THESIS

POST OCCUPANCY EVALUATION (POE) OF LEED K-12 SCHOOLS IN THE USA

Submitted By

Akash Mehta

Department of Construction Management

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Master's Committee:

    Advisor: MaryEllen Nobe

    Svetlana Olbina
    Lenora Bohren

ABSTRACT

POST OCCUPANCY EVALUATION (POE) OF LEED K-12 SCHOOLS IN THE USA

$14 billion dollars were spent on school construction, including new buildings, addition to upgrade of the existing buildings. If such staggering amount of money is spent on construction of schools, why not build them in such a way that schools last longer, are more efficient and are less harmful to the environment. In order for that to happen it is necessary that buildings perform in a way they are designed to perform. To help fill the voids between expected and actual performances of Leadership in Energy and Environmental Design (LEED) structures it is necessary to conduct a Post Occupancy Evaluation (POE). The main purpose of this research is to promote the awareness of conducting the POE and inclusion of students in the POE. The important research questions for this research are: (a) how many schools conduct a POE? (b) Out of those who conduct, how many include students?: (c) Do these barriers to conduct POE's differ according to type of school district and region?; (d)What are the solutions for making a POE a routine evaluation with respect to the type of school district?. A survey was sent to 750 LEED K-12 schools in the USA, thirty five completed responses were received in a span of three weeks. Five schools (18.5%) out of the 27 schools conducted a POE, only 2 schools included students. It was observed that the barriers were: ' not familiar with how to conduct a POE, 'lack of financial resources,' 'question of ownership of POE,' 'participation,' 'Commitment,' 'low benefit-cost ratio' and 'time needed to complete the POE', were independent of the type of schools and region the school district is located. Solutions namely: 'Changing the attitude of

school administrators', 'changing the attitude of construction professionals', and 'changing the attitudes of design professionals' and 'development of best practices for conducting a POE' were independent on the type of school district. This means that these solutions can be used all over the country in order to improve the negative situation of the POE in schools and thus help to improve the current situation of POE's in schools.

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CHAPTER 1 - INTRODUCTION

Context

$14 billion was spent on school construction that includes constructing new buildings and upgrading the existing ones. According to 20th Annual School Construction Report in2015 there was a 5% increase in amount spent than in the previous year 2014. If schools are spending this staggering amount of money on construction of schools, why not build schools that last longer and are more efficient and less harmful to the environment. Green school can be one notable model for those schools.

An article on the USGBC website center of green schools shows how green school can be profitable (Jason & Rainwater, 2011). At a rough estimate, green school can lead to the following annual emissions reductions:

- 1,200 pounds of nitrogen oxides, a principal component of smog.

- 1,300 pounds of sulfur dioxide, a leading cause of acid rain.

- 585,000 pounds of carbon dioxide, the main greenhouse gas.

- 150 pounds of coarse particulate matter, a principal cause of respiratory illness.

Furthermore, getting pupils involved in energy efficiency programs in green schools can contribute to significant cost savings for school districts. Douglas County schools in Colorado, helped the school district save about $11 million in five years by bringing a significant resource which every school has, students. Influenced by these savings, 59 out of 69 schools (elementary

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to high school) started including students in the energy efficiency program and based on 2006 utility costs, now the entire district saves around $3.1 million per year. The primary reason for the county's success was because of the cultural change achieved through student engagement. Students were empowered first, and then they were allowed to run the energy efficiency program under the guidance of school administration, which helped students to implement healthy initiatives. (Stanley & LeBlanc 2012)

There are many ways in which students can contribute to the betterment of the school in which they spend most of their day. One of them is through post-occupancy evaluation. Wheeler, (2015) defined Post Occupancy Evaluation (POE) as "processes of assessment of buildings that have been occupied for some time and typically includes: surveys of building occupants; interviews or observations of occupants; performance measurements in terms of energy or water consumption; and physical measurements (temperature, humidity, acoustics, artificial lighting)."

Baker (2012) stated that it is significant to implement a school design that is based on performance and post-occupancy evaluations to affirm that we have honest feedbacks. Acknowledging all the occupants in the assessment would give a more honest impression, since they are the ones who use the building.

Makela, T, et al.(2014) found that involving students in their learning environment would help to "(a) increase the quality of the design, (b) improve participatory organizational culture, and (c) lead to a positive impact on learning, and by doing so it also improve students' overall wellbeing." Wheeler, A, et al. (2011) suggested developing initiatives that gives an opportunity to children to engage with architects and designers in order to become a part of their school design. It can be an educational opportunity that can help bring required change in schools. (Wheeler, A, et al. 2011)

General Statement of the Problem

Kaatz, et al. (2005) in their research stated that when all occupants including children are considered in evaluations, the building performance has been exceptional. However, most of the research work Wheeler (2015) carried out in this domain shows that schools do not conduct POE and those who do conduct them tend not to include students, despite being significant stakeholders in the design and functioning of the schools (Mumovic, et al. 2009). Similar research by Marley, Nobe, & Clevenger, (2012) showed that two-thirds of the schools surveyed did not conduct a POE and out of those who conducted only 7% included students. The reason stated for excluding students in POE's was the difficulty associated with incorporating students, especially elementary students. (den Besten, Horton, & Kraftl, 2008); (Woodcock & Newman, 2010).

The two components required bringing out the maximum efficiency in buildings and schools are 'design' and 'users'. When these components work in synchronization, maximum efficiency is attainable. Hence, not only the 'design' of the building is important to get maximum efficiency, but to inform the 'users' on how to get maximum use out of the building to attain that efficiency is equally crucial. In the case of schools, apart from the staff and teachers the main occupants are students and they utilize school space the most.

Purpose statement

The primary intent of this study is to promote awareness of the importance of conducting a POE that includes students in the post-occupancy evaluation of schools among school districts in the USA. While doing so, various other questions were answered, such as-

(a)What is the percentage of schools that conduct POE and out of those schools which schools include students?

(b)What are the barriers to conducting POE's in school?

(c) What are the barriers to including students in the evaluation?

The research will give solutions to the inclusion of students in a post-occupancy evaluation.

Significance of the Study

Numerous benefits of conducting POE's in schools for all stakeholders are well documented. In addition to POE information acquired, the research database includes student experiences with POE evaluation's in the schools. This approach of including students in POE would also educate students about the green school environment and its benefits. The results of this study can be used by school districts, state policymakers to raise and promote awareness of the POE along with its benefits and the importance of the inclusion of students in the POE. Many researchers have been speaking about the inclusion of students in the research process and the advantages that are associated with it (Fielding 2004, Kerr et al. 2002, Kirby 1999, Alderson, 1995).

Delimitations

The study was conducted only in the USA, so only school districts in the USA were used as a sample for this study. Further, only K-12 school districts in the USA were used in this study.

Research Questions

- What percentage of school districts conduct a POE?

- From the number of school districts that conduct a POE, how many include students?

- What are the barriers to not implement a POE in school districts?

- How can a POE turn into a routine evaluation?

- What are the benefits of conducting a POE?

- What are the barriers faced in including students in the POE of school districts?

Procedural Questions:

- Does the % of schools which include students increase with the school district experience in LEED projects?

Hypothesis: More experience with the LEED projects, more the involvement of students in the POE process.

- Do the barriers to conducting a POE, differ from public and private school districts?

Hypothesis: The barriers for all type of school districts are independent of whether the school districts are public or private.

- Does the solution for making a POE a routine evaluation differ by type of school district?

Hypothesis: To make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools.

- Do the benefits to conducting a POE differ from the public and private type of school districts?

Hypothesis: The benefits for all type of schools are independent no matter the districts being public or private.

- Do the barriers change according to the region of the school district?

Hypothesis: The barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region).

CHAPTER 2 - LITERATURE REVIEW

This literature review includes a brief introduction to POEs. It further outlines the

benefits of a POE; methods used to conduct POEs and methods to include students in a POE, and

the documented barriers to carrying out a POEs in a school context. The rest of the literature

review focuses on the inclusion of students in the POE process.

Post Occupancy Evaluation (POE)

Wheeler (2015) defined Post Occupancy Evaluation (POE) as "process of assessment of

buildings that have been occupied for some time and typically includes: surveys of building

occupants; interviews or observations of occupants; performance measurements in terms of

energy or water consumption; and physical measurements (temperature, humidity, acoustics,

artificial or daylighting)."

In addition to this definition of POE, research of Post- Occupancy Evaluation of Schools

2010-2011, recommended that a "POE should become a normal part of the capital spend review

process, using a streamlined methodology that takes account of the current government priorities,

and considering the lessons learned from this evaluation."

U.S. Green Building Council, (USGBC 2009) has put emphasis on the need to use POE

information to help fill the voids between expected and actual performances of LEED structures.

This indicates that there is a need to include a POE in the sustainable development of the

building.

Benefits of a POE

Many researchers over the time have emphasized the importance of a POE and the benefits that come along with it. Stevenson (2008) listed the benefits of POE as: future cost reduction by minimizing maintenance cost; reduction of whole-life environmental impact; reduction of the future liability of clients; maximization of the value of property portfolios; increased occupant satisfaction and increased design know-how. Similar benefits were listed in separate research conducted out by (Malin, et al. 2003, Bordass & Leaman 2005, Hewiit, et al. 2005, Meir, et al. 2007).

Preiser and Vischer (2005) summarized the POE benefits as being short, medium and long term:

• Short term benefits would be feedback that we receive from the current users on problems in buildings and solutions for it.

• Medium term benefits would be to use those feedbacks in the design and construction of the next building cycle.

• Long-term benefits include a creation of databases of a new generation of planning and design protocols.

Other than the benefits that are mentioned above, POE's also have the following benefits: (Meir, et al. 2007)

• A better understanding of how the building operates versus how it was designed which can lead to improvements in design, building operations and maintenance.

• A better understanding of how the occupants use the building, which can lead to better

identification of the occupants' level of understanding of the building design and features;

it can also help identify the areas requiring supervision.

•An insight into whether or not a building meets the occupants' needs while also being

sustainable/green.

•An awareness for the building occupants on how their building functions and how they

impact that function.

