Utilization of Post-Occupancy Evaluations in LEED Certified K-12 Schools

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ABSTRACT

Post-occupancy evaluation (POE) focuses on the requirements that occupants have in terms of “health, safety, security, functionality and efficiency, psychological comfort, aesthetic quality and satisfaction” (Federal Facilities Council, 2001). Post-occupancy evaluations provide an opportunity to integrate multiple priorities including building performance and occupant requirements, which contributes to buildings becoming more sustainable. This research looks at the application of POE among LEED® Certified K-12 schools, and whether or not they address the imperative to include children’s perspectives about their everyday environments. Data for this study comes from a survey of LEED® Certified K-12 schools. Results show that two-thirds of the schools surveyed did not conduct a POE. Reasons identified include lack of awareness of the purpose and benefits of a POE, as well as a lack of funding. Of the 10 schools that did conduct a POE, only 2 (7% overall) included students in the process.

INTRODUCTION

Research suggests a link between the physical attributes of school buildings to student performance and achievement (Olson and Kellum, 2003; Tanner, 2000). Historically, builders and designers have implemented construction strategies aimed to improve or protect the buildings themselves. More recently, many building professionals have begun to strive to protect the occupants and living surroundings of the built environment as well (Day, 2004). The current approach to sustainable school design and construction emphasizes energy and resource efficiency and minimizing harmful health effects, but tends to stop short of considering the social impacts of sustainable design, which includes opportunities to actually facilitate, not simply protect, children’s health (Kellert, 2005). Meir, Garb, Jiao, & Cicelsky (2009) suggest that post-occupancy evaluations provide an opportunity to integrate multiple priorities
including building performance and occupant requirements, which may, ultimately, contribute to buildings becoming more sustainable by increasing occupants’ sustainable behaviors.

Existing K-12 schools across the United States are in need of renovation. In 2003, the average school building was over 40 years old, and half of all schools were in need of major improvements (US Department of Energy, 2003). According to the Green Schools Alliance (2009), school communities have the opportunity to develop a sustainable future through their collective strength, acting as stewards for environmental, economic and social responsibility. At the same time, they continue to face challenges stemming from the need to serve growing student populations amid demanding community expectations with aging buildings, constrained budgets, and increasing energy costs (Green Schools Alliance, 2009). The incorporation of sustainable design into the renovation of exiting schools, and the construction of new schools can be a way to meet some of these demands. In order to do this effectively and efficiently, feedback is needed from past sustainable school projects to determine which design strategies have been successful both in terms of building operations and impacts on building occupants. Design professionals can then use this information to improve the design of future projects.

Design professionals have previously examined the relationship between people and their environment through needs assessments, also called predesign research, and by conducting post-occupancy evaluations (Kopec, 2006). Post-occupancy evaluation first emerged in practice in the 1960s beginning with case studies, and developed into more cross-sectional evaluations in the 1970s and 1980s (Preiser, 2001). Preiser (2001) defines post-occupancy evaluation as “the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time”. It focuses on the requirements that occupants have in terms of “health, safety, security, functionality and efficiency, psychological comfort, aesthetic quality and satisfaction” (Federal Facilities Council, 2001). Emerging U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED®) credits focus on the measurement of “on-going human experience” using survey methods. Additional tools currently used to evaluate human experience in and around built environments include interviews, and direct observations. Traditional tools and methods used to conduct post-occupancy evaluations employ both qualitative and quantitative research methods (Meir et al., 2009).

Post-occupancy evaluations present the opportunity to merge practice and research through qualitative and quantitative research methods. However, despite evidence that post-occupancy evaluations provide an opportunity to balance building performance and occupants’ needs, the field is not fully established in either theory or practice (Meir et al., 2009). Meir et al. (2009) document that the use of post-occupancy evaluations specifically related to stakeholder goals and requirements, such as sustainability initiatives, is inconsistent. They identify a lack of protocols, measures and procedures for conducting post-occupancy evaluations as obstacles. Pyke et al. (2010) suggest that while traditional methods yield important insights, they are not readily scalable or spatially extensible and need further evolution and extension. Finally, Meir et al. (2009) conclude that post-occupancy evaluations are
minimally used to educate architects and other building professionals. This is a missed opportunity to inform future building projects about what worked well in the past and what improvements need to be made.

