

Developing Sustainable Leaders: Implementing a USGBC LEED® Lab™ Program on Campus

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Abstract

The LEED Lab program, sponsored by the United States Green Building Council (USGBC), offers educational institutions a way to teach energy conservation, efficiency, and sustainability as well as offer students the “real world” experience of actually certifying a campus building through the LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) process. This paper examines how one institution developed and implemented a LEED Lab program on its campus, from inception through the certification process. Through this examination of one program’s successful implementation, other engineering educators can decide whether the LEED Lab program might be a good fit for their campuses and can build upon the authors’ successes and avoid some of their challenges.

Introduction

The USGBC has been a leader in sustainable practices in the built environment since 1993, most notably through its Leadership in Energy and Environmental Design (LEED) certification program. This program, initiated in 1998 has been adopted and used worldwide. LEED certification was originally developed for new construction but has broadened to include other building types, including a certification process for the operations and maintenance of existing buildings. LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) certification, offered since 2005, was developed for existing structures and is predicated on how the building is actually performing, not just its designed or expected performance. The USGBC’s LEED Lab initiative is supporting universities to simultaneously “green” their campuses and offer students the experience of leading the certification process. Different institutions have adopted different models for implementation and another institution just completed the first building certification through the program.

The LEED Lab initiative benefits both institutions and students. As stated by the USGBC:

Existing buildings hold incredible promise for higher education institutions, offering tremendous opportunities to connect academics with operations. The implementation of LEED for Building Operations and Maintenance on campuses will support an institution’s sustainability goals by reducing the environmental impact of buildings and grounds; creating a positive effect on student, faculty and staff health; and preparing students to be global sustainability citizens.

With the goal of transforming existing campus facilities around the world, we have developed a clear vision for the future: LEED Lab. An innovative solution for integrating sustainable practices into daily campus operations and maintenance, LEED Lab is an interactive, multidisciplinary immersion course designed to transform the academic environment by preparing students for competitive 21st century careers in sustainability.

In the course, students learn the principles of LEED and assess the performance of existing facilities on campus, choosing one building where they will facilitate the complete LEED O+M process with the goal of certifying the facility.¹

This approach is in line with the findings of McCoy, O'Brien, Novak, and Cavell, who believed that the hands-on aspect was a critical component of sustainable education².

The Catholic University of America conducted the pilot program and was the first to certify a campus building through the LEED Lab program. Since the program utilizes a building on the institution's own campus, they found students had "great enthusiasm...because they feel a sense of "ownership" towards the building"³. As of January of 2017, the program has grown to include 24 institutions from seven countries across the world⁴.

Across these different institutions, there is a multitude of intents and approaches as a LEED Lab participant. Some, such as the Catholic University of America and the authors' institution, involve students in actually submitting a campus building for LEED-EBOM certification. Others go through parts of the process to expose students to the requirements and procedures, and some focus more on preparing students for one of the accreditation examinations. Colorado State University at Pueblo utilized both lecture and laboratory components, with the intent of simultaneously certifying a building and preparing students for the accreditation examination⁵. The LEED Lab program is flexible and can be implemented in a variety of ways to fit institutions' particular aspirations.

Background

The authors' involvement in LEED Lab was based upon their institution's longstanding sustainability initiatives. Ball State University is signatory to the Talloires Declaration, which states:

The first official statement made by university administrators of a commitment to environmental sustainability in higher education. The Talloires Declaration (TD) is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. It has been signed by over 350 university presidents and chancellors in over 40 countries.⁶

Ball State University's strategic plan includes meeting LEED standards for all campus buildings, including both new facilities and renovations ⁷. The concept was brought to the authors through a faculty member in another college who was active in the USGBC. The authors had previously collaborated in team-teaching several other interdisciplinary courses, including the first sustainable construction class at the institution, so the idea of being able to involve students in an actual building certification fit perfectly with their and their program's intentions.

Process

The LEED Lab program began at Ball State University in Spring 2015 as an immersive class offered by the construction management program and led by the authors of this paper in collaboration with a representative from the Center for Energy Research/Education/Service (CERES). LEED Lab brought together an interdisciplinary group of students from construction management, architecture, interior design, and landscape architecture. With Ball State's Facilities Planning and Management (FP&M) department as their client, and while working closely with FP&M, through the course of four semesters Ball State's LEED Lab has submitted one campus building for certification and is currently preparing to submit a second campus building.

LEED Lab is structured as an *immersive learning* class. "Immersive learning brings together interdisciplinary, student-driven teams guided by faculty mentors to create high-impact learning experiences" ⁸. To achieve this goal, students from a variety of majors provided the expertise to successfully implement the project, as also recommended by Brncich, Shane, Strong, and Passe ⁹.

The ability to evaluate current operations and maintenance procedures and policies, research sustainable strategies and technologies, and complete LEED documentation were all skills which will benefit them in their future professions. All of these students will work collaboratively as professionals upon graduation, often at the same firms. Each major took the lead on a particular area of the project, but all students were involved in every aspect.

