until one decides what to measure. The challenge is to find a way to be precise and reliable and still represent the essence of the concept validly. Students also have to decide how to analyze their data. This part of the research process involves considerable invention and imagination. They are encouraged to find their own way, go off track and find their way back on track. They learn that research, like design, is an iterative process; students turn in many drafts of research design proposals and research instruments for editing and review, not just a final one for a grade. This same need for alertness through processes of trial and error continues through analysis and write-up.

1. Operationalizing the questions

GSIs closely monitor the progress of each method group and ask them to come up with categories to answer their questions. For instance, for the questions of “How is the building connected to Downtown Berkeley?” students in one group came up with the following categories after brainstorming in discussion section.

- Ability to attract passers-by
- Visual appeal
- Communication of sustainability
- Suitability to Berkeley’s urban and architectural context
- Accessibility
Following that, each method group comes up with ways of assessing these categories using their data collection techniques. At the Brower Center, the observation group looked at passers-by’s body language and facial expression, if they got closer to the building once they saw it, if they took time to look at the building, or attempted to see what is inside. In this process, students realize that not all of the categories are answerable by each data collection technique. For instance, the observation group could not know whether the building communicated sustainability by just observing expressions of passers-by. Pedagogically, this fact helps strengthen the message that each method fosters the uncovering of different data. Students witness first-hand what categories the other data collection groups can and cannot answer, given the nature of the data collection technique they used.

Photo elicitation groups were asked to use images of the building to generate conversations in order to find answers their research questions. The group answering the question of “How does the Center connect to downtown Berkeley through its urban context?” showed photographs of three different entrances, the Brower Center, and a housing complex, and a retail complex that share a building with the Center, and asked which one looks like the DBC’s main entrance. They found that nearly 2/3 of the interviewees missed the Brower Center’s entrance (Figure 1) and concluded that the building was not read as either public or inviting.

Students conducting interviews or soliciting questionnaire responses often struggled with exactly how to operationalize their
question, unsure if they could directly ask their question or if they needed to go about it in a round-about manner. One questionnaire group, answering the question “how does the building help engage and inspire the public about sustainability?” solved the problem by doing both. Some of their questions were as follows:

- Is the building inspiring to you?
- If yes, which area is most inspiring? (with areas provided for people to circle)
- Which area gives the most information about environmental sustainability?
- Does the building look green/sustainable?
- How well does the building help engage and inspire the public about sustainability?

In this instance, they found that 62% of the people found the building inspiring, and respondents rated it an 8 out of 10 on how well it inspires the public, so asking the question in a different way did not yield strikingly different results. Thus, the different questions turned out to be a form of internal validation for the findings. However, had the questions yielded different results, the students would have had the opportunity to try to uncover why the answers were different.

2. Collective learning and presenting findings

As each methods group presents their findings to their section, students get a chance to see the strengths and weaknesses of each data collection technique. They are also asked to analyze the similarities and differences between their findings, and think about why those differences might occur. For instance, observation groups and interview groups may end up with contradicting findings; students often find a stark contrast between what users do and what they say. At the Brower Center, the observation group reported people interacting both in courtyard and elevator areas, as opposed to the rest of the groups who concluded that the courtyard was the
only place where tenants interacted. Thus, this within-section sharing proves to be an important part of the learning process.

After in-section presentations, each methods group from the six sections is asked to summarize and present their findings to the entire class. The building manager or administrator is always invited to this presentation, and the director of the Brower Center did attend. These presentations are supposed to be no more than five minutes per 25-person section, so students are forced to present only their most compelling findings. One section suggested adding both heaters and umbrellas to the outdoor space to promote more tenant interactions there (Figure 2). In this way students get a chance to see how the same set of techniques can be used to answer different questions. This is the phase in the research where findings, from each of the teams in each of the sections, fill the gaps in the question-methods matrix (Table 2). The findings matrix is included here to show the collective learning possible from this assignment; the details of the findings are not included since this paper’s focus is pedagogy.¹

