

AC 2010-923: IMPLEMENTING LEED COURSE CONTENTS IN THE BACHELORS CURRICULUM

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Abstract

Mounting energy constraints are enhancing the trend for sustainability; creating proficient demand for GREEN Building experts. This trend highlights the importance of individuals with LEED Professional Accreditation in hand. In today's competitive market individual's latent talents have to be exhibited effectively to make it count. LEED Accredited Professionals can tangibly bolster the efforts towards comprehending the idea of GREEN building industry in particular and render their valuable services towards the community at large.

This research enlightens us on implementation of the courses required for LEED Accreditation in the curriculum of students at graduate level. This will provide students with an opportunity and platform to prepare for LEED Accreditation Exam alongside their formal university graduation.

The research includes the implementation of LEED in the curriculum of Bachelors of Science in Construction Engineering Technology at Indiana University-Purdue University at Fort Wayne and the results of two surveys conducted to ascertain the response of Indiana University-Purdue University students' and Construction Industry across North East Indiana towards LEED Accreditation in general and LEED Accredited Professionals in particular.

Introduction

The need of the hour makes it incumbent for buildings to go 'GREEN' as there is no other way to circumscribe the growing energy crises. One of the most authoritative rating system to certify buildings as 'GREEN' is United States Green Building Council's (USGBC) LEED rating System. The number of projects acquiring certification under United States Green Building Council's (USGBC) LEED Rating System is increasing at a great rate ensuing in the increased demand for the LEED Accredited Professionals.

A LEED Accredited Professional is one who has passed the LEED (AP) exam and withholds the awareness and skills needed to participate in the design process. The Professional encompasses the necessary skills to streamline the application and certification process.

While government and professional organization are actively participating in promoting sustainability, the educational institutes are relatively slow in recognizing the need to incorporate sustainability concepts in their curricula. This issue needs to be addressed and the circumstances behoove the academic institutes to produce architects and engineers having a profound knowledge of LEED rating system in particular and sustainable design in general.

Indian University-Purdue University, Fort Wayne has taken these facts into consideration and implemented Sustainable design in its curriculum of Bachelors of Science in Construction Engineering Technology first time in spring 2008, The University is interested in getting its students and North East Indiana market response towards LEED Accreditation and evaluating that incorporating LEED contents in the curriculum was a prudent decision to achieve the aim of producing professionals having a consummate command over sustainable design.

Literature Review

It is inspiring to see that LEED APs can be found in all fifty states and in more than 2,400 cities, indicating a strong interest on the part of architects and engineers in building sustainably across the country (Cidell, 2009). The trend for sustainable design is in embryonic stages at present; with the potentials to develop across vast latitudes. Its ever-increasing demand is creating a void that needs to be filled by LEED Accredited Professionals. The outstripped demand makes it imperative for universities and other academic institutions to accouter a scads of professionals, engineers and architects; equipped with skills and expertise necessary to meet the diversified challenges of 21st century. The American institute of Architects found that 13 percent of the architecture firms it surveyed had a LEED AP on staff (Design Intelligence 2007).

A survey conducted by Consulting specifying Engineer showed that the total number of LEED APs employed by Giant 100 firms is 4,042 which accounts for almost 8% of the nation's 51,452 LEED APs at the time the survey was conducted (Consulting Specifying Engineer, 2008).

According to U.S Green Building Council Strategic Plan: 2009-2013, the educational institutes lack the curriculum for GREEN Building and Sustainable Design. In the present scenario academic institutions can play a pivotal role in preparing students for the LEED Accreditation Exam. As educators we should keep our standards high and encourage students to stretch to reach goals. This will build the personal leadership skills needed to succeed in the construction industry (Bain & Bender, 2006). The students need to be accoutered with all the technological developments and innovations to keep pace with the changing demands of the construction industry. Undergraduate Construction Management (CM) curricula need to be evaluated frequently to meet the requirements of an ever changing construction industry (Souder & Gier, 2006). The disciplinary confinements need to be eliminated to view things in broader perspective; easing implementing sustainability in built education (Jucker 2002).

Earning the LEED AP credential strengthens the GREEN building qualification and enables the students to market their GREEN building knowledge to recruiters, hence significantly improving their chances of being hired by GREEN builders (Brow, A. 2009).

Darwish and Agnello (2009) suggested that two approaches can be adopted to incorporate sustainability into the engineering curriculum, Center Approach and Whole Curriculum approach.

