

# The Evaluation of the USGBC Course LEED 205: Green Buildings and Preparing for the LEED Green Associate as a Means of Exam Preparation

Team YAR : Yi Zhang, Avriel Lee, Renea Hicks

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Indiana University

Dr. Catherine Roma

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## **Executive Summary**

This evaluation project was conducted between May, 2011 and July, 2011 on the U.S. Green Building Council (USGBC) course LEED 205: Green Buildings and Preparing for the LEED Green Associate. After consulting with Kay Kane, an instructional designer for USGBC, about the needs of USGBC, several evaluation questions were decided upon. The evaluation examined four levels of evaluation: satisfaction, learning, behavior, and results. This evaluation attempts to provide insights into the following questions:

1. Are students satisfied with the course as a means of preparation for the Green Associate credential exam?
2. Did participants learn the content?
3. Does the course effectively prepare participants for the Green Associate credential exam?
4. Do students pass the credential exam?
5. Do students apply the green building knowledge in their workplaces?
6. Do(es) the credential exam and/or the green building knowledge assist participants in their professional lives?
7. Does this course have any tangible benefits for USGBC or aid in furthering the mission of the organization

The evaluation used volunteers for all data collection. Participants from the course were selected from Winter 2010 to Spring 2011. Students currently enrolled in the course were also contacted for participation for the evaluation of learning. Ninety-six out of 532 contacted students participated in the evaluation of course satisfaction, behavior, and results. Fifteen out of ninety-nine contacted students participated in the evaluation of learning.

Three data collection instruments were used. An online survey including open-ended and closed-ended questions and was used to measure satisfaction, behavior, and results. Open-ended questions were analyzed using a method known as content analysis. Close-ended questions were statistically analyzed. In addition to the survey, email or phone interviews were conducted with thirteen volunteers to provide further information on these levels of evaluation. A content analysis was also conducted on the interview responses. A multiple-choice test measured learning.

The overall results are as follows:

- Course participants expressed satisfaction with the assistance of the instructor in assisting with exam preparation.
- Participants expressed overall satisfaction with all components of the course, but in particular found the videos/presentations, readings, and inclusion of LEED 201 materials to be the most valuable components of the course.
- Participants desired additional exam prep questions and shorter videos

- A twenty-five question multiple-choice test was used to determine learning. Fourteen volunteers took this exam. The mean result of the multiple-choice exam was 77.43% with a median and mode of 76%.
- Among ninety-six volunteer survey participants, 59.4% of all respondents have taken the Green Associate credential exam. Of those that have taken the exam, 82.5% have passed the exam
- Participants report utilizing their knowledge in their workplaces with peers and clients.
- Based upon participant responses, the course appears to positively contribute to the mission of USGBC as participants are utilizing their knowledge in the workplace with peers and clients.
- USGBC is likely to benefit in the future as past course participants indicated they were likely to take another USGBC course in the future or recommend this USGBC to peers.

Based upon our findings we have several recommendations:

- The instructor was a crucial component in the overall satisfaction of the students in evaluating the course as a means of exam preparation. This aspect of the course should continue with an emphasis on using instructors that are knowledgeable about Green Building and can communicate in a timely and responsive manner.
- Any course revisions should be selected carefully so as not to decrease the current satisfaction, learning, behavior, and transfer ratings.
- Consider course revisions based upon the findings of the open-ended questions. This might include reducing the length of the videos/presentations and adding additional exam-type questions. The content of the course should be reviewed to insure it covers all aspects of the credential exam.
- Provide more technical details in videos, readings and discussions with respect to the exam questions.
- Develop and incorporate a brief introductory video or tutorial on how to navigate the online platform.
- Consider creating smaller discussion sections as several respondents indicated the size of the discussion sections was problematic.
- Consider the addition of a required pre-test and a required post-test in the course to more accurately assess learning.
- USGBC should continue to monitor pass rates for the exam by following up with course participants. This might be done via a simple online survey three months, six months and twelve months after the course has been completed.
- A baseline measure of “success” and a target goal should be established for passing rates on the credential exam.
- USGBC should consider adding a question to the course sign-up form that asks how the new student learned of the course. This may provide additional evidence about the results of the educational offerings for USGBC.
- To more accurately evaluate how this course aids in fulfilling the mission of USGBC and the quality of course transfer into the workplace, further

evaluation is needed. This would incorporate employers, peers, or clients of students.

## **Introduction**

This evaluation was conducted as part of a graduate-level course in evaluation at Indiana University. It was conducted between May, 2011 and July, 2011. The team reviewed and used Kirkpatrick's Evaluation Model (2006) as the model for the evaluation. Background information on the course and the US Green Building Council (USGBC) was collected to better understand the context of the evaluation. After interviewing our contact at USGBC, Kay Kane, the team developed a proposal for the evaluation. The proposal was revised with input from Kay Kane and Dr. Catherine Roma, the instructor for the course.

The Washington, D.C.-based U.S. Green Building Council (USGBC) is a non-profit organization that promotes sustainability in building design, construction, and operation. USGBC is best known for the development of the Leadership in Energy and Environmental Design (LEED) Green building rating systems, and GreenBuild, a green building conference and expo that promotes the green building industry. The mission of USGBC is: "To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life." (<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124>)

USGBC's Education Department offers training and development courses in green building with a variety of delivery formats for construction-related professionals such as architects, project managers, and contractors. The online course we are basing our transfer evaluation report is called LEED 205: Green buildings and Preparing for the LEED Green Associate. The LEED Green Associate is a credential exam. Upon passing the exam, one may use the Green Associate credential professionally.

Course registration is open to the public for four sessions each year. The course is eight-weeks long. It is delivered in a blended format with instructor-led and asynchronous components. Core concepts and strategies in green building are introduced with a self-taught course called LEED 201. Other components of the course include weekly readings, online forum discussions, and videos/presentations. There are no prerequisites or final assessments required of participants.

In addition to teaching concepts and facts about green building, the other important goal of the LEED 205 course is to prepare participants to take the Green Associate credential exam with the non-profit organization Green Building Certification Institute (GBCI). In order to be eligible to apply for the exam, the participant must have an electronic completion certificate from the LEED 205 course, which is distributed by the online learning platform vendor at the end of the course. However, participants are not required to take the Green Associate credential exam

within a defined time frame. Whenever the exam is taken, GBCI does not publicly associate the participant's information (i.e. name and contact information) to his exam result.

The following stakeholders for this evaluation report were identified:

1. USGBC training staff and decision makers.
2. The participants who have taken the LEED 205 course and have had experience in preparing for Green Associate credential exam.
3. The peers and/or employers, identified by the evaluation participants, who may have formally or informally observed behavioral changes and/or results of the participant after completing the course and earning the Green Associate credential.

Based upon the context, the Indiana University course assignment, and our proposal, we adopted the following evaluation questions.