Since the focus of the research is on the inclusion of students in the POE process, most of

the literature review to follow will concentrate on those elements of a POE that will directly

relate to the integration of students into the process.

Methods used for Post Occupancy Evaluations

<u>*To conduct a POE in general*</u>

There are various methods available by which a POE can be performed. Hadjri and Crozier

(2009) divided the ways to conduct POE's into the following five categories:

1. Audit: Use of qualitative technical assessments.

2. Discussion: Workshops and Interviews by discussing techniques.

3. Questionnaire: Various questionnaires are available such as BUS occupant survey (UK),

    CIC design quality indicators (Whyte & Gann, 2003) and overall likert score (Leaman,

    2004).

4. Process: Techniques that are used to in the procurement process (Example: Soft landings

    and Building Research Establishment)

5. Packages: Wherein two types of processes are combined to make one package, Probe package where there is combination of questionnaire and audit POE (Bordass & Leaman 2005)

Methods involving students in a POE:

Sanoff (2001), a well-respected designer of green schools recommends for conducting POEs in school settings. He also advocates for the inclusion of students as an important group of building occupants during the design process. He suggested various methods that could help to involve students in the POE process,   such as conducting surveys, photo questionnaire (survey which has photographs to aid), and development of a wish poem with the occupants/students and group interaction.

In contrast, Stevenson (2009) suggests that the best way to conduct a post-occupancy evaluation is the method of 'open question' when children are involved in the evaluation. According to Stevenson (2009), this approach can elicit factors that may not be included in structured questionnaires. Wheeler (2015) stated that this method of evaluation has not shown good results when used with children because verbal communication may pose difficulties for students to express their opinions, specifically for the elementary school students. The solution to this problem is 'art-based methods' of evaluations which are children-friendly methods.   In contrast to the open question method, these art-based methods are less dependent on written and verbal skills which are considered a hindrance in evaluation in other methods. Examples of art-based methods include "walk-through" method, video ethnography and storytelling. (Wheeler 2015).

Woolner (2010) summarizes the methods that were used in the past by other researchers for conducting POEs that include children in a POE. First is the mosaic approach (Clark 2010),

which is used to research the views of young children (aged 3 to 6 years). This method comprises child photography, map making and tours led by children, photo elicitation and picture sorting. The participants work on 15 laminated color pictures and discuss their likes and dislikes on them. Next is a diamond backing method where children work in pairs and arrange nine pictures in the shape of a diamond, placing the most liked picture on the top and most disliked on the bottom. The children can also add their comments to each picture. The last one is the map making method where children map their location during the day and add stickers to the places they liked and disliked accordingly.

Adding to the above list of art-based methods, Malinin (2012) in his research summarized other methods researchers used to include students in their research. These methods consisted of individual interviews, photo annotation, evaluation questionnaire, photo elicitation interviews, drawings and semi-structured interviews and focus group with older primary students and drawings with younger students. Malinin (2012) concluded that if designers, policy-makers, and clients are to construct appropriate buildings, then people will need to understand the multiple meanings attached to schools by those who are affected by them including students.

Barriers to POEs in general

While numerous ways to conduct POEs have been identified, there are a few barriers to conducting POEs. For example, Preiser and Vischer (2005) mentioned common barriers faced by other researchers are "cost, defending professional integrity, time, and skills" (Vischer 2001). Other barriers that can hinder effective conduct of a POE are as follows: fragmented incentives, lack of knowledge of benefits within the procurement and operation processes, lack of agreed and reliable indicators, potential liability for owners, exclusion from current delivery expectations and exclusion from professional curricula. (Zimmerman and Martin 2001).

Adding to the list of barriers, Woon, Ramli & Zainol (2013) stated lack of professional territory, no standard practice, lack of education and attitude, no indicators and benchmarks, no group is ready to take ownership for a POE, insufficient information, less participation and commitment, no realization of return on investment, lack of cost, time, and skills. The authors concluded that the barriers to conducting POE are similar and are interrelated among researchers in this field. These barriers have consistently discouraged the use of POE over the years.

To resolve the barriers hindering POE mentioned above, Bordass, & Leaman (2005) in their research came up with a solution of incorporating POE's as a routine evaluation technique rather than research and development tool. They are: changing the attitudes of clients and industry, changing the process to incorporate every stakeholder including students, development of techniques and benchmarks for conducting a POE, finding the money and making use of the knowledge that is gained.

Barriers to include students in POE

Along with the barriers identified in general POE, a few disadvantages also come up with student participation in POE. For example, after conducting 15 interviews, Besten et al. (2008) identified the following challenges to student involvement in POEs: pupil participation was disappointing, pupil participation was excluded due to the complexity of the program, pupil participation was modest, and pupil participation was contingent and local. Adding to the list Woodcock, & Newman (2010) said that the pupil participation is hindered due to the complexity of the process, lack of a skilled guide to assist them through the process, lack of trained facilitators and time and expertise in involving pupils in the design.

Research done by Baker (2011) did not include students in the POE evaluation citing many reasons. The primary reason being difficulties in getting access to the students,   wide age

span of students and also the difficulties in getting permission from school districts to use students as study subjects. It was also mentioned that the responses of the students who were involved early in the process while developing the survey tool, the responses strayed from the concepts (Barr, 2011).

Inclusion of students

The countries of the United Kingdom (UK) have shown some urgency in changing their policy so that the children can actively participate in the evaluation of the building in which they are the most important stakeholder. The UK government mentioned in their "The Five-year Strategy for Children and Learners: maintaining the excellent progress" that, "Putting the user's experience at the heart of all we do… will be critical to success in delivering on our priorities" (DfES, 2006).

A POE was conducted in one of the schools to see if the Building for Future (BSF) initiative in the UK was working as planned. Students from "The Lammas School, Leyton" had some positive comments about the school after conducting the post-occupancy evaluation. Their Comments were "Inside and outside the design is different from any other school. It looks like an office – it is a working environment, the organization is great, all exits are easy to get to, you can get from one place to another with the minimum of fuss and the design of the school is really important."

Wheeler et al. (2011) draws a comparison between the UK and the US, noting that the US is better situated at the policy level to conduct POEs. POEs have been included in the building programs of some federal facilities in the USA, with the aim of making a POE more rigorous and systematic. According to Wheeler et al. (2011), this has the potential to lay the groundwork for

the development of a database for building use and performance along with establishing a repository for assembling, maintaining and disseminating POE information.

POEs have been performed in elementary schools and high schools which have included students in the research along with teachers. In total, 222 interviews were conducted with students, out of which 54% were students between 13 to 15 years of age and 28% were between 10 to 12 years old. It was concluded that students were eager and enthusiastic to voice their opinions about the environment they utilize. McEwen, et al. (2011) included students from 1st, 3rd and 5th year (age approximately 12, 14 and 16) in their research to identify their subjective experiences of their physical school. This research used both focus groups and Physical School Environment Questionnaire (PSEQ) methods to interact with the students.

Wheeler (2015) showed us that involving students in a POE has numerous benefits. The benefits are: provide designers with valuable performance data, user perceptions, and new concepts to support the sustainable design of school buildings, while also guiding both children and adults into new reflections on the root problems of sustainability. In his research in 3 schools, he included six pupils from each grade from year 2 (age 11-12) to year 6 (age 16-18) totaling 140 students from 3 schools. Over a four-week period, one hour per week was utilized for workshops which corresponded with regular class time. The other methods used by the researcher were storytelling, video walkthrough, exercise and by drawing positive and negative aspects of buildings.

Research by Woodcock and Newman (2010), in which teachers and architects were interviewed, mentioned the following benefits of successful participation of students in the evaluation- improvements to the spaces and day to day running of school buildings, greater user satisfaction with the school environment, fostering a culture of trust and collaboration, reduced

vandalism and anti-social behavior, opportunities for teaching and learning, enhanced design literacy, raising learners self-esteem, familiarizing pupils with new school environments.

In Scotland, POE's were carried out in Craigour Park Primary schools, Edinburgh and Braes High School in Falkirk. The evaluation was conducted consulting all the stakeholders, including the students. The questionnaire for the students was designed in an easy manner so that they would be able to understand what they have been asked. It consisted of brief and colorful paper sheet with three straightforward and open-minded questions which are easy to figure out for students who have basic knowledge of reading and writing in the age group of 7 to 11 (Yufan & Peter, 2010).

Participatory Post Occupancy Evaluation (PPOE) is also one of the methods that help to include other stakeholders effectively. Many types of research have referred to participatory research in their terms. Clark (2004) says that participatory research "gives a 'voice' to those being researched, by questioning the acquisition and usefulness of knowledge, the power relationship between the researchers and the researched, and the stance of the 'objective' researcher."

For school buildings, it is necessary to engage children along with teachers and staff through the PPOE because children analyze the space different than the adults Wheeler et al (2015). Research carried out by Sanoff (2001) mentioned that photo questionnaires and interviews in POE are very effective ways of elaborating evaluative comments about the physical settings in a particular environment. This way it makes it easier to include students in the evaluation process.

Mansour (2014) in his evaluation of LEED-certified elementary school, has mentioned that using photographs with the focus group helped a lot in his research since it allows students to talk and express their feelings and knowledge freely. It is essential that the students understand the questions and concepts, hence the use of photographs along with normal interview is a good way to convey those ideas to students in a stress-free way.

Beyond the benefits to the POE participants, a participatory POE process has additional benefits for schools which do not have time to devote solely to a POE. The available time is used to discuss problems faced by the users/participants, which make the exercise more engaging and wasting less time as compared to pre-set agenda in most of the other cases. By being involved in the participatory process, it also helps in developing qualities such as "need to feel included, to identify and express one's views about what is important, as well as being aware of the needs of others and to see fairness and transparency in the democratic process." (Chris Watson & Keith Thomson 2005).

Makela et. Al. (2014) said that participatory design will "develop a democratic and participatory organizational culture" and co-designing with students will create an improvement in learning as they will play an active role "as designers of their learning." Sharples, Parnell and Refaee (2007) employed the use of photographs to involve children in determining critical features of the environment. This technique helped them include children 2-6 years of age. Similarly, Marley, Nobe & Clevenger (2015) used a qualitative method of photo-voice to include students in the participatory post-occupancy evaluation. They further concluded by saying that PPOE method assisted them by including students in evaluating a green school facility.