Electronic mail messages discussing the class were sent early in the previous semester to students in the targeted majors: construction management, architecture, interior design, and landscape architecture. Students applied directly to one of the authors, who also served as the program's academic advisor, early in the previous semester. Students who were selected needed to be committed to quality work, as well as possess strong communication and time management skills. Previous LEED knowledge was a plus, but not a requirement. Those selected were then notified and given permission to enroll during course registration. Care was taken to ensure a mix of majors.

When selecting the first building for LEED Lab, the students researched eight of the university's LEED buildings. All had been certified under either LEED for New Construction or LEED for Commercial Interiors. Selecting a building that was previously LEED certified qualified the building for several points in LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM); therefore, the authors only considered previously LEED certified buildings on campus.

Of the eight buildings considered, four were eliminated due to their being residence halls. Due to privacy concerns for the residence hall occupants, the students would not have complete access to the buildings. This was anticipated to be a hindrance, so the team turned to the non-residence hall buildings. Next the students eliminated a recreational center. Due to its specialized spaces, the students thought it would be a more difficult choice. So, of the two remaining, the Marilyn K. Glick Center for Glass was chosen due to its smaller square footage and the fact that it only achieved the Certified level. The students felt it would be a more manageable first project for LEED Lab. Ironically, what was anticipated to be an advantage was later found to be a challenge. Due to it being a glass-blowing facility, there is a great amount of process energy. That minimizes the opportunities to improve its energy efficiency by 20%, which is a prerequisite. This could not be met, so the team submitted an appeal under a Pilot credit, "Energy Jumpstart," an option being tried by USGBC for those in similar situation. The authors have been in constant conversations with USGBC, and are confident that this will allow the team to achieve the LEED Certified level of certification.

As the authors await the final decision on the Glick Center, for the second LEED Lab selection the students returned to their previous list of buildings. Of the two that had not been eliminated, the David Letterman Communication and Media Building and the Teachers College building, the students selected the Letterman Communication and Media Building. Their rationale was since it was originally certified in 2007 there would be more opportunities for improvement. As a second incentive, the David Letterman Communication and Media Building is a showcase building for the university, due to its namesake and his ties to the university.

As the group began a new building, the first step was to analyze the existing condition of the building and their standard operating procedures. The students had all been in the Glick Center building, but they all went on a tour of the building led by a representative from Facilities Planning and Management, who is a LEED AP O+M (Operations + Maintenance). He was the campus representative who oversaw the construction and initial LEED certification of the Glick Center building. He was able to share specific information concerning the LEED requirements and implementation throughout the building, as well as his suggestions for areas of improvement. The team then met with representatives from Facilities Planning and Management to learn their standard operating procedures. Representatives included:

- The Senior Purchasing Agent, who met to discuss Ball State University's efforts in the area of sustainable purchasing overall
- The Associate Director for Landscape and Environmental Management, who met to discuss Ball State's efforts in the areas of grounds upkeep and waste removal
- The campus interior designers, who met to discuss efforts in the area of sustainable furniture and finishes
- The Building Services Supervisors, who met to discuss green cleaning
- The campus Energy Engineer, who met with the team to discuss energy management

All of these representatives discussed their area's impact on the building being studied that semester, including the university's overall efforts and those associated with the Glick building specifically. With the information gathered from the building tour and the meetings with the representatives from Facilities Planning and Management, the students selected their area of concentration from the following:

- Project Information Forms
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation

Within their area, the students then researched the current state of the building under examination. They interviewed occupants and looked for areas of improvement under the various LEED criteria. As areas of improvement were identified, they then worked with Facilities Planning and Management to implement them before the performance period began. Being a state institution, cost was always a consideration, but the students were adept at finding no-cost or low-cost options, such as increasing the visibility of recycle bins. Upgrades that were already scheduled, such as new sustainable lobby furniture and the conversion to light-emitting diode (LED) lighting, were also helpful. A particularly impactful change was to put the HVAC (heating, ventilation, and air conditioning) systems on an operating schedule. The systems were running 24/7, without any setbacks. The engineering staff at FP&M had realized for years that this was a problem, but with 52 buildings under their supervision, they had not gotten the chance to set an operating schedule. Working with the students in LEED Lab, they put it together and began implementing it for the performance period.

Lessons learned

The authors are in the middle of the process for certifying a second LEED Lab building on campus, and here are the main lessons they have learned from the first LEED Lab building:

1. Make sure the prerequisites can be met. For example, the LEED for Existing Buildings requirement stipulate a 20% reduction in energy consumption as a prerequisite. If the building under consideration is already energy-efficient, this may present a challenge. However, USGBC has a “Energy Jumpstart” Pilot credit in case the building is having a problem with meeting this prerequisite. USGBC does not want to penalize buildings that have continued to perform efficiently, so this is valuable.
2. Keep in constant contact with the university’s Facilities Planning and Management department. Everyday operations can provide opportunities for LEED Lab participation. For instance, the authors found out the Facilities Planning area will be replacing the lobby furniture in the current building being certified in LEED Lab, the David Letterman Communication and Media Building. This will qualify for a point, since they are using furniture from Steelcase which meets the requirements for MRc2 “Sustainable Purchasing – Durable Goods.” The FP&M department has scheduled to replace the existing fluorescent lamps with LED lamps, which will qualify for a point under MRc4, “Sustainable Purchasing—Reduced Mercury in Lamps.” These activities must occur during the performance period in order to qualify.
3. Do not take anything for granted. Ball State University has been a national leader in sustainability, but the students still had to check that every trash can had a recycle bin attached to it. The students did a waste stream audit last April, for Earth Day, and will do another this April to see if their efforts yielded any improvements.
4. Utilize the Innovation credits. The authors feel they could have done better in this category for their first building, the Glick Center for Glass. LEED allowed a project to qualify for six points in this category under a combination of Exemplary Performance, Innovation and Pilot credits. For the current building undergoing certification, the team will be spending more time researching this category. LEED Lab itself counts as an Innovation point, which in addition to the LEED AP point and an Exemplary Performance point for Alternative Transportation, were the only ones pursued for the authors’ first building project. For the current project, the team will pursue the full six points. Innovation and Pilot credits need to be registered through USGBC as soon as possible in the process, since USGBC only allows a certain number of applicants for each. The authors’ team registered for “LEED Lab” (IPpc96), “Green Building Education” (ID3115), “Design for Active Occupants” (EQpc78), “Indoor Air Quality

Procedure” (EQpc68) and “Water Restoration Certificates (WEpc110). The team already qualified for the LEED AP Professional and an Exemplary Performance for WEC2 “Additional Indoor Plumbing Fixture and Fitting Efficiency,” so it is expected that the team will exceed the attempts for these six points.

5. Make use of the support available. The LEED Lab Coach for USGBC was available for questions and suggestions, both through emails and conference calls. For information on the procedures other LEED Lab university courses incorporated into their curriculum, the “USGBC+” online magazine had many articles on LEED Lab. An effective method of connecting directly with other LEED Lab faculty was the LEED Lab discussion group on Yammer. The authors found this useful when dealing with issues, specifically dealing with LEED Lab implementation. After registering their building, participants have access to the full platform of LEED online at usgbc.com, where one may keep current on the progress of documenting the project. Finally, the website leeduser.com provides forums to discuss specific credits, sample documentation, helpful tips and the email newsletter, Building Green. Some of the site is free, but for full access there is a monthly fee.

Challenges

LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) requires a 12-month performance period, where the energy and water usage of the building is tracked. Many credits need to be attempted during this period and coordinating this with the academic calendar proved to be a challenge. Ball State University tracks energy and water usage, so the team always had that data, but it required more planning to work within the confines of the 10-month academic schedule. A possible solution would be to have a summer section with two or three students to keep the progress consistent.

The changing of students from one semester to the next also was a challenge. Having to start over each semester explaining the process, what had already been done, and what was yet needed to be accomplished slowed down progress. The varying abilities of students, and matching them to their areas of expertise, proved to be a challenge also. The mix of majors served to minimize some of this, since the authors had a variety of skill sets available to them. Students from previous semesters were usually available to smooth the transition, but some had graduated and left campus.

Although the staff of Facilities Planning and Management were very supportive, the fact was that they all had full-time jobs and were not always available when the team needed assistance. The authors tried to minimize the intrusion by collecting questions and sending them at one time, rather than bothering them as each question arose.

Funding can be another challenge for LEED Lab, but the authors were fortunate to receive support from their university. LEED certification fees (for Silver level USGBC member organizations) include:

- Registration: \$1,200 (*This fee is currently waived for LEED Lab projects*)
- Application for certification: \$1,900
- Appeals: \$800 for complex credits and \$500 for simple credits

For the authors' first building, an internal grant and additional monetary support from the Center for Energy Research/Education/Service (CERES) was received. The main additional resource needed was the "LEED Reference Guide for Green Buildings Operations and Maintenance, v2009 edition", which was also purchased with the internal grant. It was an invaluable resource as the authors navigated through the LEED certification process.

Although the ultimate goal of LEED Lab may seem to be certifying a building for LEED-EBOM, the actual accomplishment was greater than that. Every student participant that researched what needed to be done, worked with the occupants to achieve the goal, and completed the actual documentation required to apply for certification, had already succeeded. The class was more than a line on their transcript. This was a talking point on their resume and during job interviews. Potential employers were impressed by students who did not simply learn *about* LEED, but have actually *participated* in the successful completion of a LEED certification.

Conclusion

The United States Green Building Council's LEED Lab program offers institutions the ability to provide sustainable education that reaches out of the classroom and provides real-world experience in building certification. Students gain both theoretical and practical knowledge, and institutions can further their own sustainability initiatives by having their buildings certified through the LEED for Existing Buildings: Operations and Maintenance process. This paper provided a description of one institution's implementation of LEED Lab, from initiation through building certification. Readers might find, as the authors did, that the LEED Lab program provides a tremendous opportunity to incorporate sustainability education and action into a single course that prepares students with the knowledge and experience to be the green builders of the future.

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