1. Are students satisfied with the course as a means of preparation for the Green Associate credential exam?
2. Did participants learn the content?
3. Does the course effectively prepare participants for the Green Associate credential exam?
4. Do students pass the credential exam?
5. Do students apply the green building knowledge in their workplaces?
6. Do(es) the credential exam and/or the green building knowledge assist participants in their professional lives?
7. Does this course have any tangible benefits for USGBC or aid in furthering the mission of the organization

## **Methodology**

Kirkpatrick's Evaluation Model is based upon four levels of evaluation. This model is commonly used in evaluation. The levels move from the relatively simple evaluation of participant satisfaction to the more complex evaluation of results.

Evaluation at level one measures how the participants react to the educational product or satisfaction. . Level one evaluation is often conducted by utilizing a survey.

Level two evaluation is focused upon the extent to which learning occurred as a result of the course or intervention. Level two evaluation is often completed with a test. Although Kirkpatrick's model recommends the use of pre-testing and post-testing for a better means of determining learning that is specifically related to the training, in the context of this evaluation pre-testing was not possible.

Level three evaluation can be defined as the extent to which a change in behavior has occurred or as the transfer of learning in a different setting. This level of

evaluation is often completed with interviews or surveys. According to Kirkpatrick (2006), whenever this level of evaluation is conducted, it is important to allow time for behavior change to take place. Results may not be apparent immediately following the intervention.

Level four evaluation determines what final results occurred because of attendance and participation in a training program such as productivity growth, quality improvement, and increased tangible benefits Kirkpatrick (2006). Typically these are the organizational level results of the client's organization. In this evaluation we will examine the results for USGBC as access to typical participants was not possible given the time constraints.

## **Data Collection**

### **Participants**

Our participants included students that took the LEED 205 course from its first offering in Winter 2010 through Spring 2011. Two sessions were currently in progress until the end of July. Due to deadlines, these students were not contacted to participate in the evaluation. An email was sent detailing the purpose and importance of the evaluation project to 541 previous students. Nine email addresses were invalid so the final number of contacts was 532. Slightly over 18%, or 96 people, responded to this email. Thirteen members of the larger sample group also participated in interviews. From the same group of 532 contacts, ninety-nine were contacted for additional participation in the evaluation of learning. This sub-group completed LEED 205 in the Spring 2011 session. Fourteen people in this sub-group participated in an additional level of the evaluation.

Fifty-eight percent of the participants identified themselves as currently working in green building related areas. Thirty-six percent identified themselves as working professionals in non-green building areas. Five percent identified themselves as students, and eight percent identified the "other" category when asked to describe their backgrounds.

All data was collected from volunteer participants due to the fact that the LEED 205 course is a course people choose to take for personal or career enrichment. It is not an in-house training program.

### **Methods**

We utilized quantitative and qualitative methods to explore the key evaluation questions. An online survey was used to gather data for the reaction, transfer, and result levels of evaluation. This survey included closed-ended and open-ended questions that provided qualitative and quantitative data. Follow-up e-mail or phone interviews (Appendix E) were utilized to provide additional qualitative data for these levels.

The initial email was sent out on July 11, 2011. This short, friendly email addressed the purpose and importance of the evaluation and included a link to the survey. Information about a free e-book from USGBC was included in this email to encourage participation. A reminder email was sent out three days after the initial email. By July 19, 2011, ninety-six participants completed the online survey. The response rate was slightly over 18%.

Participants were given the option to provide their names and contact information for follow-up interviews. Participants that left only email addresses were sent an email with interview questions. Participants that left both email addresses and telephone numbers were contacted via email by the evaluation team to determine their preferred method for completing the follow-up interview. A total of thirteen participants volunteered to participate in the follow-up interviews. Due to the support of USGBC in this evaluation project, all participants that completed both the survey and follow-up interview were entered into a drawing for an e-book provided by USGBC. At the conclusion of the interview, interview participants were asked if they would be willing to invite peers or employers to participate in the evaluation.

To evaluate learning, only participants that completed the Spring 2011 session were selected. The team's Instructional Systems Technology course instructor and the instructional designer at USGBC's education department suggested this. The main reason was that they were the most recent participants, and participants from Spring 2010 to Winter 2011 may not be able to provide us with data effectively and efficiently. It was believed that the time since course completion might have been too long for them to complete a test at this level. Many of them may have already taken and/or passed the Green Associate credential exam. The Spring-2011 participants may be the most motivated group as it is likely they are/were in the process of preparing for the credential exam and needed no extra incentives.

There were ninety-nine participants enrolled in Spring 2011 who received our test instructions via email. (See Appendix H) The email was sent on July 19, 2011. The participants were given 6 days from to complete the test. Fourteen percent of the email recipients responded and completed the test.

## **Instruments**

### ***Online Survey***

The primary data collection method for course satisfaction, behavior, and results was via an online survey through USGBC's premium account at Zoomerang.com. The survey contained closed-ended and open-ended questions. Close-ended questions were rated on a five-point Likert scale from Strongly Disagree to Strongly Agree. Questions were created to gather information about satisfaction, behavior, and transfer. After the survey was created at Zoomerang.com, an email (Appendix A) with the survey link was sent to 541 participants via email. Table 1 shows the questions asked of participants for each level of evaluation

Table 1

<b>Questions: Close-ended (Quantitative Data)</b>	<b>Evaluation Level</b>
In relation to preparing for your Green Associate exam, please rate your experience with your instructor	Satisfaction
<ul style="list-style-type: none"> <li>• The instructor was knowledgeable.</li> <li>• The instructor was an effective and timely communicator.</li> <li>• Having an instructor to lead this course added value.</li> </ul>	
In relation to preparing for your Green Associate exam, please rate your experience with the course.	Satisfaction
<ul style="list-style-type: none"> <li>• The reading assignments were appropriate.</li> <li>• I posted threads every week in response to the forum discussion topics.</li> <li>• I watched videos and/or presentations on a weekly basis to improve my understanding of the content.</li> <li>• The amount of interaction in this course was sufficient.</li> <li>• LEED 201, the self-paced learning module at USGBC's official site, effectively introduced LEED core concept and strategies.</li> <li>• The online learning platform at ugotclass.org was easy to navigate and/or provided with prompt technical support.</li> </ul>	
Please rate your learning outcomes.	Behavior, Results
<ul style="list-style-type: none"> <li>• I have been putting my green building knowledge into effect in my job and/or work on a regular basis.</li> <li>• I have shared my green building knowledge with my peers and/or clients on a regular basis.</li> <li>• In my school program and/or workplace, the use of the green building knowledge is also well supported and/or rewarded.</li> <li>• I will continue to use my green building knowledge in the future and thus the knowledge is likely to be sustained.</li> <li>• When preparing for Green Associate exam, resources from LEED 205: green buildings &amp; Preparing for Green Associate are enough for students.</li> <li>• My green building knowledge and/or Green Associate credential, helped my career and/or attracted more clients.</li> <li>• I will recommend this course to my peers.</li> <li>• I will consider USGBC's other educational products in the future.</li> </ul>	