Summary Statement

The literature review started with the idea of a POE, its benefits, various methods of conducting POE, followed by the barriers and then moving on to the main focus of this research that is the inclusion of students in the POE process. Even though there have been barriers to including students in the POE process, many researchers in the past have shown that it is possible to incorporate them in an efficient manner. This research is going to promote the idea of inclusion of students in the POE process. Hence, the survey in this research had questions which directly or indirectly related to the students and their involvement in evaluations.

CHAPTER 3 - DESIGN AND METHODOLOGY

Research design

Since the total number of school districts to be researched is high (approximately 850 school districts in the USA), it is beneficial to conduct surveys rather than interviews. A survey allows one to collect a significant amount of data in a short period of time. Also, surveys are less expensive than other methods available for research and, it helps to gather data on a wide range of topics (Tookaloo & Smith 2015). In this case, the survey started with basic questions and then move on towards specific questions of involvement of students in the POE process (see Figure 1).

Development of Instrument

The survey was developed and administered using the Qualtrics survey website. The survey underwent numerous reviews and revisions. The completed survey is included in Appendix A. The questions in the survey come from the literature review. The survey was divided into four parts:

Part 1- General information about the school district,

Part 2- POE questions,

Part 3- Respondents personal views on POE, and

Part 4- Demographics.

The flowchart of the survey is shown in Figure 1. The survey instrument was sent out for a pilot study to facility managers with the local school district; unfortunately they were not able

respond. An expert review was conducted by an expert in Green Schools and POEs in schools.

Comments received from the expert review were incorporated into the survey.
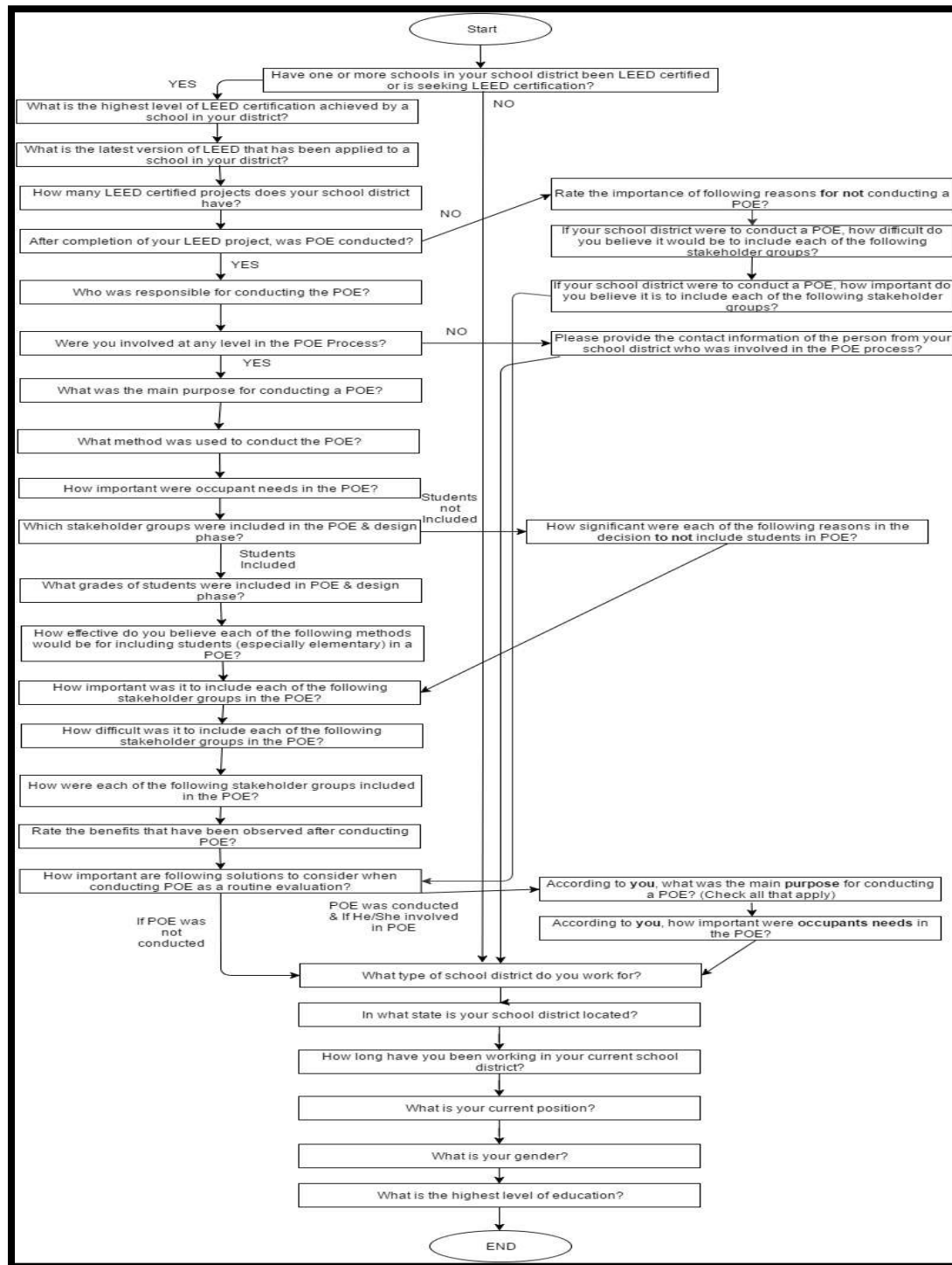
Figure 1: Flowchart of Survey

Population and Sample

The list of LEED green schools in the US was taken from the USGBC Center for green schools website. The list includes LEED schools which were certified prior to September 2015. Initially, the total number of schools was 3,462. This list was revised to identify school districts that had at least one LEED certified school. The resulting list contained 750 school districts. The process followed to decrease the count of school districts is explained in the Table 1. Emails for key contacts for each school district were manually collected from each school district's websites. Key contacts were defined as either the Facilities Manager, Operations Manager, Building Supervisor, Maintenance Supervisor or Superintendent.

Table 1: Sample Space

Factors	Number of schools
Initial total number of schools	3462
No name of the project owner company in the list, confidential projects and schools outside the USA were deleted	2418
On the basis of owner type; Only k-12 were considered. Deleted: one which is blank, Higher education, Non-Profit, Investor, Corporate, Federal and Local Government	1595
Considering only one school per district	1040 School Districts
Removed duplicates or no email listed,	750 School Districts

Data Analysis Procedures

Administration of the survey and initial coding of the data was done through the Qualtrics software. The data was then exported to SPSS for further analysis. Since the data was categorical, non-parametric tests were used for analysis. Basic descriptive statistics summary are provided for the responses received.

For research question "What % of school districts conduct POE's?" descriptive statistics such as frequencies are shown. For research questions "Do barriers to conduct a POE differ with public and private school districts?" and "Does benefits to conducting a POE differ from public and private type of school districts?", chi-square test was conducted to find out if there is any association between the barriers and the type of school district, and between the benefits and type of school district.

Also for the research question, "How do the barriers change according to the region in which the school district is located?" chi-square test was conducted to find if there is an association between barriers and region. This school districts are divided into four US areas by state. Table 2 identifies which states were in each region. The same chi-square test analysis is used for the research question "How does the solution for making POE a routine evaluation differ by type of school district?" to find out if the solution and type of school districts (public vs. private schools) are associated.

Finally, for the last research question, "Does the % of schools which include students in the POE increase with the school district experience in LEED projects?" chi-square test is conducted depending on the responses. If more than 20% of the expected cell frequencies is less than five after collecting responses, then Fischer's exact test is used instead of Chi-Square test.

Table 2: States that fall under regions

Regions			
NorthEast	**Midwest**	**South**	**West**
New England Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, and Pennsylvania	Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota	Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, Washington D.C., West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Alaska, California, Hawaii, Oregon, and Washington

CHAPTER 4 - FINDINGS

This chapter focuses on the analysis and is divided according to the research questions. It starts with a brief discussion of the survey responses, pilot study, followed with an analysis addressing each of the procedural research questions and ending with a summary.

Results

The survey was sent by email to these sample 750 school districts in the US. Out of those 750 emails, 17 emails were undeliverable and 6 were duplicate emails; hence, only 727 emails reached the school districts. Two reminder emails were sent one week apart to the participants. The survey was active for four weeks from the day it was initially sent out.

Out of those school districts, 35 (4.81 %) complete responses and 47 (6.46 %) partial responses were received, for a total of 82 responses (11.12%). Some school districts opted out of this study citing different reasons: it did not fit into their school policies, study needs school districts IRB (Institutional Review Board) approval, or they do not allow for research for masters or PHD's in school districts. In the analysis, only the 35 complete responses were used for the data analysis. Completed responses help with the accuracy of data analysis of the survey data.

Since the survey responses for each of the sections was not high and over 20% of expected cell frequencies is less than 5, Fisher's test was used instead of chi-square tests.

<u>*Demographics*</u>

Table 3 shows the 35 responses divided according to the four regions namely North-east region, Midwest region, South and West Region. Table 2 shows the states that fall under those 4 regions.

Under which region does the school come under?

Region	Frequency	Percent
North East	2	5.7
Midwest	12	34.3
South	14	40.0
West	7	20.0
Total	35	100.0

Table 4 shows the 35 responses according to type of school district: public, private, charter and religious school districts.

Table 4: Demographics according to type of school

Type of School	Frequency	Percent
Public	28	80.0
Private	5	14.3
Charter	1	2.9
Religious	1	2.9
Total	35	100.0

Table 5 shows the cross tabulation of the number of school districts with LEED certified school buildings according to the region in which they are located. The general trend was a higher percentage of LEED schools buildings in the South and the Midwest region as compared to Northeast and West.