- a) The Center Approach refers to as developing a multidisciplinary GREEN center to serve as a focal point towards promoting sustainable design. The Georgia Institute of Technology's center for sustainability is an exemplary model to this approach.
- b) The Whole Curriculum approach refers to designing a new curriculum integrating more Sustainable Green perspective.

Brown (2009) developed an elective course in Green Building Practices and LEED Certification at California State University, for the construction management students that led to a fast paced LEED AP training course for construction professionals. The results shaped a collaborative and moving relationship between academia and industry.

A course, *Sustainability and LEED* was first offered at Purdue University in the fall of 2006 to interior design students. It gained so much popularity that it was offered again in spring 2007 with 50% enrollment increase. One objective of developing this course was to teach students LEED rating system in an attempt to produce LEED Accredited Professionals prior to their graduation (Kilmer & Kilmer 2007).

Darwish and Agnello (2009) enlightened the idea of introducing a new course *An Introduction to Green Development and Construction* at Texas Tech University in spring 2009. The main objective of introducing the course was to give students a deep insight to the sustainable design and help them preparing for LEED Accreditation.

United States Green Building Council promotes the concept of sustainability and wants universities and other Research-and-Development organizations to prepare individuals equipped with sound knowledge of Green buildings. The energy crisis is proving to be a scourge of 21st century. This challenge can only be met by retrenching the energy resources or by innovations and technological developments in Green industry. This ensue technologists and professionals to come up with novel ideas and effective solutions pertaining to Green industry. Advancements in this arena will have far reaching impact at global and national level. Some academic institutions have modified their curriculum to promote sustainability, and few others are in the process of doing so. It is imperative for the universities to modify their curricula to meet the growing demands of the industry.

If this challenge is not responded our students and our community will be failed. More over it could make us fall behind our peers in the other parts of the world who are racing forward in commitment, action and innovation (Darwish & Agnello 2009).

Methodology:

The research was conducted in two parts:

- 1) Studying the Implementation of LEED in the curriculum of Bachelor's of Science in Construction Engineering Technology at IPFW

The curriculum of Bachelor's of Science in Construction Engineering Technology at IPFW was assessed in detail with the objective of identifying at least one or more courses that can help students in broadening their knowledge towards LEED System and helping them prepare for LEED AP Exam.

To verify that implementation of LEED was a prudent decision responses were collected towards LEED Accreditation.

- 2) Data Collection: Two survey instruments were designed to collect the following data:

- a) Market Response towards LEED APs

A survey consisting of structured questions was designed to collect market response toward LEED Accreditation and to identify the employment prospects for LEED Accredited Professionals. The tool survey Monkey was used to distribute survey and collect responses from different organizations within the Construction Industry across North East Indiana.

- b) Indiana University-Purdue University, Fort Wayne Student's response towards LEED Accreditation

A survey consisting of structured questions was distributed among Indiana University-Purdue University, Fort Wayne Construction Engineering Technology, Interior Design, and Architectural Engineering Technology students to collect their response towards LEED Accreditation and their interest in being a LEED AP.

Implementation of LEED in the Curriculum of Bachelors of Science in Construction Engineering Technology at Indiana University-Purdue University, Fort Wayne

In Spring, 2008 a new course “*Sustainable Construction*” was included in the curriculum of Bachelors of Science in Construction Engineering Technology, to introduce students with the new dimensions of sustainable design. This made Indiana University-Purdue University, Fort Wayne the first University in Indiana region to incorporate sustainability in the curriculum of Bachelors of Science in Construction Engineering Technology.

The course was introduced and developed by a faculty who was a LEED Accredited Professional in compliance with the LEED System. The contents of the course covered all the necessary topics for understanding the LEED rating system and preparing students for the LEED AP Accreditation Exam. The text book for this course “*Sustainable Construction and Design*” explains in detail the LEED rating system, distribution of credits, and the Certification process.

Course goals: The goals of the course were to increase student awareness about the LEED rating system, help them in being a LEED AP and support USGBC efforts in promoting sustainability. Another important objective of course was to assist student in taking LEED AP Accreditation Exam before graduation so they can start a professional career with LEED Accreditation in hand.