Please select either Yes or No according to your situation		Behavior
	<ul style="list-style-type: none"> <li>I have taken Green Associate exam and have passed.</li> <li>I have taken Green Associate exam but have NOT passed.</li> </ul>	
<b>Questions: Open-ended (Qualitative Data)</b>		<b>Evaluation Levels</b>
	Please share any additional comments regarding your instructor in helping you prepare for Green Associate exam.	Satisfaction
	Which component(s) should remain in this course and why?	Satisfaction
	Client requested: Which component(s) should change in this course and why?	Satisfaction
	Please share any additional comments regarding your experience with the course components in helping you prepare for Green Associate exam.	Satisfaction
	Please share any additional outcomes you achieved due to this course and/or Green Associate credential.	Behavior, Since this is open-ended, this question was also examined for any information about Results that may have occurred

The following question was included at the request of the client: If your participation dropped during the course, please share with us why.

### ***Interviews with participants***

To gather qualitative data the last question of the online survey stated “to enter a drawing to win a USGBC e-book (\$50 value), would you be willing to fill out the following information and to join our follow-up e-mail or phone interview? We truly appreciate your effort to improve our course.” When participant’s responded with a full name and an email address or phone number, we initiated contact with them. Those that responded became the interview group. The e-book was provided by USGBC as a way to support and encourage participation in the evaluation.

Since our participants were online students, face-to-face interviews were not possible. We used phone and email interviews based on the participants’ preferences. Telephone interviews, according to Pershing (2006), can be very useful for seeking general information about specific feedback on one or two straightforward issues. . The team member used scripted questions and took notes without distracting the participant. Similar to phone interviews, email interviews are less expensive than face-to-face interviews.

The evaluation team developed an open-ended question bank for the interview participants. Questions were customized for individuals based upon their survey responses. For instance, for those that reported that they did not pass the test in the first quantitative data collection phase, were asked how the course could provide sufficient resources to help pass the credential exam. Most participants answered five interview questions.

At the end of the follow-up interviews with the participants, we asked them if they would be willing to invite their peers and/or employers to participate in an interview. This would allow us to gather further data on the transfer of green building knowledge in the work environment. At the time of this writing we have not received any positive responses to this request and have not interviewed any peers or employers.

Although only thirteen people agreed to interviews their responses to interview questions generally supported the responses to the open-ended questions on the initial survey. Due to the small number of responses, the overall results of this information will be presented descriptively rather than statistically. While statistical results were possible when many interviewees responded, the evaluation team believed that an overall statistical presentation would be misleading.

### ***Multiple-Choice Test***

A multiple-choice test was created to evaluation learning. LEED 205 includes a self-quiz for each green building Rating System unit in the course: *Site Selection, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Air Quality, and Innovation in Design*. There are ninety-four questions on the original self-quizzes. Ideally, post-testing combined with pre-testing can differentiate between what participants already knew prior to the course and what participants learned from the course. The LEED 205 course did not require a pre-test prior to the start of the course. As a result, no pre-testing data was available for comparison.

The test for this level of evaluation included 25 questions (Appendix I). The test question covered all six units, but was kept intentionally short to encourage participation by volunteers. New test items were written based upon the existing test items. In addition to using direct and explicit questions, authentic scenarios were adapted and revised from USGBC's project database, giving opportunities for participants to apply for their knowledge.

During this step, the team also worked closely with a Subject-Matter Expert (SME). This SME also works as an instructional designer in USGBC's education department and holds the Green Associate credential. The team wrote the test with input from the SME to insure that the quality of the test items matched the credential exam. It was important that the test questions and difficulty did not mislead participants planning to take the credential exam. The Green Associate exam materials state that candidates need to demonstrate knowledge and skills in understanding and supporting green design, construction and operations.

The content and the format of the multiple-choice questions were chosen to align with the Green Associate exam format. Multiple-choice questions are often used to test knowledge, comprehension, application and analysis levels in Bloom's Taxonomy (Shrock and Coscarelli, 2007). LEED 205 is a 200-level course primarily aimed at creating knowledge and comprehension. . The basic course is primarily at

the understanding and comprehension levels of Bloom's taxonomy. The team agreed that multiple-choice questions were appropriate and it was unnecessary to attempt to measure higher levels in Bloom's taxonomy with different formats of test items, such as open-ended questions.

The original test contained numerous multiple-choice items with multiple responses. The team did not continue the use of this type of multiple-choice questions, as it is not suggested by Shrock and Coscarelli (2007). They claim these test items are low in reliability and high in difficulty although equal in validity. The team wrote each test item with a single correct answer.

The test was administered online via Zoomerzang.com.

## **Results**

Zoomerang.com allowed evaluators to download basic survey results for the close-ended questions results in a Microsoft Excel spreadsheet. These basic results included the percentage and specific number of participants that provided a particular answer to each question. From this spread sheet, an Excel spreadsheet was created. This spreadsheet detailed the total numbers of responses for each possible Likert scale response to each question. The Likert responses were converted into numerical values of one through five. One was equal to a "strongly disagree" response. Two equaled a "disagree" response. Three equaled an "undecided" response. Four equaled an "agree" response, and five equaled a "strongly agree" response. This spreadsheet was utilized to compute the mean and standard deviation for each question.

For all open-ended survey questions and for interview questions we performed a content analysis. We followed the guidelines recommended by Gilmore (2006). All responses to a question were read with the idea of identifying common themes in the answers. After an initial reading categories of answers emerged. Categories were created based upon similar concepts in answers. Responses were reread and categorized. If a response contained more than one concept, both concepts were categorized. A heuristic coding method was used. Two team members independently analyzed the open-ended question so as to provide for further reliability and validity. Upon completion of this task, two team members compared results and negotiated any differences.

The overall results of the multiple-choice test were computed. Each test taker was given a percentage score based upon the number of correct answers. For the purposes of this report, results for individual questions were unnecessary.

## Quantitative Results

Ninety-six out of 532 people responded to all close-ended questions on the online survey. The following results are based upon an 18% response rate. In examining the results of student satisfaction with the course as a means of preparation for the Green Associate exam several elements of the course were evaluated. The first element evaluated was the satisfaction with the instructor and characteristics of the instructor that may have contributed to student satisfaction with the course as related to exam preparation. The mean, standard deviation, and percentages for each response for individual questions are shown below in Table 1. All ratings for the three questions related to the satisfaction with the instructor contribution to test prep were combined to give an overall view of issue. The combined mean was 4.16 with a standard deviation of .78. The combined mean and standard deviation seem to indicate overall satisfaction with the role of the instructor. The results indicate that instructor knowledge and communication played the most important role in satisfaction.