Region	LEED Certified School	
	Yes	No
NorthEast Region	1	1
Midwest Region	9	3
South Region	12	2
West Region	5	2
Total	27	8

Percentage of school districts that conduct a POE

Frequency statistics were run in SPSS to find out the percentage of school districts that conduct a POE. As shown in Table 5, out of 27 total responses for this question, five school districts (14.3 %) confirmed that they conducted a POE, while 22 school districts (77.1.5%) did not conduct a POE.

Further, to find out if the POE conducted varied according to the region and the LEED experience of the district, the percentage of school districts that conducted a POE's was cross-tabulated in SPSS. However, these statistics were not significant because the number of schools districts was low. These cross-tabulations are shown in Table 6 and Table 7. Chi-square tests for these cross-tabulations were not run because chi-square tests need a value above 5 in each cell.

When the POEs were cross-tabulated against regions (Table 6), it was found that in the Northeast region, one school district responded to this question, and that district did not conduct a POE. In the Midwest region a total of 9 school districts responded, 3 of which conducted a POE and 6 did not. In the south region, of the 12 school districts that responded only 1 school district conducted a POE and 11 school districts did not. In the West region a total of 5 schools responded, and only 1 school conducted a POE and 4 did not.

Table 6: School districts that conduct a POE according to region

Region	Conducted POE	
	Yes	No
NorthEast Region	0	1
Midwest Region	3	6
South Region	1	11
West Region	1	4
Total	5	22

For the cross-tabulation of POE conducted against experience with the LEED projects (Table 7), it can be seen that 12 school districts had 2 or more LEED projects experience. However, out of the 12 school districts, only 2 conducted a POE and 10 did not. Moreover, out of the 15 school districts that had 1 LEED project experience, 3 conducted a POE and 12 did not conduct a POE's. It was expected that school districts with LEED experience would be more likely to conduct POE's.

Table 7: School districts that conducted POE according to LEED Projects

| | | Number of LEED Certified Projects in School District(s) | | | | | | | |
		1	2	3	5	6	7	8	More than 10
Conducted POE	Yes	3	0	0	0	1	0	0	1
	No	12	4	1	1	1	1	2	0
Total		15	4	1	1	2	1	2	1

Barriers

This section throws light on the barriers that school districts faced while conducting POE's and how they rate the importance of those barriers in their school district. The barriers are presented compared to two school demographics: (1) the type of school district and (2) the region in which the school district is located. To test the hypothesis, Fishers test will be conducted in SPSS. The barriers for type of school (public and private) are independent regardless if the school districts are public or private. The barriers are independent regardless of where the school districts fall in the 4 regions (Northeast region, Midwest region, South region, West Region). The significance level (alpha / α) for this tests will be 0.05.

Barrier 1: Not familiar with the purpose of a POE

Table 8 gives the cross tabulation for the importance of barrier 'not familiar with the purpose of a POE against the public, private and charter school districts. Religious school district that responded to the survey did not respond to this particular question so were not included in this analysis. It can be seen that public school districts gave a varied response from this barrier being least important to extremely important, while private school districts considered this barrier to be very important and extremely important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school district. The P-value, in this case, is 0.747 which is greater than the significance level of 0.05 (P value > α), in this case hypothesis, 'the barriers for all type of school districts are independent of whether the school districts are public or private' was not rejected.

Table 8: Crosstabulation of Barrier 'Not familiar with the purpose of a POE with type of school

		Type of School District		
Barrier	Level of Importance	Public	Private	Charter
Not familiar with the	Least Important (1)	2	0	0
purpose of a POE	Less Important	2	0	0
	Moderately important	3	0	0
	Very important	3	1	0
	Extremely important (5)	3	3	0
	Not Applicable	3	1	1
	Total	16	5	1

In the Table 9, the barrier 'not familiar with the purpose of a POE' was cross-tabulated with the regions in which the school district is located. This barrier received a response from least important to extremely important over all regions. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.779 which is greater than the significance level of 0.05 (P value > α). The hypothesis, 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 9: Crosstabulation of Barrier 'Not familiar with the purpose of a POE' with region in which the school is located

		School Region			
		NorthEast	Midwest	South	West
Barrier	Level of Importance	Region	Region	Region	Region
Not familiar with the	Least Important (1)	0	0	1	1
purpose of a POE	Less Important	0	1	0	1
	Moderately important	0	0	3	0
	Very important	1	1	2	0
	Extremely important (5)	0	2	3	1
	Not Applicable	0	2	2	1
	Total	1	6	11	4

Barrier 2: Not familiar with how to conduct a POE

Table 10 gives the cross tabulation for the importance of barrier 'nor familiar with how to conduct a POE' against the public, private and charter schools. It can be seen that public schools gave a varied response from least important to extremely important, while private schools

considered this barrier to be very important and extremely important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.735 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers for all type of school districts are independent of whether the school districts are public or private' was not rejected.

Table 10: Crosstabulation of Barrier 'Not familiar with how to conduct a POE' with type of school

| Barrier | Level of Importance | Type of School District | | |
		Public	Private	Charter
Not familiar with	Least Important (1)	1	0	0
how to conduct a	Less Important	3	0	0
POE?	Moderately important	4	0	0
	Very important	2	2	0
	Extremely important (5)	3	1	0
	Not Applicable	3	2	1
Total		16	5	1

In the Table 11, the barrier 'not familiar with how to conduct a POE' was cross-tabulated with the regions the school district fall under. This barrier was considered to be mostly very important or extremely important over all regions. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.802 which is greater than the

significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 11: Crosstabulation of Barrier 'Not familiar with how to conduct a POE' with region in which the school district is located

Barrier	Level of Importance	NorthEast Region	Midwest Region	South Region	West Region
Not familiar with how to conduct a POE	Least Important (1)	0	0	1	0
	Less Important	0	1	0	2
	Moderately important	0	1	3	0
	Very important	1	1	2	0
	Extremely important (5)	0	1	2	1
	Not Applicable	0	2	3	1
Total		1	6	11	4

Barrier 3: Lack of financial resources to conduct a POE

Table 12 gives the cross tabulation for the importance of the barrier 'lack of financial resources to conduct a POE' against the public, private and charter schools. It can be seen that most public schools responded this barrier as very important or extremely important barrier, while private schools had a varied response from least important to extremely important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.982 which is greater than the significance level of 0.05 (P value > α). The hypothesis,

'the barriers for all type of school districts are independent of whether the school districts are public or private' was not rejected.

Table 12: Crosstabulation of 'Lack of financial Resources to conduct a POE' with type of school

Barrier	Level of Importance	Type of School District		
		Public	Private	Charter
Lack of financial	Least Important (1)	2	1	0
resources to	Moderately important	4	1	0
conduct a POE	Very important	2	0	0
	Extremely important (5)	5	1	1
	Not Applicable	3	2	0
Total		16	5	1

In the Table 13 the barrier 'lack of financial resources to conduct a POE' was cross-tabulated with the regions in which the school district is located. Responses from the Midwest and West regions were more inclined towards very important and extremely important and the responses from the south region varied from least important to extremely important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.792 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 13: Crosstabulation of Barrier 'Lack of financial resources' with region

		Region			
		NorthEast	Midwest	South	West
Barrier	Level of Importance	Region	Region	Region	Region
Lack of	Least Important (1)	0	1	1	1
financial	Moderately important	0	0	4	1
resources to	Very important	0	1	1	0
conduct POE	Extremely important (5)	1	2	2	2
	Not Applicable	0	2	3	0
Total		1	6	11	4

Barrier 4: Ownership of a POE

Table 14 shows the cross tabulation for the importance of barrier 'ownership of a POE' against public, private and charter schools. Both public and private schools considered this barrier to be moderately important and very important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.836 which is greater than the significance level of 0.05 (P value > α). The hypothesis, 'the barriers for all type of school districts are independent of whether the school districts are public or private' was not rejected.

Table 14: Crosstabulation of Barrier 'Ownership of a POE' with the type of school district

Barrier	Level of Importance	Type of School District		
		Public	Private	Charter
Ownership of POE	Least Important (1)	2	0	0
	Less Important	1	0	0
	Moderately important	5	1	0
	Very important	4	1	0
	Extremely important (5)	1	0	0
	Not Applicable	3	3	1
Total		16	5	1

In the Table 15 the barrier 'ownership of a POE' was cross-tabulated with the regions the school district is located. In the Midwest region the respondents stated that the ownership of a POE is least important to moderately important barrier for conducting the POE, in the south region responses were more inclined toward very important an extremely important and in the West region it was inclined towards least important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.851 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 15: Crosstabulation of Barrier 'Ownership of a POE' with region

		Region			
Barrier	Level of Importance	NorthEast Region	Midwest Region	South Region	West Region
Ownership of	Least Important (1)	0	0	1	1
POE	Less Important	0	1	0	0
	Moderately important	1	2	2	1
	Very important	0	1	4	0
	Extremely important (5)	0	0	1	0
	Not Applicable	0	2	3	2
Total		1	6	11	4

Barrier 5: Participation of Stakeholders.

Table 16 gives the cross tabulation for the importance of the barrier 'participation' against

public, private and charter schools. Public schools considered it to be moderately important/very

important, while private schools considered this barrier to be least important to moderately

important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the

school. The P-value, in this case, is 0.313 which is greater than the significance level of 0.05 (P

value > α). The hypothesis 'the barriers for all type of school districts are independent of

whether the school districts are public or private' was not rejected.

Table 16: Crosstabulation of Barrier 'Participation' with the type of school district

Barrier	Level of Importance	Type of School District		
		Public	Private	Charter
Participation	Least Important (1)	2	0	0
	Less Important	2	1	0
	Moderately important	7	1	0
	Very important	3	0	0
	Not Applicable	2	3	1
Total		16	5	1

In the Table 17 the barrier 'participation' was cross-tabulated with the regions the school district fall under. This barrier received responses from least important to very important over all regions. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.936 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 17: Crosstabulation of Barrier 'Participation' with region

Barrier	Level of Importance	Region			
		NorthEast Region	Midwest Region	South Region	West Region
Participation	Least Important (1)	0	1	1	0
	Less Important	0	0	3	0
	Moderately important	1	2	3	2
	Very important	0	1	2	0
	Not Applicable	0	2	2	2
Total		1	6	11	4

Barrier 6: Commitment of Stakeholders

Table 18 gives the cross tabulation for the importance of barrier 'Commitment' against public, private and charter schools. Public schools gave a varied response from least important to extremely important, while private schools considered this barrier to be moderately important to very important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value, in this case, is 0.636 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers for all type of school districts are independent of whether the school districts are public or private' was not rejected.