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¹ To read about findings of Brower Center POE study see, Cranz, et al., 2013.
<table>
<thead>
<tr>
<th>methods</th>
<th>research issue</th>
<th>users &amp; spaces</th>
<th>observation</th>
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<th>questionnaires</th>
<th>photo elicitation</th>
<th>archival and precedents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilize and support tenant connections</td>
<td>Tenants in gallery and lobby, meeting rooms, elevators, stairs, courtyard</td>
<td>• elevators and the courtyard fostered the most connections; • lobby was walked through, fostered few connections; • meeting rooms were seldom used by tenants.</td>
<td>• tenants complained about thin walls transmitting noise and interrupting concentration; • not enough places for tenants to have private conversations or to meet casually; • The courtyard is the most socially successful even though it provides no privacy and has no defined purpose. • The gallery, despite being made to stimulate conversation, is extremely socially unsuccessful.</td>
<td>• ¼ tenants claimed that they rarely engage in interactions in any space other than the courtyard, but unpredictable weather meant inconsistent use. • ¼ tenants expressed a need for a space indoors where they could eat lunch and engage in longer interactions.</td>
<td>• DBC documentation included many claims of creating social interactions between tenants; • most articles about the DBC focus on environmental sustainability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilize and support tenant connections</td>
<td>Tenants in offices and shared tenant spaces</td>
<td>• more connections within offices, fewer in public shared spaces.</td>
<td>Could not collect data</td>
<td>Could not collect data</td>
<td>Could not collect data</td>
<td>• the building’s design supports more intra-group interconnection than inter-group connections, esp. common areas on 2nd floor</td>
<td></td>
</tr>
<tr>
<td>Engage and Inspire the public about sustain-ability</td>
<td>Visitors in gallery and lobby</td>
<td>• visitors spend most of their time in the gallery; • few visitors touch the touchscreen; • few visitors venture to the second floor</td>
<td>• cold, not noticeable, does not show its sustainable parts; • the majority appreciated the Brower Center more after learning that it is one of the greenest buildings in Berkeley; • many passers-by did not notice the DBC.</td>
<td>• a little over half of the people who completed the questionnaire found the building inspiring; • a little less than half of the people who completed the questionnaire did not think the building is sustainable</td>
<td>• users choose pictures of signs and symbols as the building’s sustainable features; • in contrast, people educated in sustainable design chose pictures of the actual green elements of the DBC.</td>
<td>• The DBC inspires people in regard to sustainability through media coverage and the website; • the art gallery and events held at the DBC are designed to inspire people through the spread of information about sustainability.</td>
<td></td>
</tr>
<tr>
<td>Engage and Inspire the public about sustain-ability</td>
<td>guests of temporary renters in (lockable) public spaces</td>
<td>• flexible energy use; *people using the site are not sufficiently informed on exactly how to take advantage of all the sustainable features</td>
<td>• few comfortable areas to relax and be casual, • few waiting areas for visitors waiting to be received.</td>
<td>Could not collect data</td>
<td>Could not collect data</td>
<td>• the lockable public spaces include numerous sustainable features, including automatically adjusting systems.</td>
<td></td>
</tr>
<tr>
<td>Connect to downtown Berkeley through non-tenant use of public spaces</td>
<td>temporary renter (including UCB, other NGOs, businesses)</td>
<td>• many users go to the DBC to attend a specific event, not just to look at the gallery or building; • the users’ ethnicities mirrored that of Berkeley.</td>
<td>Could not collect data</td>
<td>• 38% of the people we surveyed who work near the DBC have never heard of it; • of those who had heard of it, ¼ had been inside</td>
<td>• many of the qualities the student groups listed about themselves were qualities that the DBC also claims, indicating an ideological match between Berkeley campus and the DBC.</td>
<td>• the DBC attracts organizations from the larger Bay Area or UC Berkeley • the majority of the DBC’s renters are environmentally and socially responsible nonprofit organizations.</td>
<td></td>
</tr>
<tr>
<td>Connect to downtown Berkeley through the urban context</td>
<td>Everyone</td>
<td>• the big windows attract attention; • passers-by pay more attention to the activities in the building than the building itself.</td>
<td>• most people walked to the site; • most people found entrance easy to locate; • most people said that building modernizes downtown Berkeley, but could not tell if the building was green or not.</td>
<td>• only 6/35 respondents liked the color of the building. The exterior design “did not indicate sustainability.” • only 7/38 disapproves more buildings like the Brower Center to be built in the downtown Berkeley, 15/36 think that building blends well into its surroundings.</td>
<td>• most people found the DBC communicated sustainability, but was visually unappealing; • the DBC fit in the urban context of downtown Berkeley, but not necessarily the immediately surrounding buildings; • most respondents could not identify the correct main entrance and did not find the entrances welcoming.</td>
<td>• the DBC expects to receive a LEED Platinum rating; • the performing arts theater in Berkeley inspired the organization of the building; • one goal is to promote independent artists, yet the gallery has a limited space and opening hours that only allow for a few artists at a time.</td>
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</tbody>
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Table 2: Findings in the issue-method matrix
C. Student Perspectives on Learning POE

At the end of the fall 2009 semester, students were offered ½ point extra credit for responding to an online survey asking them to rate and comment on their own learning, using www.surveymonkey.com. Students were asked about how well the project helped them (1) to learn a range of data collection techniques, (2) to evaluate buildings, (3) to work in a team, and (4) to think about design, using both a Likert scale (1-7, with one being the least helpful and seven being the most helpful) and with open comments. They were also asked which data collection technique they thought was the most effective. Finally, there were asked if they were enrolled in studio that semester, whether or not they had tried to incorporate these techniques into studio class projects, and how it went, and whether they planned to implement any of the methods they learned in the POE project into their future practice as designers. Ninety students responded, although far fewer choose to leave comments.