To examine student satisfaction with the course as a means of exam preparation the online survey next asked questions about course components. These components included the readings, discussions, videos, interaction, and the inclusion of LEED 201 materials. A question about the learning platform was also included at the request of USGBC. In combining all responses for each question related to course components, the mean rating is 3.98 with a standard deviation of .93 indicating some disagreement about the course components and the role each plays in overall satisfaction.

Analysis of the statistical data shown in Table 2 shows the role each component played in the overall satisfaction of the respondents with the course as a means of exam preparation. The videos and presentations were most valued by students with 86% responding, "Agree" or "Strongly Agree" to the question about videos and presentations. The mean rating for this component was the highest at 4.26 with a standard deviation of .82 indicating fairly strong agreement that the videos were important to the survey participants' satisfaction. The readings and the inclusion of LEED 201 was nearly as important to respondents in determining satisfaction with the course as a means of exam preparation. While a slightly higher percentage of students, 85%, rated the readings more favorably as compared to 83% that rated LEED 201 more favorably, the mean response for LEED was higher at 4.06 with a standard deviation of .96. The mean rating for the readings question was 3.96 with a lower standard deviation of .78. These results indicate that the value of these two components is nearly equal in the view of the respondents. Similarly the two least valued components, the discussion and interaction were rated nearly equal. Given that one means of interaction in the course is through the discussions this result is not surprising. Nonetheless, these components do appear to have value to a majority of students as the data in Table 2 shows and as will be shown in the analysis of the qualitative data.

In response to the USGBC requested question about the ease of navigation and prompt technical support of the online learning platform at ugotclass.org, the mean rating was 3.98 with a standard deviation of .93, which indicates slight disagreement. Seventy-seven percent of respondents agreed or strongly agreed that the platform was easy to navigate or they were provided with prompt technical support. Further information on this topic was obtained in the interviews.

Table 2

	Mean	Standard Deviation	Percentage of Responses for each rating				
			Strongly Disagree	Disagree	Undecided	Agree	Strongly Disagree
<b>In relation to preparing for your Green Associate exam, please rate your experience with your instructor:</b>							
The instructor was knowledgeable	4.21	.69	1	0	7	59	32
The instructor was an effective and timely communicator	4.15	.74	1	1	11	54	32
Having an instructor to lead this course added value.	4.09	.92	3	1	15	44	36
<b>In relation to preparing for your Green Associate exam, please rate your experience with the course.</b>							
The reading assignments were appropriate.	3.96	.78	1	5	9	64	21
I posted threads every week in response to the forum discussion topics.	3.83	1.05	2	12	15	42	29
I watched videos and/or presentations on a weekly basis to improve my understanding of the content.	4.26	.82	1	2	11	41	45
The amount of interaction in this course was sufficient.	3.81	.94	3	6	18	52	21
LEED 201, the self-paced learning module at USGBC's official site, effectively introduced LEED core concept and strategies.	4.06	.96	3	5	8	49	34
The online learning platform at ugotclass.org was easy to navigate and/or provided with prompt technical support.	3.98	.93	2	5	16	47	30

The evaluation of learning in LEED 205 was designed to cover all content units of LEED 205 and included twenty-five multiple-choice test items. The evaluators also attempted to simulate questions that one might find on the Green Associate credential exam. Specific objectives were not available for each unit. The test was administered online via Zoomerang. Totaling the number of correct answers and dividing that number by the total number of test items determined a final score for each individual. Among the 14 volunteer participants who completed the test, the scores ranged from 56(%) to 96(%). The mean score on this multiple-choice test was 77.43(%) with a median and mode of 76(%). The standard deviation score is 12.31. The number of participants receiving a particular percentage score is shown below in Table 3.

Table 3

Number of Participants	Percentage Score
2	96
2	92
5	76
1	72
2	68
1	64
1	56

The Green Associate exam is scored using a scaled process with scores ranging from 125 to 200. A candidate must achieve a minimum score of 170 to pass the exam and earn the credential. Wrong answers do not count against the individual. Weighting of answers is not disclosed, but a score of 170 is about 85%.

By applying the criteria of passing the LEED Green Associate credential exam, 85%, to these learning evaluation four participants, or 28.6%, met the standard. Although a majority of the evaluation participants did not meet the 85% standard, the evaluators are reluctant to interpret these results to mean that participants do not learn in LEED 205. More evidence and a larger sample of previous students are needed to make this determination.

To examine behavior transfer, several questions were asked. Of most importance is the passing rate for the Green Associate credential exam. Among ninety-six volunteer survey participants, 59.4% of all respondents have taken the Green Associate credential exam. Of those that have taken the exam, 82.5% have passed the exam. 49% of all evaluation participants have passed the Green Associate credential exam. This number may rise as additional students take the exam. Currently 39.6% have not taken the exam, and 10.4% have taken the exam but not passed it. The qualitative analysis provides some insight as to the reasons for this.

In considering the sufficiency of the overall course resources in assisting students in passing the credential exam, it should be noted that 33% of the students did not

consider the resources sufficient as indicated by a “disagree” or “strongly disagree” response. Nearly the same were undecided. This might be attributed to the numbers of students that have not yet taken the exam. Although a slightly higher number, 36%, believed the resources to be adequate, the difference is minimal and should be further examined. Due to the type of the data available, it is not known whether those responding positively or negatively have taken the exam and passed it. Changes or additions to the resources may be indicated. The mean response for the question, “When preparing for the Green Associate exam, resources from LEED 205 are enough for students” was 2.93 with a standard deviation of 1.15. It should be noted that this question received the lowest mean rating of all close-ended questions, and the standard deviation indicates a high degree of variability in this response. Again, this maybe related to the number of participants that have not yet taken the exam or failed to pass the exam.

In addition the transfer of knowledge to the work place was evaluated. In examining the responses to the questions related to the current and future use of green building knowledge by the participants, this evaluation relied upon self-reported results. The accuracy of these self-reports was not substantiated in this evaluation. Participants did self-report that the knowledge was successfully transferred to the workplace. This was indicated by the high percentages that strongly agree or agree that they are using their knowledge with peers and clients, and will continue to do so in the future. The number of participants that strongly disagreed with these questions was zero. Questions related to using and sharing knowledge with clients and in the work place are detailed in Appendix B. Specific results for the following behavior/results related questions are shown in Table 4.

To evaluate the results of the LEED 205 course for USGBC two questions were examined: is it likely that the LEED 205 course will result in further business for USGBC as indicated by future course participation and does the course assist in meeting the mission of USGBC to further green building knowledge and use? Although an attempt was made to gather participant result data via an interview question, it was unsuccessful. This is likely due to the voluntary participation in the evaluation and the request for participants to provide names for additional volunteers including employers, clients, or co-workers. The evaluators believed that gaining such participation at a significant level would be unlikely.