Table 18: Crosstabulation of Barrier 'Commitment' with the type of school district

Barrier	Level of Importance	Type of School District		
		Public	Private	Charter
Commitment	Least Important (1)	2	0	0
	Less Important	3	0	0
	Moderately important	3	1	0
	Very important	5	1	0
	Extremely important (5)	1	0	0
	Not Applicable	2	3	1
Total		16	5	1

In the Table 19 the barrier 'Commitment' was cross-tabulated with the regions the school district fall under. This barrier received a response from least important to extremely important in the Midwest and South regions and very important in the West region. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value in this case is 0.969 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

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Table 19: Crosstabulation of Barrier 'Commitment' with region

		Region			
		NorthEast	Midwest	South	West
Barrier	Level of Importance	Region	Region	Region	Region
Commitment	Least Important (1)	0	1	1	0
	Less Important	0	1	2	0
	Moderately important	1	1	2	0
	Very important	0	1	3	2
	Extremely important (5)	0	0	1	0
	Not Applicable	0	2	2	2
Total		1	6	11	4

Barrier 7: Low benefit cost ratio

Table 20 gives the cross tabulation for the importance of barrier 'Low Benefit Cost ratio' against the public, private and charter schools. Public schools and private schools considered this barrier to be least important and less important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value in this case is 0.447 which is greater than the significance level of 0.05 (P value > α).The hypothesis 'the barriers for all types of school districts are independent of whether the school districts are public or private' was not rejected.

Table 20: Crosstabulation of Barrier 'Low benefit to cost ratio' with the type of school district

		Type of School District		
Barrier	Level of Importance	Public	Private	Charter
Low benefit to cost ratio	Least Important (1)	4	1	0
	Less Important	3	0	0
	Moderately important	2	0	0
	Very important	2	0	1
	Extremely important (5)	3	1	0
	Not Applicable	2	3	0
Total		16	5	1

In the Table 21 the barrier 'low benefit-cost ratio' was cross-tabulated with the regions in which the school district is located. This barrier received responses from least important to extremely important in Midwest and South region and very important to extremely important in West region. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value in this case is 0.218 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 21: Crosstabulation of Barrier 'Low benefit to cost ratio' with region

Barrier	Level of Importance	Region			
		NorthEast Region	Midwest Region	South Region	West Region
Low benefit to cost ratio	Least Important (1)	0	2	3	0
	Less Important	0	0	3	0
	Moderately important	0	0	2	0
	Very important	0	0	1	2
	Extremely important (5)	1	2	0	1
	Not Applicable	0	2	2	1
Total		1	6	11	4

Barrier 8: Time needed to complete a POE

Table 22 gives the cross tabulation for the importance of barrier 'Time needed to complete a POE' against the public, private and charter schools. Most of the public schools considered this barrier to be very important to extremely important. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P value, in this case, is 0.307 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers for all types of school districts are independent of whether the school districts are public or private' was not rejected.

Table 22: Crosstabulation of Barrier 'Time needed to complete a POE' with the type of school district

Barrier	Level of Importance	Type of School District		
		Public	Private	Charter
Time needed to	Least Important (1)	1	0	1
complete POE	Less Important	2	0	0
	Moderately important	3	0	0
	Very important	5	1	0
	Extremely important (5)	3	1	0
	Not Applicable	2	3	0
Total		16	5	1

In the Table 23, the barrier 'time needed to complete a POE' was cross-tabulated with the regions in which the school district is located. This barrier received responses from least important to extremely important in South region, very important and extremely important in Midwest region and moderately and very important in the West region. Fisher's test was conducted to test the hypothesis for this barrier on the type of the school. The P-value in this case is 0.324 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'the barriers to conduct a POE are independent whether school districts fall under these four regions (Northeast region, Midwest region, South Region, West Region)' was not rejected.

Table 23: Crosstabulation of Barrier 'Time needed to complete POE' with region

Barrier	Level of Importance	NorthEast Region	Midwest Region	South Region	West Region
			Region		
Time needed to	Least Important (1)	0	0	1	1
complete POE	Less Important	0	0	2	0
	Moderately important	0	0	2	1
	Very important	0	1	4	1
	Extremely important (5)	1	3	0	0
	Not Applicable	0	2	2	1
Total		1	6	11	4

Solutions to make the POE a routine evaluation

School districts were asked about the solutions that would make a POEs more routine in the future. This section will state the importance of each of the solutions that school districts selected in private and public schools. Charter and Religious school districts were not included in the analysis as the responses from this schools were low. The hypothesis 'to make POE a routine evaluation the solutions will be independent whether the schools are public school districts and private school districts' will be tested. To test the hypothesis Fisher's test will be conducted for each of the solutions against public or private school districts. The significance level (alpha / α) for this tests will be 0.05.

Solution 1: Changing attitudes of school administrators

Table 24: Crosstabulation of Solution 'Changing attitudes of school administrators' with the type of school district

Solution	Level of Importance	Type of School District		
		Public	Private	Charter
Changing attitudes	Least Important	0	1	0
of school	Moderately important	5	1	1
administrators	Very important	10	1	0
	Extremely important	4	1	0
	Not Applicable	0	1	0
Total		19	5	1

Table 24 shows how respondents feel about the solution 'changing the attitudes of school administrators.' It can be seen from table 24 that considering both public and private school districts this solution can be very important to improve the present conditions of the POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.134 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was not rejected.

Solution 2: Changing attitudes of facility managers

Table 25: Crosstabulation of Solution 'Changing attitudes of facility managers' with the type of school district

		Type of School District		
Solution	Level of Importance	Public	Private	Charter
Changing attitudes	Least Important	1	1	0
of facility managers	Less important	0	1	0
	Moderately important	3	0	1
	Very important	6	0	0
	Extremely important	9	2	0
	Not Applicable	0	1	0
Total		19	5	1

Table 25 shows how respondents feel about the solution 'changing attitudes of facility managers.' Table 25 shows that this solution can be an extremely important one to consider among both public and private school districts to improve the present conditions of a POE. Fisher's test was conducted in SPSS to test the hypothesis (solutions are independent whether school districts are public or private). The P-value in this case is 0.044 which is smaller than the significance level of 0.05 (P value $< \alpha$). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was rejected.

Solution 3: Changing attitudes of construction professionals

Table 26: Crosstabulation of Solution 'Changing attitudes of construction professionals' with the type of school district'

Solution	Level of Importance	Type of School District		
		Public	Private	Charter
Changing attitudes	Least Important	2	1	0
of construction	Less important	3	0	0
professionals	Moderately important	5	1	1
	Very important	2	0	0
	Extremely important	6	2	0
	Not Applicable	1	1	0
Total		19	5	1

Table 26 shows how respondents feel about the solution 'changing the attitudes of construction professionals.' Table 26 shows that this solution can be a moderately important and extremely important solution to consider among both public and private school districts to improve the present conditions of the POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.926 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was not rejected.

Solution 4: Changing attitudes of design professionals

Table 27: Crosstabulation of Solution 'Changing attitudes of design professionals' with the type of school district'

		Type of School District		
Solution	Level of Importance	Public	Private	Charter
Changing attitudes	Least Important	1	1	0
of design	Less important	3	0	0
professionals	Moderately important	1	0	1
	Very important	5	0	0
	Extremely important	7	1	0
	Not Applicable	2	3	0
Total		19	5	1

Table 27 shows how respondents felt about the solution 'changing the attitudes of design professionals.' Table 27 shows that this solution can be a very important and extremely important solution to consider among both public and private school districts to improve the present conditions of the POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.069 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was not rejected.

Solution 5: Development of best practices for conducting a POE in schools

Table 28: Crosstabulation of Solution 'Development of best practices for conducting a POE' with the type of school district

		Type of School District		
Solution	Level of Importance	Public	Private	Charter
Development of	Least Important	1	1	1
best practices for	Less important	1	1	0
conducting a POE	Moderately important	4	0	0
	Very important	8	1	0
	Extremely important	4	0	0
	Not Applicable	1	2	0
Total		19	5	1

Table 28 shows how respondants feel about the solution 'development of best practices for conducting a POE in schools.' Table 28 shows that this solution can be an important solution to consider among both public and private school districts to improve the present conditions of the POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.073 which is greater than the significance level of 0.05 (P value > α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was not rejected.

Solution 6: Identifying reoccurring funding sources

Table 29: Crosstabulation of Solution 'Identifying reoccurring funding sources' with the type of school district

Solution	Level of Importance	Type of School District		
		Public	Private	Charter
Identifying	Least Important	1	1	1
reoccurring funding	Less Important	2	1	0
sources	Moderately important	2	1	0
	Very important	9	0	0
	Extremely important	5	1	0
	Not Applicable	0	1	0
Total		19	5	1

Table 29 shows how respondants feel about the solution 'identifying reoccurring funding sources for a POE.' Table 29 shows that this solution can be a very important solution to consider among both public and private school districts to improve the present conditions of a POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.05 which is equal to the significance level of 0.05 (P value = α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools', was rejected.