Meir et al. (2009) propose that post-occupancy evaluations bridge static performance of buildings with dynamic functioning of occupants, bringing conceptions and aspirations closer to realized practices and performances. They argue that current sustainable building standards, do not clarify discrepancies and problems between the design process and building operation and usability. Colantonio (2008) argues that within the sustainable development movement, policy makers have yet to prioritize the social impacts of the built environment, which are often more intangible and difficult to define, compared to environmental and economic priorities. Yet, nearly every decision made by a building project team has a social impact (Wendt, 2009). In conclusion, the building industry as a whole is systematically under-investigating the most valuable aspect of buildings: the occupant experience (Pyke et al., 2010).

**Post Occupancy Evaluations in Schools**

Traditionally, children have not been included as participants in post-occupancy evaluation of school buildings. Yet, children are among the most vulnerable members of society (Freeman and Mathison, 2009) and in the United States, 55 million children spend their days in K-12 schools (Olson and Kellum, 2003). Meir et al.’s (2009) review of post-occupancy evaluation studies in more than 100 selected papers showed only eight studies were of school building projects. Of those that did include post-occupancy evaluation of school buildings, none specifically reported that they included children as participants in the evaluations (Meir et al., 2009). Such research identifies a need to perform more post-occupancy studies in school building projects; however, it is unclear if there has been an increase in post-occupancy evaluations since Mier et al.’s 2009 study. The goal of the present study is (1) to determine what percentage of LEED® certified schools have conducted (or are planning to conduct) a post-occupancy evaluation and (2) whether or not children’s perspectives have been included.

To answer these research questions, a survey was conducted of LEED® Certified K-12 U.S. schools in January of 2012 as Phase 1 of a sequential mixed methods research on POEs in Green Schools. For this survey, 92 schools were identified from the US Green Building Council’s (USGBC) website that had been LEED® certified in 2010 or earlier. Schools certified after 2011 were not included in the survey since occupants would not have occupied their new buildings long enough to have conducted a POE. This list was further reduced to 75 by eliminating schools that were part of the same school district, assuming that the performance of a POE would be based on policy at the district level. Very few of the schools listed on the USGBC’s website had a contact person and e-mail identified. For those schools that did not, an online search was conducted of their websites to locate an individual at the school who would have likely been involved in, or have knowledge of the LEED® certification process (e.g., director of facilities, facilities manager, principal, or head master). A recruitment e-mail was sent to each of these individuals along with a web
link to the survey summarizing the purpose of the survey and asking for their participation. A follow-up reminder e-mail was sent two weeks later.

The survey contained ten questions and was designed to be answered in less than 5 minutes. The purpose of the survey was to determine the current use of POEs among LEED certified K-12 schools and how students were included in the POE, if at all. Responses to selected survey questions are provided in Table 1.

### Table 1 Post Occupancy Evaluation Use Survey of K-12 Schools

<table>
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<tr>
<th>Selected Survey Questions</th>
<th>Answer Options and Responses</th>
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<tr>
<td>1. After the completion of your green/sustainable school project, was a post-occunancy evaluation conducted?</td>
<td>(a) Yes, a Post-Occupancy Evaluation has been (or is being) conducted (n=10) or (b) No, a Post-Occupancy Evaluation has not been conducted (n=17)</td>
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<td>2. Were children who attend the school included participants in the post-occunancy evaluation?</td>
<td>(a) Yes (n = 2) or (b) No (n=6).</td>
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<td>3. How were children included in the post-occunancy evaluation? (Check all that apply.)</td>
<td>(a) They were interviewed (n=0), (b) They were given surveys (n=2), (c) They were observed (n=0), and (d) Other (n=0).</td>
</tr>
<tr>
<td>4. What grades were included in the post-occunancy evaluation? (Check all that apply.)</td>
<td>(a) Pre-K (n=0), (b) K (n=0), (c) 1st Graders (n=1), (d) 2nd Graders (n=1), (e) 3rd Graders (n=1), (f) 4th Graders (n=1), (g) 5th Graders (n=1), and (h) Other (please specify) (n=2)</td>
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<td>5. To better understand why certain projects conduct Post Occupancy Evaluations while others do not, please identify the reasons why a Post Occupancy Evaluation was not conducted this green/sustainable school project. (Check all that apply.)</td>
<td>(a) Not familiar with the need for/or purpose of a Post Occupancy Evaluation (n=9) (b) Not familiar with how to conduct a Post Occupancy Evaluation (n=7) (c) Lack of resources to conduct Post Occupancy Evaluation (n=6) (d) A Post Occupancy Evaluation is currently being conducted (n=0) (e) A Post Occupancy Evaluation is planned for the future (n=2) (h) Other (please specify) (n=2)</td>
</tr>
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</table>

1 All of the responses to these categories came from one school, who also indicated that they were a K-12 facility.

2 The only other response to this question was 'other' and came from a school that indicated self-identified as a K-16 institution, which is unusual in the U.S., and indicated that only college level students were included in the POE.