Two survey questions addressed the issue of results for USGBC. We considered the likelihood of future business for USGBC in the form of future students. It seems that this course will lead to future business based upon the answers to these two questions. Participants were asked, “I will recommend this course to my peers.” The mean value for this question was 3.69 with a standard deviation of 1.02. This does indicate some disagreement, but 70% of the respondents replied with “agree” or “strongly agree” to this question. It seems more likely that participants will consider USGBC courses in the future. When asked, “I will consider USGBC’s other education products in the future” 76% responded positively as shown by an “agree” or “strongly agree” response. The mean for this question was slightly higher at 3.9 with

Table 4

Please rate your learning outcomes.		Mean	Standard Deviation	Percentage of Responses for each rating				
				Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	I have been putting my green building knowledge into effect in my job and/or work on a regular basis.	3.71	.79	0	8	25	54	12
2	I have shared my green building knowledge with my peers and/or clients on a regular basis.	3.80	.71	0	3	27	56	14
3	In my school program and/or workplace, the use of the green building knowledge is also well supported and/or rewarded.	3.58	.90	2	10	26	50	11
4	I will continue to use my green building knowledge in the future and thus the knowledge is likely to be sustained.	4.28	.57	0	0	6	59	34
5	When preparing for Green Associate exam, resources from LEED 205: green buildings & Preparing for Green Associate are enough for students.	2.93	1.15	16	17	31	31	5
6	My green building knowledge and/or Green Associate credential, helped my career and/or attracted more clients.	3.46	.86	2	6	47	33	11
7	I will recommend this course to my peers.	3.69	1.02	6	5	19	53	17
8	I will consider USGBC's other educational products in the future	3.91	.77	2	0	22	57	19

a lower standard deviation of .77 indicating this possibility is more likely. The degree of participant satisfaction may also contribute to this area of success. Other survey questions provided some information on how this course specifically helps USGBC spread and increase public information about green building principals. The previously discussed quantitative data related to the use of green

building knowledge in the workplace supports the idea that this course aids USGBC in fulfilling a portion of its mission by increasing knowledge and use of green building principles.

## **Qualitative Results**

One open-ended question was used to gather further data on the role of the instructor. Respondents were asked, "Please share any additional comments regarding your instructor in helping you prepare for the Green Associate exam." Thirty-two of the ninety-six respondents answered this question. The responses to this question revealed one problem with online surveys. Respondents are often unable to view the entire survey to plan their answers. Because they do not know if they will have an opportunity to address an issue in later open-ended questions, they may address it in the first open-ended question, even if the response is unrelated to the question. The content analysis of responses to this question showed evidence of this idea as the largest percentage, of the responses, 25.8%, were unrelated to the instructor issues. The number of unrelated responses decreases as the survey is completed. Overlooking the unrelated responses, the data seems to indicate that the facilitation role of the instructor is of most value to students as they complete the course in preparing for the Green Associate exam. 22.5 % of the respondents indicated the importance of facilitation. Instructor responsiveness was mentioned in 16.1% of the responses. This seems to support the findings of the quantitative results indicating the important role instructor communication played in student satisfaction. Facilitation and responsiveness are two components of instructor communication. The motivation provided by the instructors appeared to be the least important element of satisfaction) Given that the students are adult professionals a higher level of self-motivation is to be expected.

The percentage of responses indicating that the instructor added no value, 22.5%, was equal to the percentage indicating the importance of facilitation role. This result should not be dismissed. It will be further addressed in the recommendations of this report. One should remember though that the overall percentage of respondents, 51.5%, that indicated some type of value in having the instructor was considerably higher.

The thirteen interviews resulted in similar findings about the effectiveness of the instructor. Course participants preferred to have an instructor guide their discussions and outline their course work, but timely responses and updated information were a key factor in their learning. Course participants also were able to learn from their classmates and view different perspectives on case studies

Three open-ended questions in the survey provided further data on the course components. These questions were:

1. Which course components should remain in this course and why?
2. Which component(s) should change in this course and why?

3. Please share any additional comments regarding your experience with the course components in helping you prepare for the Green Associate exam

Several findings emerged following the content analysis of these questions. As a whole, participants named “all” components of the course important as related to exam preparation. There were fifty-three responses to question one. This was indicated in 28 percent of the responses to question one.

Students also valued the role the videos/presentations played. This supported the findings of the quantitative data. Twenty-one percent of the responses identified the videos as an element that should remain. In the interviews, 42% of these responses indicated that the videos provided a break from the readings and gave valuable examples of case studies. Those 42% also stated that even though the videos showcased general topics, they did not provide enough detailed technical information in relation to the exam.

Discussions were mentioned in 11.3% of the survey responses. The interviewees found the discussions helpful as a means of learning from others experience and great for understanding examples from different perspectives. When exam preparation was concerned, the majority found the discussions were not applicable, as they did not address how to answer specific exam questions

The LEED 201 course was indicated in 9.4% of the survey responses. The interviews provided some evidence that major reason was the cost, which was rolled into the LEED 205 course. This was especially true when participants had some previous knowledge and used LEED 201 as a refresher course.

Although the quantitative survey results indicated respondents valued the readings, this was not specifically mentioned in these responses. It may have been included in the “all” responses. In the interviews, 60% of the course participants found the reading materials comprehensive in preparing for the exam, while 30% found the readings to not contain enough detail when they took the exam.

Course interaction was not mentioned in any of the survey responses. In the interviews, respondents stated that the course interaction was not as important due to issues related to time constraints and personal technical ability. Course participants acknowledged that the interactivity with others, modules and quizzes were essential in motivating themselves to carry on learning and enjoying the course.

Forty-two responses were received to the question about which course components should change. A large number of respondents seemed to indicate that particular content, especially content related to portions of the exam, was lacking or that there were not enough practice exam questions. 35.7% felt that additional content was needed in prepping for the exam. 16.7% indicated the desire for additional quiz or

test questions. Following these issues related to exam preparation, a number of responses, 14.3%, complained that the length of the videos was too long.

The need for additional content and exam questions was further indicated in the responses to the third open-ended question asking for additional comments. Thirty-two responses were received for this question. Inadequate content and lack of preparation for the actual exam questions were indicated in 34.3% and 31.2% of the responses. It should be noted though that 21.9% specifically responded that the course was helpful in preparing for the exam.

Technology issues and material availability were minor issues. The interview responses provided further insight into the technical issues as 55% of the respondents initially found it difficult to navigate the platform due to unfamiliarity. Being unable to find certain components of the course was a common occurrence but as the course progressed, they were able to familiarize themselves with the platform.

The qualitative analysis of a question asking respondents to explain why the exam was not taken helped revealed some possible answers as to why 39.4% of the survey respondents have not taken the exam. The thirty-two responses provided some evidence that it is related to the quality of LEED 205 as a means of preparing for the exam 18.7% of the responses fit into this category. Primarily though, the responses indicate time factors as the issue. The content analysis of the question, "If you have not scheduled the Green Associate exam or you had to reschedule it, please share with us why" indicates that time constraints related to other commitments and study time are the primary reasons. Larger percentages indicated that a lack of study time, 25%, and other time issues, 31.3% were the predominant reasons. In the twelve interviews, 40% felt that the LEED 205 was sufficient in their exam preparation while 60% used various resources like test bank websites and co-workers.