Solution 7: More involvement of school administration in the design process

Table 30: Crosstabulation of Solution 'More involvement of school administration' with the type of school district

Solution	Level of Importance	Type of School District		
		Public	Private	Charter
More involvement	Least Important	0	1	1
of school	Less important	2	0	0
administration	Moderately important	3	2	0
	Very important	5	0	0
	Extremely important	9	0	0
	Not Applicable	0	2	0
Total		19	5	1

Table 30 shows how respondants feel about the solution 'more involvement of school administration in the design process.' It can be seen from the table that this solution can be an extremely important solution to consider among both public and private school districts to improve the present conditions of a POE. Fisher's test was conducted in SPSS to test the hypothesis (Solutions are independent whether school districts are public or private). The P-value in this case is 0.002 which is smaller than the significance level of 0.05 (P value > α). The hypothesis 'to make a POE a routine evaluation, the solutions will be independent of whether the school districts are public or private schools' was rejected.
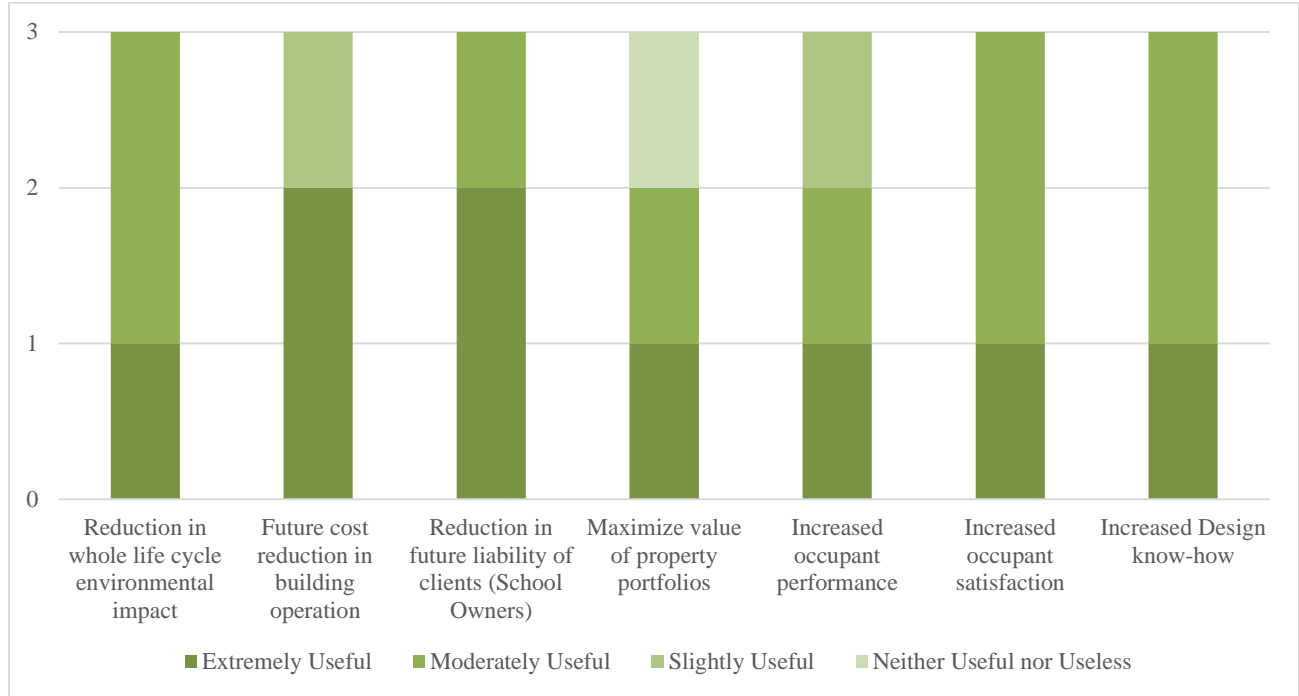
Figure 2: Benefits

In this section, frequency analysis will be conducted for the benefits that are achieved by conducting POE and how useful they were to the school districts. Two school districts found future cost reduction in building operation and reduction in future liability of clients (School Owners) to be the extremely useful benefits of conducting a POE and one school district found them to be moderately useful. Two school districts found a reduction in whole life environmental impact, increased occupant satisfaction and enhanced design know-how to be a moderately useful benefit, and one school district found it to be extremely useful. One school district found the benefit of maximizing value of property portfolios to be extremely useful, moderately useful and neither useful nor useless. Occupant performance in the school was found to be extremely useful benefit for one school district and two other school districts found them to be moderately useful and slighty useful benefit for their school district.

Chi-square tests/ Fisher's tests were not able to run for this section because the school districts that responded to this question were all public schools, so we were not able to compare benefits with public/private school districts as initially planned.

Stakeholders included in the Design phase and in the POE
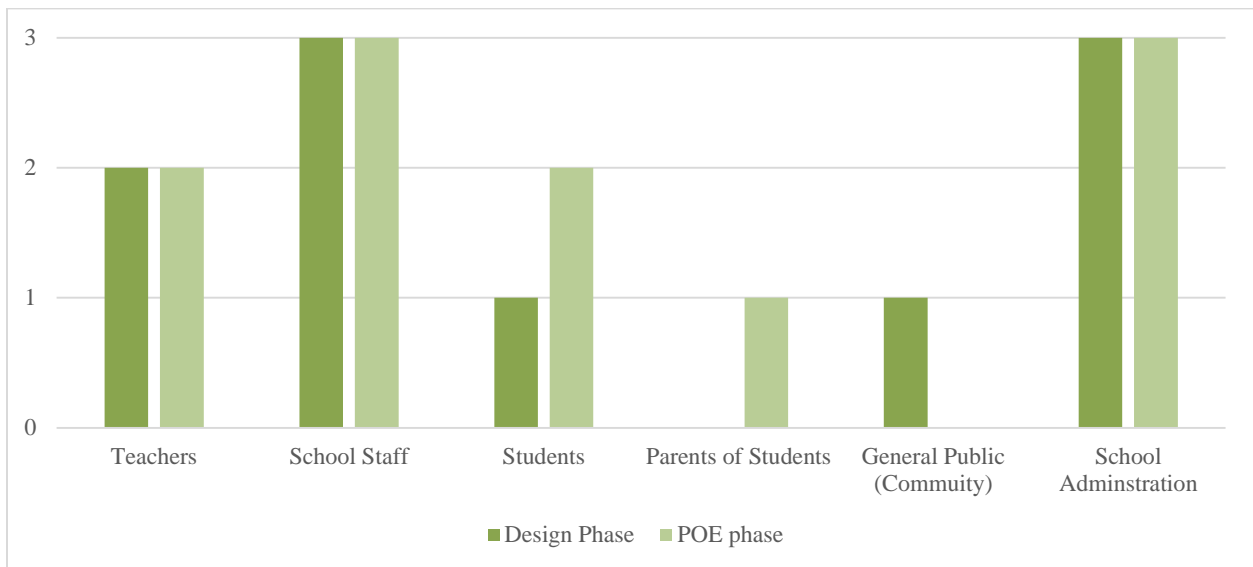
Figure 3: Inclusion of Stakeholders

Due to low response for these questions, only frequency analysis was done in this section. Figure 3 shows the inclusion of stakeholders in the design phase and the POE phase. Of the 3 school districts that responded to this question 3 included school staff school administration, 2 included teachers, 1 included students and the general public (community), and none included parents of students in the design phase. During the POE process, 3 included school staff and school administration, 2 included teachers and students, 1 included parents of students and none of included the general public (community).

Student Inclusion

This section focuses on school districts that included students in the design process and the POE process. The grades of students included and the methods of inclusion in the POE process are analyzed.

During the design phase, one school district included 1st, 5th, 8th, 11th and 12th graders; while another school district did not include any of these graders.Two school other districts did not include either pre-K, K, 2nd, 3rd, 4th, 6th, 7th, 9th or 10th graders in the design phase.

The statistics did not change during the POE phase for these school districts. One school district included each of the 1st, 5th, 7th, 11th and 12th graders respectively. Two school districts each did not include pre-K, K, 2nd graders, 3rd graders, 4th graders, 6th , 8th , 9th and 10th graders in the design phase respectively. Moreover, one school district did not include 1st, 5th, 7th, 11th and 12th graders.

There are different ways in which students can be involved in the evaluation. The survey tested the effectiveness of these methods. One school district found 'photo questionnaire' to be very effective and while another school district found it only slightly effective. 'After school program' was found to be very effective in one school district and while another found it to be slightly effective. Two school districts found 'in-class assignment' to be very effective methods for including students. 'Mapmaking and tours led by students were found to be extremely effective for one school district and moderately effective for the other.

'Picture sorting' method was found to be slightly effective for two school districts and 'diamond backing method' was found to be moderately effective for one school district and one school district did not find it effective at all.

Reasons to not include students in the POE: One school district selected additional time required as the extremely important reason to not include students. One school district selected complexity of process to include students, lack of expertise in including students, lack of guidelines for including students as the very important reasons to not include students in the POE. One school district indicated a lack of support from the principal/teacher to administer it as a moderately important reason to not include students, and the additional cost was not at all important reason according to one school district.

<u>*Importance of each stakeholder to be included*</u>

This section in the study analyzes how important it is for the school to include every stakeholder in the evaluation. Teachers were found to be least important to be included in the evaluation by one school district, two school districts found them to be slightly important, six school districts found them moderately important and eight school districts found them very important and extremely important respectively. Four school districts found staff to be slightly important to be included in the evaluation; four school districts found them moderately important, 11 school districts found them very important, and six school districts found them extremely important.

Parents were found to be least important to be included in the evaluation by six school districts, five school districts found them slightly important, 11 school districts found them moderately important and two school districts found them very important and one school district found them to be extremely important. Twelve school districts found the general public (community) to be least important to be included in the evaluation, six school districts found them slightly important, five school districts found them to be moderately important, two school districts found them to be very important. School administration was found to be slightly

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important and moderately important by 2 schools and three school districts respectively to be included in the evaluation, nine school districts and ten school districts found them to be very important and extremely important to be included in the evaluation.

With the student stakeholders, four school districts each found them to be least important and slightly important to be included in the POE, seven found them to be moderately important, 4 and five school districts each found them to be very important and extremely important respectively.

Difficulty in including stakeholders

This section analyzes how difficult it would be to include every stakeholder in the POE according to the school districts. Teachers were found to be extremely easy to be included in the evaluation by six school district, four school districts found them somewhat easy. Eight school districts found teachers neither easy nor difficult, six school districts found them somewhat difficult, and one school district found them extremely difficult. Five school districts found staff to be extremely easy to be included in the evaluation, seven school districts found them somewhat easy, seven school districts found them neither easy nor difficult. Five school districts found it somewhat difficult and one school district found them extremely difficult.