Course Contents:

The major topics covered in the course were:

- The Foundations of Sustainability
- Site and Natural Energy Mapping : Covering USGBC LEED NC: Sustainable Sites 14 points in detail
- Water Resources and sustainable Landscaping: Covering USGBC LEED-NC Water efficiency 5 points
- Building Orientation, Renewable energy and storage and HVAC Systems: Covering USCBC LEED-NC Energy and atmosphere 17 points
- Materials and Resources: Covering USGBC LEED NC-materials and Resources 13 points
- Indoor Quality-Air, Light and Views: Covering USGBC LEED-NC Indoor Environmental Quality 15 points
- Innovation and Design: Covering USGBC LEED-NC Innovation and Design Process 5 points

Assessment Method: The method of assessment included a Mid Term in class Exam, a Final in class Exam, Assignments and a Project Paper. (The topic for project paper was to be in accordance with sustainability). The course received an excellent response and after taking the class some students took the LEED AP Accreditation Exam and passed it. Indiana University-Purdue University, Fort Wayne and M. Regina Leffers, Ph.D. also helped students in registering with a LEED registered project so they can appear in the Exam without any predicament. According to one of the students *“The subject gave me a good insight into the Sustainable Design and helped greatly in preparing for LEED AP Accreditation Exam”*.

The course has now become a permanent part of Bachelors of Science in Construction Engineering Technology Curriculum and is offered every year in spring. Currently the instructor is of the view *“After taking this course a student should be able to take the LEED AP Accreditation Exam with very little preparation of his own, the only two reasons for him not taking the exam can be money or being tired of school”*

To further strengthening the knowledge of students towards LEED rating system, some practical work experience was needed. So the instructor decided to modify one of the existing courses and making it as a Group work Project course in which all students had to work on one real time project which is trying to achieve LEED Certification. The modified course was introduced as *“Senior Capstone I”*. Practically looking at the LEED Rating system greatly helped students in better understanding the theory about the LEED System.

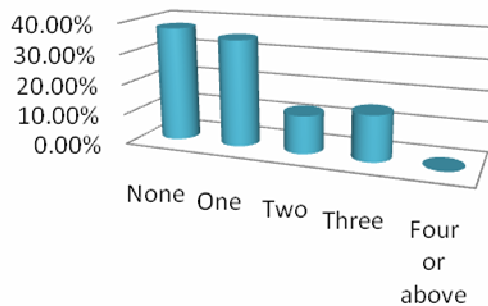
The course *Sustainable Construction* is offered in 3rd year and *Senior Capstone I* is offered in fourth year, the combination of both practical and theoretical knowledge about the LEED Certification is providing students with invaluable information as they can physically see the lead resources in action.

Survey Results:

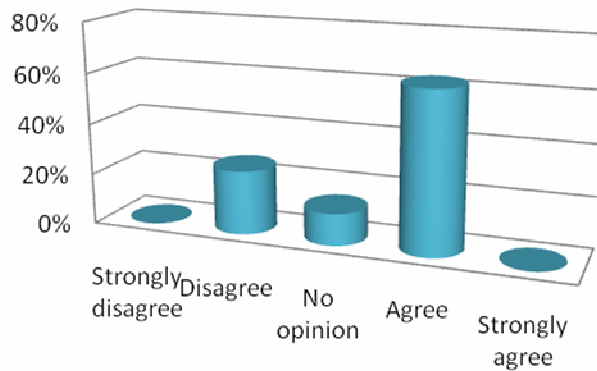
Market Response towards LEED APs (North East Indiana Region)

The survey was sent to different organizations within the Construction Industry across North East Indiana, the response rate came out to be 28%. Results of few important questions asked in survey are as follow:

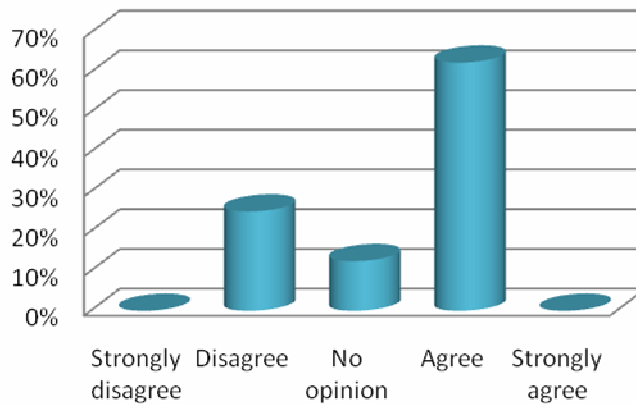
Survey Question: How many LEED (AP) are working in/with your Organization?



Survey Question: With the Growing Trends in Green Buildings, the demand for LEED(AP) is likely to increase, do you



Survey question: With LEED Accreditation in hand you have better chances of getting hired, do you?