Although there were only a twenty-one responses, the qualitative data further supports the conclusion that the course helps USGBC fulfill its mission. The most common responses from an open-ended question, "Please share any additional outcomes you achieved due to this course and/or the Green Associate credential," are primarily job related. If one assumes that job related responses indicate new and increasing use of green building principals and knowledge, further evidence of the course impact on achieving the mission of USGBC is present. The other responses also indicate use of knowledge that would support the mission of USGBC. In the twelve follow-up interviews when asked about their application of their green building knowledge, participants applied what they learned in both their personal and professional lives. Some examples of their application are educating others (friends, co-workers, clients), writing GREEN articles, and writing a how-to-be-green for your home book and GREEN design.

## Discussion

Upon reviewing all data collected for this evaluation, several areas of success in the LEED 205 are indicated. Participants indicated overall satisfaction with the course as a means of preparation for the Green Associate exam. Students do appear to be learning green building principals and design requirements from the course. A majority of the evaluation participants that have taken the Green Associate exam have passed it. Participant self-reports indicate that the knowledge gained is utilized in their workplaces and personal lives. The quality of this use is unknown. The course seems to aid in fulfilling the mission of USGBC, and it is likely that the course will result in additional sales of USGBC educational products as reported by the evaluation participants. There are some areas that might be improved in any future course revisions. These will be discussed further in the recommendations.

In considering overall satisfaction with the course as a means of exam preparation respondents valued the roles of the instructors in the course. The mean rating for all instructor related survey questions was 4.16 indicating a high degree of satisfaction. It was important that the instructors were knowledgeable and communicated in a timely manner. The survey questions related to the course components provided evidence that students found the videos/presentations and LEED 201 as providing great assistance in exam preparation. The interview data revealed that this was not necessarily due to the content of the videos, but was it valued as a different method of learning. Given the small number of interviewees, this question offers an opportunity for further evaluation.

The qualitative data did show areas for improvement, but overall 21.9% specifically responded that the course was helpful in preparing for the exam. Components that may be considered as needing improvement include the need for additional content specifically related to the exam questions. 35.7 % of the respondents indicated this as a need. 16.7% of the respondents requested additional exam type questions. 14.3 % requested that the videos/presentations, while useful, be shortened. The data indicated that participants seemed to believe all components were useful to some extent.

Evaluation participants seemed to learn the content of the course with a moderate degree of success. The results of the multiple-choice exam revealed that students learned and retained on average about 78% of the material. This figure is lower than the 85% score required to pass the Green Associate exam. Whether this figure is considered successful must be determined by USGBC. As there was no pre-test, there is no basis for comparison. There may be a variety of reasons for this figure. Although students that finished the course most recently were utilized for the evaluation, they may have forgotten some information, especially if they have taken the credential exam and no longer are trying to retain the information.

The data seems to indicate that a majority of participants that have taken the credential exam have passed it. This should be considered a successful result. One

concern is that 39.6% of the respondents have not currently taken the credential exam. Although only 18.7% indicated they have not taken the exam due to factors related to the lack of preparation in the course the pass rate should continue to be monitored. 56.3% indicated time constraint factors as the reason for not taking the exam.

Based upon self-reports, the evidence indicates that many evaluation participants are using and applying their knowledge in the workplace with peers and with clients. It does seem to assist them professionally in this respect. 64.9% reported using their knowledge in their jobs and 67% reported sharing their knowledge with peers and clients. Twenty-nine percent of the responses related to an open-ended question about individual outcomes were related to jobs. Only 5% indicated that the credential or knowledge was not useful. These statistics may be impacted by several factors including the time since course completion, the number of respondents not in a green building related job, or other lack of opportunity.

In determining the results of the course for USGBC two areas were considered: is the course likely to result in furthering the mission of USGBC, and is the course likely to provide future students for USGBC courses? Based upon the quantitative data, it appears as if the course is a valuable means of providing future students in the LEED 205 course or other USGBC educational offerings. 67% of survey respondents indicated that they would recommend the course to peers. It is more likely that participants will take another course with USGBC as 73% responded favorably to a question about this.

Determining the extent to which this course aids in furthering the USGBC mission was done indirectly in this evaluation. If one infers that satisfied participants that utilize the knowledge gained in the course are likely “to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.” (<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124>), then this course appears to aid in reaching that goal. As discussed previously, survey respondents report utilizing the course in their careers and do seem to be satisfied with the course overall. Additionally a question related to future use of green building knowledge indicates this is likely to continue as 90% of respondents agreed or strongly agreed with this statement.

## Recommendations

Based upon the findings of this evaluation, the following recommendations are made:

- The instructor was a crucial component in the overall satisfaction of the students in evaluating the course as a means of exam preparation. This aspect of the course should continue with an emphasis on using instructors that are knowledgeable about Green Building and can communicate in a timely and responsive manner.
- Any course revisions should be selected carefully so as not to decrease the current satisfaction, learning, behavior, and transfer ratings.
- Consider course revisions based upon the findings of the open-ended questions. This might include reducing the length of the videos/presentations and adding additional exam-type questions. The content of the course should be reviewed to insure it covers all aspects of the credential exam.
- Provide more technical details in videos, readings and discussions with respect to the exam questions.
- Develop and incorporate a brief introductory video or tutorial on how to navigate the online platform.
- Consider creating smaller discussion sections as several respondents indicated the size of the discussion sections was problematic.
- Consider the addition of a required pre-test and a required post-test in the course to more accurately assess learning.
- USGBC should continue to monitor pass rates for the exam by following up with course participants. This might be done via a simple online survey three months, six months and twelve months after the course has been completed.
- A baseline measure of “success” and a target goal should be established for passing rates on the credential exam.
- USGBC should consider adding a question to the course sign-up form that asks how the new student learned of the course. This may provide additional evidence about the results of the educational offerings for USGBC.
- To more accurately evaluate how this course aids in fulfilling the mission of USGBC and the quality of course transfer into the workplace, further evaluation is needed. This would incorporate employers, peers, or clients of students.

**Appendix A**  
**Email Introduction of Online Survey**

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Dear Online Green Building student:

We are conducting a follow-up evaluation from students to make sure USGBC is on track with our online “Green Building and Preparing for the LEED Green Associate” LEED 205. In collaboration with three graduate students from Indiana University: Yi Zhang, Renea Hicks, and Avriel Lee, a comprehensive evaluation project was designed based upon up-to-date research-based frameworks in Instructional Systems Technology.