<table>
<thead>
<tr>
<th>How well the project helped you learn… (with 1 being not at all and 7 being most helpful)</th>
<th>range of data collection techniques</th>
<th>about how to evaluate buildings</th>
<th>about how to work in a team</th>
<th>about how to think about design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.2</td>
<td>4.3</td>
<td>4.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Median</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Mode</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Comments addressing problems with the site</td>
<td>8 of 54</td>
<td>13 of 53</td>
<td>0 of 44</td>
<td>5 of 39</td>
</tr>
</tbody>
</table>

Table 3: Student responses to the project.

The mean response to each question was above four (Table 3). Many of the comments indicated that some of the reason for low scores was student frustration at the newness of the building and the restricted access we had to tenants and renters alike. This limitation for this particular project is discussed in the next section.

2 Graduate student instructors collected the survey results only after grading student’s final projects in order to assure that student can respond to the year-end survey honestly.
Out of fifty-four comments in response to learning a range of data collection techniques, fourteen of them talked positively about learning a range of data collection techniques and understanding importance of verification, such as “I did learn that it is not sufficient to merely observe a space, or assume you know how the space will work, and that by gathering information from different perspectives, you can see what things work and what does not by the similarities in data from all of the techniques.” But, twenty of the comments were about the drawbacks of learning only a single method effectively, not the rest. Based on these answers, the teaching team has decided to increase students’ exposure to all data collection techniques, perhaps by budgeting more time to exchange information between methods groups.

Out of fifty-three comments regarding how to evaluate buildings, twenty-five of them stated their knowledge was expanded. One student said, “Before taking this course, the only method I knew for how to evaluate a building is simply through looking at drawings and models (studio reviews)…” Seven comments specifically addressed the importance of taking into account the users. For instance, “It makes it clear where the faults in the buildings lie through the eyes of the users.”

This assignment heavily relies on skills to work collaboratively with others. Since students who take this class include majors outside of architecture this assignment also teaches them how to communicate with non-architects. On the one hand, students enjoy working in teams because it creates a supportive environment and provides the ability to brainstorm together. On the other hand, sometimes work gets unequally divided between students even though team gets a single grade. Out of forty-four student comments on teamwork, twenty-two of them indicated that the assignment helped them learning how to work in teams, such as “… I think we all learned how to negotiate and plan collectively.” However, twelve comments
indicated frustration. In particular, many students complain that scheduling is one of the most challenging parts of working in teams. Another ten comments were neutral.

Out of thirty-nine comments about learning to think about design, twenty-five of them indicated that students gained new perspectives on design: “POE makes the researchers see things about functionality of buildings that couldn't otherwise be noticed. The best example is one of the architecturally successful spaces in the building, which was underused, but not noticed until after the data collection.” Eleven comments addressed attention to the users, “All the data that we got shows that whether a building is successful depends on what people feel about it.”

When asked whether they would try to implement some of the methods learned in the POE into their future career as designers, seventy-six said yes. Fourteen said no, but of those, six said it was because they were not planning on being designers.

**Discussion and Conclusion**

There are several ways of POE can be taught to students. Here are our thoughts on the complications, advantages, and disadvantages of the pedagogy presented in this paper. Generally, teaching POE in this hands-on way requires intensive coordination efforts by the instructor due to time constraints, public image of the building, and student’s responsibilities. The amount of time students needed to spend in the Brower Center was more than the managers expected or were willing to allow, so the teaching staff had to filter student questions and emails, and send them in batches to the administrators. Similarly, in order to limit number of students that interact with visitors, one group had to redefine their subjects as “potential users,” and give questionnaires to businesses and non-profits that were nearby in the neighborhood.

Previous experience in evaluating public buildings such as libraries was much more successful in terms of having access to workers and visitors of the building. Despite such
limitations, over all, taking the strengths and weaknesses of the assignment into account, the benefits of this project outweigh its frustrations.