Parents were found to be extremely easy to be included in the evaluation by two school districts, three school districts found them somewhat easy, two school districts found them neither easy nor difficult, 17 school districts found them somewhat difficult and one school district selected extremely difficult. Six school districts found the general public (community) to be neither easy nor difficult to be included in the evaluation, 12 school districts found them to be somewhat difficult, seven school districts found them to be extremely difficult. School administration was found to be extremely easy and somewhat easy by 10 and five school districts

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respectively to be included in the evaluation. Moreover five school districts found it neither easy nor difficult, four school districts and one school district were found to be somewhat difficult and extremely difficult to be included in the evaluation.

With the student stakeholders, six school districts found them to be extremely easy, and five school districts found them to be somewhat easy to be included in POE, three found them to be neither easy nor difficult, 10 and one school districts each found them to be somewhat difficult and extremely difficult.

Additional Analysis

This section of the data analysis focusses on other aspects of the POE which are not part of research questions but were included in the survey. This section can be expanded for further studies in the future. This section will have briefs on the purpose of conducting a POE, methods that were used to conduct POE, and finally how these stakeholders were included in the POE will be listed.

Purpose: Two school districts chose 'LEED credit' as the main reason for conducting a POE and one school district chose it as an important reason but not the main reason for conducting a POE. Two school districts picked 'verification of mechanical systems' as the main reason for conducting a POE and one school district chose it as an important reason but not the main reason for conducting a POE. Similarly, two school districts chose 'assessment of occupant comfort' as the main reason for conducting a POE and one school district chose it as an important reason but not the main reason for conducting a POE. Three school districts selected 'assessment of occupant performance' as the main reason for conducting a POE. Two school districts chose 'documentation of temperature, humidity, daylighting' as the main reason for conducting a POE and one school district chose it as an important reason but not the main reason

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for conducting a POE. One school district each chose gather data to use in future building projects as the main reason, important but not main reason and not considered important while conducting a POE.

Methods to conduct a POE: There are different methods through which POE can be conducted. One school district selected both 'discussion (individual &/or group)' and 'measurement of daylighting' as a method that was used to conduct a POE. Two school districts each selected 'structured interview', 'measurements of indoor air quality' and 'questionnaire' as the method that was used to conduct a POE in their school district. Three school districts conducted their POE through 'collection of utility data'.

Methods in which stakeholders were included: There are various ways through which stakeholders are included in the POE process. Teachers were involved through surveys, focus groups and walk through the school in two school districts respectively and through interviews in three school districts. For school staff: two school districts each involved them through focus groups, interviews and walk through the school and one school district involved them through surveys. Parents of the students were involved through surveys, through interviews by one school district, through focus groups by one school district and two school districts involved them through the walk through school process.

The general public (Community) was involved through focus groups, interviews in one school district and two districts involved them by a walk through school process. To involve school administration, one school district included them through surveys, three districts included them through focus groups and two districts each involved them in the walk through process and interviews.

The students in the school districts were involved through surveys, walk through school and story-telling. One school district each involved them through surveys and interviews, three districts involved them by a walk through school process and two school districts involved them into storytelling. None of the school districts used 'they directed researchers on what photographs to take' and 'they drew pictures' in a POE involvement of the stakeholders.

Conclusions

This section will summarize the findings and tie those findings to the research questions along with the significance of the conclusion.

Percentage of schools that conduct a POE

It can be seen from the results that only five school districts (18.5%) out of the 27 school districts conducted a POE. Last time a similar study was done by (Marley, Nobe, & Clevenger, 2012), 10 out of 27 (37%) of schools that responded conducted a POE. These results suggest a downward trend in the number of schools conducting POE's. It was also seen that every region is facing the same situation. For example, out of the 12 school districts that responded from the south region, only one school district conducted a POE. In LEED school districts, there was no significant change found in a number of POEs conducted. Interestingly, school districts with 2, 3, 5, 7, or 8 LEED projects did not conduct evaluations in their respective school district.

Barriers:

Fisher's test was conducted to test the hypothesis for each of the barriers against the type of school and the region in which the school district is located. The hypothesis was not rejected for any of the barriers mentioned in the survey. This means that all the barriers included in the survey were independent of the type of schools and region in which the school district is located. These barriers can be significant to consider in the case of all the 4 regions regardless of the school district type.

The significance of this finding can be that all school districts, state boards, federal agencies can work on this set of barriers no matter the type of school (public or private) and region in which the school district is located. Every school district can focus on these barriers and work towards making them into an opportunity to increase the rate of POEs that are conducted in schools.

Solutions to make POE a routine solution

Fisher's test was use to test the hypothesis for each potential solution against the type of school. The hypothesis was not rejected for four solutions mentioned in the survey and was rejected for three solutions. The hypotheses not rejected for solutions were: 'Changing the attitude of school administrators', 'changing the attitude of construction professionals', and 'changing attitudes of design professionals' and 'development of best practices for conducting a POE'. This means that these four solutions are independent of the type of school district. The hypotheses rejected for solutions were: 'changing attitudes of facilities managers', 'identify reoccurring funding sources', and 'more involvement of school administrators'. These results suggests that attitudes of facility managers, funding and involvement of school administrators is more important in certain types of schools.

Responses for "Changing the Attitudes of Design Professionals" and "Changing the Attitudes of Facilities Managers" were quite unexpected. The responses stated that design professionals and facilities managers are willing to conduct a POE in their respective school district.

Benefits

The benefits that were found to be extremely useful by the school districts were 'cost reduction in the building operation', 'reduction in future liability clients', 'reduction of whole life environmental impact', and 'increased occupant satisfaction and occupant performance'. The

hypothesis was not tested in this case because responses for school districts that conducted POEs were to low to be statistically significant.

The benefits mentioned above can be used as a marketing tool by state and federal agencies to promote the awareness of POE's in school districts. The school districts that have conducted a POE can also use it as a marketing tool while advertising their school districts.

Student inclusion

The school districts that conducted POE's and which included students involved 1st, 5th 8th, 11th and 12th grades in the design phase and the same in the POE phase. There was not much difference in the inclusion of students during the design phase and the POE phase shown by school districts. These results show that students (specifically elementary students) are still being included in the POE evaluation by the school districts. Due to low responses from a couple of regions it was not possible to run Fisher's test since the results would not be statistically significant and hence could not test the hypothesis.

The methods to include students that were found to be very effective by the school districts were: 'Photo-questionnaire', 'After school program' and 'map making' and 'tours led by students'. More research is needed on how these methods can be easily incoporated by school districts into POE's.

Limitations

Since the school districts that conducted POE's responding to this survey were very low, it was not statistically significant to test two hypotheses identified in the research questions. The hypotheses that could not be tested are 'the benefits for all type of schools are independent no matter if the districts are public or private' and 'the more experience with the LEED projects, the more involvement of students in the POE process'.

While conducting Fisher's test cross tabulation for barriers against region analysis, the school districts that responded from the Northeast and West regions were only 1 and 4 respectively. If responses were equal from all the regions, the significance of the results could be very high.

Another limitation was availability of contact information (emails) for all the LEED school districts in the USA. The contact list had to be prepared manually from the schools' websites. While doing so, some websites did not provide direct facilities management department or construction department contact information. Futhermore, some schools had email system set up in such a way that email had to be sent through their website.

Given the short duration for the study, it can also be considered as a limitation. If more time had been available for research, taking out a random samples from sample space and then structured interviews can be conducted until desired response rate is achieved.

Future research in this area

There are many sections in the survey other than that stated in the research questions section that are not analyzed in this research. The topics mentioned in the additional analysis such as reasons for not including students, purpose for including students, and methods in which students were involved can be extended in a future research project.

Another research project could be concentrating on a region based study rather than focusing on all the school districts in the US. This can help in conducting more rigorous methods to gather contact information of school districts and possibly increase the number of responses. Also, if the number of school districts to be included will decrease, there is possibility that phone calls can be done to school districts asking them to respond to the survey.

There could be another possible project in which a qualitative study of the school districts that conducted POEs and involved students in the POE process could be done. In this project, the

researchers could conduct interviews to gather more insight on topics such as benefits gained by conducting a POE with student involvement.

Also, this study focused only on K-12 school districts that had a LEED certified school; there could be research projects where elementary, middle and high schools are studied separately, and the results could be generalized to that level of schools.

All in all, there can be many ways in which this study of Post Occupancy Evaluation (POE) in school districts can be expanded in the future. If more school districts become aware of the benefits of the POE and student involvement in the POE, research in this area can be continued leading to the betterment of school structures.

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Appendix A - Survey Instrument

Questions on Background information

Thank you for agreeing to take part in this survey on POE's. There are 4 Parts to this survey.

PART 1: Questions in this part will focus on background information of the school district.

Have one or more schools in your school district been (or is seeking) LEED certification?

Yes   No

What is the **highest level** of LEED certification achieved by a school in your district?

Certified

Silver

Gold

Platinum

Still Under Review

What is the **latest version** of LEED that has been applied to a school in your district?

How many LEED certified projects does your school district have?

[▼]

Was a POE conducted for any of the LEED projects in your school district?

Yes   No

Questions about conducting POE & occupants

> **PART 2:** This section contains questions about the POE process used in your school district. Please refer to the **most recent POE** conducted by your school district when answering these questions.

How important are each of the following reasons **for NOT** conducting a POE?

Instructions:
1.) Review the list of reasons.
1.) Identify the activity that is **Least Important and rate it as 1.**
2.) Next, identify the activity that is **Extremely Important and rate it as 5.**
3.) Rate the remaining activities in between **Least Important** and **Extremely Important**.

	Least Important (1)	Less Important	Moderately important	Very important	Extremely important (5)	No Applic
Not familiar with the purpose of a POE	○	○	○	○	○	○
Not familiar with how to conduct a POE	○	○	○	○	○	○
Lack of financial resources to conduct POE	○	○	○	○	○	○

Ownership of POE	○	○	○	○	○	○
Participation	○	○	○	○	○	○
Commitment	○	○	○	○	○	○
Low benefit cost ratio	○	○	○	○	○	○
Time needed to complete POE	○	○	○	○	○	○
Others (Please specify)	○	○	○	○	○	○

Who was responsible for conducting the POE?