We believe the project greatly assists in our educational mission. With data collected from you, we will be able to find out whether or not what *USGBC* has done in the course has successfully helped you prepare for the LEED Green Associate exam and what improvements *USGBC* can continue to make in order to meet the needs of you and other students. Your assistance plays a **crucial** role in this cooperative project.

This project is for research purposes only. To enter a drawing to win a free copy of a USGBC e-book: *LEED Stories from Practice* - case study (\$50 value), in the last survey question you can provide your information for us to invite you to join follow-up e-mail or phone interviews. Your name will not be associated to your responses in the post-survey interview.

For questions, concerns, or communication comfort, please feel free to email any of the project team members.

Your prompt responses will be greatly appreciated. **Please complete the survey by July 18th.**

Please click [here](#) to take the survey. It will take you only 10-15 minutes to finish.

Thank you very much in advance for your time and effort,

Kay Kane, LEED Green Associate  
Instructional Design Specialist  
U.S. Green Building Council

Renea Hicks : [rrhicks@indiana.edu](mailto:rrhicks@indiana.edu)  
Avriel Lee : [avrlee@indiana.edu](mailto:avrlee@indiana.edu)  
Yi Zhang: [yzhang@usgbc.org](mailto:yzhang@usgbc.org)

**Appendix B  
Online Survey**

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2010-2011 Comprehensive Evaluation of LEED 205:  
Green Buildings and Preparing for Green Associate

Questions marked with an asterisk (\*) are mandatory.

1. Which of the following best describes your background? (Check both if they apply.)

- Working profession or previously employed professional in green building related areas
- Working profession or previously employed professional in non- green building related areas
- Student
- Other, please specify: (box)

2. In relation to preparing for your Green Associate exam, please rate your experience with your instructor.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	2	3	4	5

- The instructor was knowledgeable.
- The instructor was an effective and timely communicator.
- Having an instructor to lead this course added value.

3. Please share any additional comments regarding your instructor in helping you prepare for Green Associate exam. (box)

4. In relation to preparing for your Green Associate exam, please rate your experience with the course.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	2	3	4	5

- The reading assignments were appropriate.
- I posted threads every week in response to the forum discussion topics.
- I watched videos and/or presentations on a weekly basis to improve my understanding of the content.
- The amount of interaction in this course was sufficient.
- LEED 201, the self-paced learning module at USGBC's official site, effectively introduced LEED core concept and strategies.

- The online learning platform at ugotclass.org was easy to navigate and/or provided with prompt technical support.
5. If your participation dropped during the course, please share with us why.
  6. Which component(s) should remain in this course and why?
  7. Which component(s) should change in this course and why?
  8. Please share any additional comments regarding your experience with the course components in helping you prepare for Green Associate exam.

9. Please rate your learning outcomes.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	2	3	4	5

- I have been putting my green building knowledge into effect in my job and/or work on a regular basis.
  - I have shared my green building knowledge with my peers and/or clients on a regular basis.
  - In my school program and/or workplace, the use of the green building knowledge is also well supported and/or rewarded.
  - I will continue to use my green building knowledge in the future and thus the knowledge is likely to be sustained.
  - When preparing for Green Associate exam, resources from LEED 205: green buildings & Preparing for Green Associate are enough for students.
  - My green building knowledge and/or Green Associate credential helped my career and/or attracted more clients.
  - Client requested: I will recommend this course to my peers.
  - Client requested: I will consider USGBC's other educational products in the future.
10. Please share any additional outcomes you achieved due to this course and/or Green Associate credential.

11. \* Please select either Yes or No according to your situation.

Yes	No
1	2

- I have taken Green Associate exam and have passed.
  - I have taken Green Associate exam but have NOT passed.
12. \* Client requested: If you have not scheduled to take the Green Associate exam or if you had to re-schedule it, please share with us why.
13. To enter a drawing to win a USGBC e-book (\$50 value), would you be willing to fill out the following information and to join our follow-up e-mail or phone interview? We truly appreciate your effort to improve our course.

Your full name:

I prefer e-mail (address):

I prefer phone (number):

**Appendix C**  
**Close-Ended Question Survey Results**

**Zoomerang Survey Results**

**2010-2011 Comprehensive Evaluation of LEED 205:  
Green Buildings and Preparing for Green Associate**

Response Status: Completes

Filter: No filter applied

Jul 20, 2011 7:53 AM PST

**1. Which of the following best describes your background?  
(Check both if they apply.)**

Working profession or previously employed professional in Green Building related areas	56	58%
Working profession or previously employed professional in non-Green Building related areas	35	36%
Student	5	5%
Other, please specify	8	8%

2. In relation to preparing for your Green Associate exam, please rate your experience with your instructor.

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
	1	0	7	57	31
The instructor was knowledgeable.	1%	0%	7%	59%	32%
The instructor was an effective and timely communicator.	1	1	11	52	31
	1%	1%	11%	54%	32%
Having an instructor to lead this course added value.	3	1	15	42	35
	3%	1%	16%	44%	36%

**3. Please share any additional comments regarding your instructor in helping you prepare for Green Associate exam.**

32 Responses

4. In relation to preparing for your Green Associate exam, please rate your experience with the course components.

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
	1	5	9	61	20
The reading assignments were appropriate.	1%	5%	9%	64%	21%
I posted threads every week in response to the forum discussion topics.	2	12	14	40	28
	2%	12%	15%	42%	29%
I watched videos and/or presentations on a weekly basis to improve my understanding of the content.	1	2	11	39	43
	1%	2%	11%	41%	45%
The amount of interaction in this course was sufficient.	3	6	17	50	20
	3%	6%	18%	52%	21%
LEED 201, the self-paced learning module at USGBC's official site, effectively introduced LEED core concept and strategies.	3	5	8	47	33
	3%	5%	8%	49%	34%
The online learning platform at ugotclass.org was easy to navigate and/or provided with prompt technical support.	2	5	15	45	29
	2%	5%	16%	47%	30%

**5. If your participation dropped during the course , please share with us why.**

36 Responses

**6. Which component(s) should remain in this course and why?**

49 Responses

**7. Which component(s) should change in this course and why?**

51 Responses

**8. Please share any additional comments regarding your experience with the course components in helping you prepare for Green Associate exam.**

30 Responses

9. Please rate your learning outcomes.

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I have been putting my Green Building knowledge into effect in my job and/or work on a regular basis.	0 0%	8 8%	24 25%	52 54%	12 12%
I have shared my Green Building knowledge with my peers and/or clients on a regular basis.	0 0%	3 3%	26 27%	54 56%	13 14%
In my school program and/or workplace, the use of the Green Building knowledge is also well supported and/or rewarded.	2 2%	10 10%	25 26%	48 50%	11 11%
I will continue to use my Green Building knowledge in the future and thus the knowledge is likely to be sustained.	0 0%	0 0%	6 6%	57 59%	33 34%
When preparing for Green Associate exam, resources from LEED 205: Green Buildings & Preparing for Green Associate are enough for students.	15 16%	16 17%	30 31%	30 31%	5 5%
My Green Building knowledge and/or Green Associate credential, helped my career and/or attracted more clients.	2 2%	6 6%	45 47%	32 33%	11 11%
I will recommend this course to my peers.	6 6%	5 5%	18 19%	51 53%	16 17%
I will consider USGBC's other educational products in the future.	2 2%	0 0%	21 22%	55 57%	18 19%

**10. Please share any additional outcomes your achieved due to this course and/or Green Associate credential.**

27 Responses

11. Please select either Yes or No according to your situation.

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.