Among many ways of teaching students of architecture how to conduct POE research, this method is efficient in terms of limiting the time that students interact with busy users. Only one fifth of a whole class need to relate directly with users, and even those students can work in groups. Questionnaire research teams can reach out via e-mail and expect responses out of work time. Observation groups may conduct unobtrusive research, and archival groups do not need to be on site. Perhaps, conducting each data collection technique consecutively would have its own advantages. Observations could provide insight to interviews; interviews could provide insight to better questionnaires, etc. However, with this simultaneous method the organizational load is reduced, and students interfere with the buildings’ use for only a short and concentrated period of time and then they are gone, instead of entering in and out throughout the entire semester.

Advantages prevail over the disadvantages and complications of this method. Taken together, the students’ comments on the year-end survey and many years of students’ collective research output, indicate that this assignment is effective for

(a) Teaching students about ways that social science techniques can be used for understanding successes and failures of existing buildings,

(b) Increasing future architects’ understanding of importance of allocating resources to conduct POEs,

c) Preventing students in their future careers from making the same mistakes that other architects have made in their designs,
d) Simultaneously serving as a community service to the university’s immediate community, hence part of the national and international movement to encourage service learning (Sara, 2011), and lastly

(e) This assignment fulfills important NAAB requirements for students learning investigative skills and the application of research in design.

Learning from users of the building is important, since the process adds nuance to the meaning of “success” in the realm of design, given that appearance dominates design discourse most of the time. It acquaints architecture students directly with socially successful and unsuccessful designs; this is also important because designers draw on personal experience both consciously and unconsciously in the creative process (Israel, 2003; Cooper Marcus, 1979).

This method of using simultaneous research methods in small groups provides a model for professional practice. Design firms can adapt the same technique to collect fast-paced and accurate user feedback in a systematic way about buildings they have designed. Firms could use this method for breaking down building performance research questions, so that an individual employee could collect small amounts of data at a time to contribute to a feedback loop about the projects built in their round of editing own office.

In general, these projects can be a form of service learning, and in the case of the 2009 class project on the Brower Center, we observed building managers implemented some of the students’ design recommendations. For example, one year after the research, when visiting the site to take photographs, one of the authors found that the second floor courtyard now has more seating areas with several umbrellas, which have extended usability throughout the day (Figure 4). Thus, students are learning through doing, with the possibility of seeing their schoolwork having real impacts outside of the classroom.
In summary, this division of labor produces a rich, multi-faceted portrait of a building. Pedagogically, it requires advance planning and continuous coordination. Its educational advantages are significant because it teaches future architects how to look at buildings; it can transform how they design, by allowing them to anticipate likely user responses from the beginning. From a public service perspective, it offers a practical service to the profession, building managers, and the general public. With this assignment, both design professionals and facility managers learn about how a building is working from many different points of view. It offers a model for teaching architectural research and design studios. This could be the programming stage of a studio leading to substantial design propositions that grow out of the site and the behaviors, attitudes, and values of its managers, tenants, visitors, and neighbors.
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Autobiographical Sketches

Galen Cranz, Ph.D. Sociology, University of Chicago, Professor of Architecture, certified teacher of the Alexander Technique, has taught social & cultural processes, including research methods, in architecture at UC Berkeley & Princeton. Several POEs conducted by her classes have been published. She co-edited Environmental Design Research: The Body, The City, and the Buildings In between (2011), wrote The Chair: Rethinking Culture, Body and Design (2004 EDRA Achievement Award) and The Politics of Park Design: A History of Urban Parks in America, which helped her win three park design competitions. She is a Kellogg National Leadership Fellow 1981-84, and a Latrobe Fellow 2005-2007 to study evidence-based design with Kaiser Permanent Hospital.

Georgia Lindsay is a Visiting Assistant Professor in the Environmental Design Program at the University of Colorado Boulder, where she is also the department's Honors Council Representative. She received her PhD in Architecture from the University of California, Berkeley. Her research focuses on the user perspective on architecture, especially in cultural buildings such as museums and in LEED buildings. Her dissertation turned the Bilbao Effect critique back on US cities, using the Denver Art Museum as a case study, finding that the iconic architecture used to increase international visibility also changed curators’ and patrons’ relationship with art. She is currently working on a book about the user perspective in contemporary museum design, due out in 2016.

Lusi Morhayim is an architectural researcher, starting her post-doctorate research at the University of Technion next year. She received her PhD at University of California, Berkeley. Her research lies at the intersection of social and environmental sustainability, politics of space and user-centered design. She has taught architectural research and theory classes at the University of California, Berkeley and Academy of Art University in San Francisco, CA and design studio at the Yildiz Technical University in Istanbul. Prior to teaching she practiced architecture.