A total of 27 completed surveys were received for a response rate of 36%. Of the responses received, ten indicated that they had used or were planning to conduct a POE. The fact that one-third of the survey respondents indicated that they had
conducted a POE suggests that the use of post-occupancy evaluations is on the rise. However, of those ten, only two, which represents less than 7% of total responses received, indicated that they had included students’ experience in their POE. Between these two schools, only one indicated that the elementary students were included in the POE. Additionally, while these two schools indicated that they administered surveys to some of their students, neither used interviews, observations, nor indicated that they used any other means of qualitative methods to evaluate student experience.

Almost 60% (n=17) of the respondents indicated that they had not conducted a POE, even though the LEED® certification process includes credits for conducting a POE. When asked why a POE had not been conducted at their school, the majority of responses were Not familiar with the need for/or purpose of a Post Occupancy Evaluation (n=8) and Not familiar with how to conduct a Post Occupancy Evaluation (n=7).

In contrast, when asked if they would be interested in learning more about the benefits of including children in Post Occupancy Evaluations of Green Schools there were only three positive responses. It is telling that two of these responses were from the same two schools who had indicated prior use of POEs and incorporation of children. This question included a clarification that they would not be sent this additional information, but that their response would be used to determine the need for further research in this area.

**CONCLUSION AND RECOMMENDATIONS**

The survey results reported in this paper indicate that the use of POEs by schools has not changed much since Meir et al.’s 2009 study. Less than 7% of respondents from LEED® certified schools reported conducting a POE and only two indicated the inclusion of students in the POE. Of those two, only one school included the perspective of elementary children. Additionally, the survey results indicated both a lack of understanding of the need to conduct POEs and of the importance of including children’s perspectives. Two possible reasons for these results were identified. First, based on a few responses to open-ended questions, it was apparent that some respondents did not distinguish between measurement and verification versus POE. By not recognizing the distinction between these tools, they would likely define a POE as only accessing thermal comfort, missing all of the other factors a POE is intended to explore (e.g. health, safety, and functionality). Second, LEED® credits related to measurement and verification call for a survey of all adults and children in grades 6th and higher who occupy the building, missing the perspective of younger children. Based on owner’s (or their representatives’) confusion regarding POE versus measurement and verification processes, this requirement has likely been interpreted as applying to POE as well, resulting in a reluctance to include children in POEs. Although the survey did not ask if projects had applied for the LEED® credit related to measurement and verification, it was apparent that the majority of respondents had not conducted a POE and had no plans for conducting one. To address these issues, better education is needed for owners and all members of the project team regarding the differences between POEs and measurement and verification processes and the benefits and limitations of each.
These survey results support Colantonio’s (2008) assumption that the social impacts of the built environment have yet to become a priority among policy makers. The purpose of POEs is to ensure that schools not only meet sustainable building standards, but also meet the needs of the children attending them, which requires that their input must be considered. Although existing scholarly literature clearly indicates a need for POE in K-12 schools, it does not specifically address the imperative, nor propose methods of, including children as participants in the process. Meir et al. (2009), estimate that a well-developed questionnaire can provide 80% of all indicators for the evaluation of a building in post-occupancy among adults. However, they do not recommend the best methods for evaluating the remaining indicators. To increase the use of POEs that incorporate children’s perspective, especially children younger than those in the 6th grade, it is necessary to move beyond just using traditional quantitative techniques to using a more holistic methodology. What is needed to move the field of POE for schools forward is the development a methodology that is inclusive of the emerging themes in social sustainability as they relate to children. For example, the incorporation of Photovoice, a participatory visual research method, would provide a means for elementary students to document their experience in a green school in a format that would be easier for them versus responding to a series of survey questions they may not fully understand. Such a method would be valuable because it (a) engages children as co-researchers in exploring and describing their experiences in their schools and (b) explores, documents and enables evaluation about the effects of school buildings on children from their perspective.

Future research will involve the development and testing of a POE methodology designed to gather elementary students’ perspectives about their daily experiences in a LEED® certified school.

REFERENCES