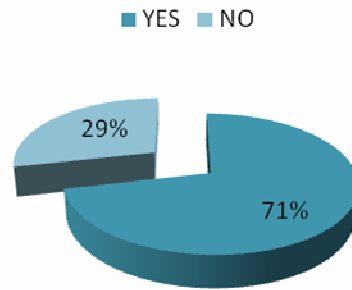


The above results indicate that at least 27.5% of the organizations in North East Indiana have 2-3 LEED Accredited Professionals working for them and almost 63% organizations have at least one LEED AP working for them. The response indicates that most of the organizations agree that the demand for LEED APs is likely to increase. 62.5 % organizations supported that LEED Accreditation can increase the job prospect of an individual.

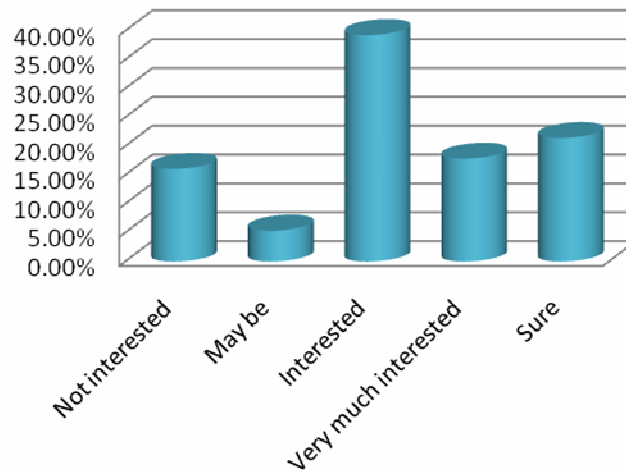
1) Indiana University-Purdue University, Fort Wayne Student's response towards LEED Accreditation

The response rate for this survey was 96%. Almost all the students who were asked to take the survey responded in a zealous manner.

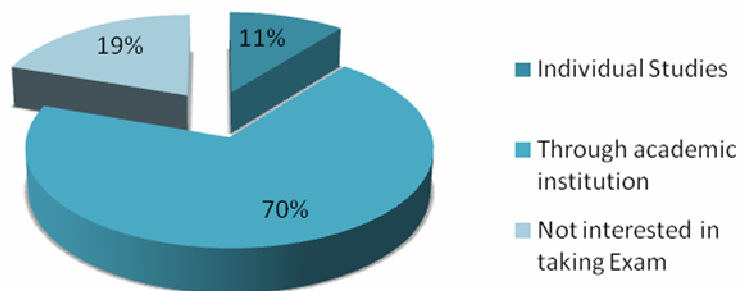
Survey Question: Are you familiar with LEED Accreditation for Professionals?



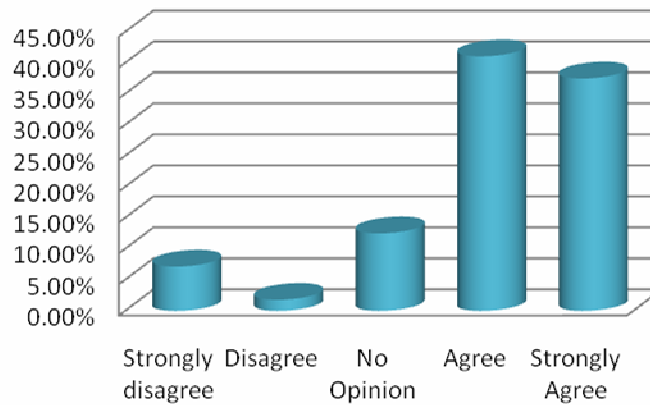
Survey Question: How likely you are to take the LEED (AP) Exam?



Survey Question: If you are interested in taking the Exam, how would you prefer to prepare for the LEED (AP) Exam?



Survey Question: An academic institution should help students in preparing for LEED (AP) Exam, do you?



The results show that a large number of students are interested in taking the LEED AP Exam and want to get prepared for the Exam through an academic institution. Most students agree that institutions should help students in preparing for the Exam.

Conclusion and Implementation

The paper provides a look on how LEED was incorporated in the Curriculum of Bachelors of Science in Construction Engineering Technology at Indiana University-Purdue University, Fort Wayne and is benefiting students to understand the sustainable design. The survey results further strengthens the idea of implementing LEED contents in the curricula of students at graduate level. Providing students with professional development opportunities have now become a need of hour and it has now become imperative for the institutions to introduce LEED in their curricula because the demand for LEED APs is increasing and both the employers and the students are interested in LEED System.

This dispassionate research results can provide a guideline for other educational institutes interested in implementing LEED in their curriculum. The research can contribute positively towards USGBC efforts for promoting LEED concepts in educational institutions.

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