Someone from the school district

Someone from design team

Someone from the construction team

A green building consultant

Other (Please Specify)

Were **you** involved at any level in the (POE) process?

Yes   No

Since the remainder of these questions require experience with the POE process, please provide the contact information of the person from your school district **who was involved** in the POE process?

What was considered by the school district to be the main reason(s) for conducting the POE?

	A **Main Reason** for conducting the	**Important,** but not a main reason for conducting the	Not considered important when conducting the

	POE	POE	POE
LEED Credit	O	O	O
Verification of mechanical systems	O	O	O
Assessment of occupant comfort	O	O	O
Documentation of temperature, humidity, daylighting etc	O	O	O
Assessment of occupant Performance	O	O	O
Gather data to use in future building projects.	O	O	O
Others (Please specify)	O	O	O

What **method(s)** was (were) used to conduct the POE? (Check all that apply)

Discussion (Individual &/or Group)

Structured Interview

Questionnaire

Observation of Occupant Groups

Collection of Utility Data

Measurements of Indoor Air Quality

Measurements of daylighting

Others (Please Specify)

When conducting the POE, how important was the evaluation of **how well the building meets occupants needs**?

Least Important	Less Important	Moderately Important	Very Important	Extremely Important

Which **stakeholder groups** were included in either the design phase or the POE?

| | Design Phase | | POE | |
	Included	Not Included	Included	Not Included
Teachers	○	○	○	○
School Staff	○	○	○	○
Students	○	○	○	○
Parents of Students	○	○	○	○
General Public (Community)	○	○	○	○
School Administration	○	○	○	○
Other (Please Specify)	○	○	○	○

What **grade levels** were included in either the design phase or the POE?

| | Design Phase | | POE | |
	Included	Not Included	Included	Not Included
Pre K	○	○	○	○
K	○	○	○	○
1st Graders	○	○	○	○
2nd Graders	○	○	○	○
3rd Graders	○	○	○	○
4th Graders	○	○	○	○
5th Graders	○	○	○	○
6th Graders	○	○	○	○
7th Graders	○	○	○	○
8th Graders	○	○	○	○
9th Graders	○	○	○	○
10th Graders	○	○	○	○
11th Graders	○	○	○	○
12th Graders	○	○	○	○
Other (please specify)	○	○	○	○

How effective do you believe each of the following **methods** would be **for including students** (especially elementary) in a POE?
(Hover over the choices for descriptions of each choice.)

	Extremely effective	Very effective	Moderately effective	Slightly effective	Not effective at all
Photo Questionnaire	O	O	O	O	O
After School Program	O	O	O	O	O
Class Assignment	O	O	O	O	O
Map making & tours led by students	O	O	O	O	O
Picture sorting	O	O	O	O	O
Diamond backing method	O	O	O	O	O

How important were each of the following reasons in the **decision to not include students** in POE?

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Complexity of the process to include students	O	O	O	O	O
Lack of expertise with including students	O	O	O	O	O
Lack of guidelines for including students	O	O	O	O	O
Additional cost required	O	O	O	O	O
Lack of support from principal/teacher to administer it	O	O	O	O	O
Additional time required	O	O	O	O	O
Other (please specify)	O	O	O	O	O

How important was it to **include** each of the following stakeholder groups in the POE?

Instructions:

1.) Review the list of reasons.

1.) Identify the activity that is **Least Important and rate it as 1.**

2.) Next, identify the activity that is **Extremely Important and rate it as 5.**

3.) Rate the remaining activities in between **Least Important** and **Extremely Important**.

	Least Important	Slightly Important	Moderately Important	Very Important	Extremely Important
Teachers	O	O	O	O	O
Staff	O	O	O	O	O
Students	O	O	O	O	O
Parents of Students	O	O	O	O	O
General Public (Community)	O	O	O	O	O
School Administration	O	O	O	O	O
Other (please specify)	O	O	O	O	O

If your school district were to conduct a POE, how important would it be to **include** each of the following stakeholder groups in the POE?

Instructions:

1.) Review the list of reasons.

1.) Identify the activity that is **Least Important and rate it as 1.**

2.) Next, identify the activity that is **Extremely Important and rate it as 5.**

3.) Rate the remaining activities in between **Least Important** and **Extremely Important**.

	Least Important	Slightly Important	Moderately Important	Very Important	Extremely Important
Teachers	O	O	O	O	O

Staff	O	O	O	O	O
Students	O	O	O	O	O
Parents of students	O	O	O	O	O
General Public (Community)	O	O	O	O	O
School Administration	O	O	O	O	O
Other (please specify) [ ]	O	O	O	O	O

How **difficult** was it to include each of the following stakeholder groups?

	Extremely easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Extremely difficult
Teachers	O	O	O	O	O
Staff	O	O	O	O	O
Students	O	O	O	O	O
Parents of students	O	O	O	O	O
General Public (Community)	O	O	O	O	O
School administration	O	O	O	O	O
Other (please specify) [ ]	O	O	O	O	O

If your school district were to conduct a POE, how **difficult** would it be to include each of the following stakeholder groups?

	Extremely easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Extremely difficult
Teachers	O	O	O	O	O
Staff	O	O	O	O	O
Students	O	O	O	O	O
Parents of students	O	O	O	O	O

General Public (Community)   ○   ○   ○   ○   ○
School administration   ○   ○   ○   ○   ○
Other (please specify)

[   ]   ○   ○   ○   ○   ○

How were each of the following stakeholder groups **included** in the POE? (Check all that apply.)

	Teachers	School Staff	Students	Parents of Students	General Public (Community)	Scho(Administr
They were interviewed	☐	☐	☐	☐	☐	☐
They were given surveys	☐	☐	☐	☐	☐	☐
They directed researchers on what photographs to take	☐	☐	☐	☐	☐	☐
They were included in focus groups	☐	☐	☐	☐	☐	☐
They drew pictures	☐	☐	☐	☐	☐	☐
They were involved in walk through the school	☐	☐	☐	☐	☐	☐
They were involved in Story telling	☐	☐	☐	☐	☐	☐
Others (Please specify) [ ]	☐	☐	☐	☐	☐	☐

There can many different benefits realized from conducting a POE. Based on outcome of the POE conducted in your school district, how significant were each of the following **benefits** to the school district and/or facilities management?

	Extremely useful	Moderately useful	Slightly useful	Neither useful nor useless	Slightly useless	Moderately useless
Future cost reduction in building operation	○	○	○	○	○	○
Reduction in whole life						

environmental impact	O	O	O	O	O	O
Reduction in future liability of clients (school owners)	O	O	O	O	O	O
Maximize value of property portfolios	O	O	O	O	O	O
Increased occupant performance	O	O	O	O	O	O
Increased occupant satisfaction	O	O	O	O	O	O
Increased design know-how	O	O	O	O	O	O
Other (Please Specify)	O	O	O	O	O	O

How important are following **solutions** to consider when conducting POE as a routine evaluation?

Instructions:
1.) Review the list of reasons.
1.) Identify the activity that is **Least Important and rate it as 1.**
2.) Next, identify the activity that is **Extremely Important and rate it as 5.**
3.) Rate the remaining activities in between **Least Important** and **Extremely Important**.

	Least Important	Less important	Moderately important	Very important	Extremely important	Not Applicable
Changing attitudes of school administrators	O	O	O	O	O	O
Changing attitudes of facility managers	O	O	O	O	O	O
Changing attitudes of construction professionals	O	O	O	O	O	O
Changing attitudes of design	O	O	O	O	O	O

professionals

Development of best practices for conducting POE in schools	○	○	○	○	○	○
Identifying reoccuring funding sources for POE	○	○	○	○	○	○
More involvement of school administration in the design process	○	○	○	○	○	○

Questions regarding personal opinion on POE

PART 3: In this section you will be asked questions about the POE based on your personal experience and opinions.

In your opinion, what was the main **purpose** for conducting a POE? (Check all that apply)

LEED Credit

Verification of mechanical systems

Assessment of occupant comfort

Documentation of temperature, humidity, daylighting etc

Assessment of occupant Performance

Gather data to use in future building projects.

Others (Please specify)

In your opinion, how important were **occupants needs** in the POE?

| Least Important | Less Important | Moderately Important | Very Important | Extremely Important |

Demographics

Part 4: Questions in this section will focus on demographics.

What type of school district do you work for?

      Public   Private   Charter   Religious   Other

In what state is your school district located?

What is the highest level of education you have completed?

How long have you been working in your current school district?

What is your current position/title?

Facilities | Maintenance | District | School | Director of | Other (please
Manager/Director | Director | Superintendent | Principal | Operations | specify)

What is your gender?

Male   Female

What is the highest level of education you have completed?

Colorado State University

Research Integrity & Compliance Review Office
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX (970) 491-2293

DATE: May 5, 2016

TO: MaryEllen C. Nobe, Ph.D., Construction Management
              Akash P. Mehta, Construction Management

FROM: IRB Coordinator, Research Integrity & Compliance Review Office
              (RICRO_IRB@mail.colostate.edu)

TITLE: Inclusion of Students in Post Occupancy Evaluation (POE) of LEED K-12 Schools
IRB ID: 075-17H   **Review Date: May 5, 2016**
                              This project is valid for three years from the review date.

The Institutional Review Board (IRB) Coordinator has reviewed the following <u>modifications</u> of this project:
        1. Final Survey submission
and has declared the study remains exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- You do not need to submit an application for annual continuing review.
- You must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if stated in your application or if required by the IRB.
- Any modification of this research should be submitted to the IRB through an email to the RICRO IRB Coordinator (RICRO_IRB@mail.colostate.edu), prior to making <u>any</u> changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.
- Please notify the IRB (RICRO_IRB@mail.colostate.edu) if any problems or complaints of the research occur.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a similar study in the future.