	Yes	No
I have taken Green Associate exam and	47	49

have passed.	49%	51%
I have taken Green Associate exam but	10	86
have NOT passed.	10%	90%

**12. If you have not scheduled for taking Green Associate exam or you had to re-schedule it, please share with us why.**

82 Responses

**13. To enter a drawing to win a USGBC e-book (\$50 value), would you be willing to fill out the following information and to join our follow-up e-mail or phone interview? We truly appreciate your effort to improve our course.**

67 Responses

**Appendix D**  
**Results of Open-Ended Questions**

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<b>Please share any additional comments regarding your instructor in helping you prepare for the Green Associate exam.</b>	
<b>Category</b>	<b>Number of Responses</b>
Motivation	4
Responsiveness	5
Facilitation	7
Unrelated to Instructor	8
No value added	7
<b>If your participation dropped during the course, please share with us why</b>	
<b>Category</b>	<b>Number of Responses</b>
Course Bias	1
Time	16
Isolation	1
Not drop	4
Did not find helpful	4
Could not add to discussion	1
<b>Which component(s) of this course should remain and why?</b>	
<b>Category</b>	<b>Number of Responses</b>
Discussion	6
Video	11
Case Studies	1
Online Activities	3
Links to other sources	2
Presentations	4
LEED 201	5
All	15
Mention unrelated needs	5
Not useful	1

<b>Which component(s) should change in this course and why?</b>	
<b>Category</b>	<b>Number of responses</b>
Add content	15
Add activities	1
Add quizzes/questions	7
Presentations	1
Video length	6
Discussions	3
Method	3
Ugotoclass format	2
Unrelated issues	1
None	3
<b>Please share any additional comments regarding your experience with the course components in helping you prepare for the Green Associate exam.</b>	
<b>Category</b>	<b>Number of Responses</b>
Inadequate content	1
Material availability	1
Lack of prep questions	10
Helpful	7
<b>Please share any additional outcomes you achieved due to this course or the Green Associate credential.</b>	
<b>Category</b>	<b>Number of Responses</b>
Pass Test	3
Job Related	6
Gained credential	2
Credential not helpful	1
Contacts made	2
Not related	2
Personal use	2
Can't get credential due to practical issues	3
<b>If you have not scheduled the Green Associate exam or you had to reschedule it, please share with us why?</b>	
<b>Category</b>	<b>Number of Responses</b>
Insufficient study time	8
Lack of prep from course	6
Other time issues	10
Cost	2
Difficulty in scheduling	3
Will not take exam	3

## Appendix E

### Follow-Up Email Interview Questions

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Dear Mr. "XYZ",

I am one of the project members in the collaboration between USGBC and the Department of Instructional Systems Technology at Indiana University. Thank you very much for completing our survey at Zoomerang.com.

Your response with your name and contact information at the end of the survey indicated that you are interested in participating our post-survey interviews so as to enter a drawing to win a USGBC e-book (\$50 value). We very much appreciate your time and effort.

Below is a list of follow-up questions created regarding your survey responses. Please feel free to reply to us via email. You may also find these new questions look familiar; however, they are designed for us to conduct content analysis for previous answer patterns of the first online survey. We prioritize questions **labeled in yellow**, such as 'prefer more details'. Again, your name will not be associated to your responses in the post-survey interview and our report.

1. How and why did having the instructor add value to this course? (optional)
2. How and why did the readings assist you in your exam preparation? (optional)
3. How and why did the online discussions help you in your exam preparation? (optional)
4. How and why did the videos help you in your exam preparation? (optional)
5. How and why did not the course interaction help you in your exam preparation (**mandatory**)
6. How and why did LEED 201 module assist you in your exam preparation? (optional)
7. Which elements of the course were the most and least useful in preparing for the exam? Why? (optional)
8. What were the difficulties in navigating the course platform? (optional)
9. a. How often do you use your green building knowledge? (optional)  
b. why have you had the chance to share your green building knowledge with your peers and/or clients? (optional)  
c. How or why is this supported in your workplace or school program if they use it? (optional)
10. Did you use outside resources to prepare for the exam?
  - a. What resources did you use? -(**mandatory**)
11. Under what circumstances are you likely to use your green building knowledge in the future? (optional)
12. Why would you recommend this course to peers? (optional)

13. Why would you consider other USGBC educational products in the future? (optional)  
14. This project also evaluates how participating in the course impacted your work, study and/or business. Would you be willing to provide contact information if you allows the evaluation team to interview your colleagues? (prefer to know your preference)

Sending your responses by Wednesday July 20<sup>th</sup> (C.O.B.) will be greatly appreciated and allow us to submit our final evaluation report on time.

Thank you so much again for being a part of this project! Please do not hesitate to ask, if you have questions or concerns. The result of the drawing will be announced by the end of July 2011.

Regards,

**Yi (Claire) Zhang**

**Other project member:**

Renea Hicks : [rrhicks@indiana.edu](mailto:rrhicks@indiana.edu)

Avriel Lee : [avrlee@indiana.edu](mailto:avrlee@indiana.edu)

**Supervisor at USGBC:**

Kay Kane

LEED Green Associate

Instructional Design Specialist

U.S. Green Building Council

## Appendix F Interview Data

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### How and why did/not having the instructor help you in your exam preparation?

Category	Responses
Knowledgeable	3
No Timely Responses	3
Interactive course	2
Good guidance	1
Outdated	1

### How and why did/not the readings assist you in your exam preparation?

Category	Responses
Comprehensive	6
No Content Detail	3
Additions	1

### How and why did/not the online discussions not help you in your exam preparation?

Category	Responses
Time Constraints	2
Content	2
No Help	4
Not Tech Savvy	1

### How and why did the videos help you in your exam preparation?

Category	Responses
Variety, Exam not helpful	3
Content Details	1
Not native language	1
Reinforcement	1
Too Long	1

**How and why did/not the course interaction help you in your exam preparation?**

<b>Category</b>	<b>Responses</b>
Time Constraints	1
Responsiveness	1
No relation to the exam	2
Communication with classmates	2
Personal Preference	1
Other	1

**How and why did/not LEED 201 module assist you in your exam preparation?**

<b>Category</b>	<b>Responses</b>
Cheaper	1
Introduction to LEED	1
Comprehensive	1
Refresher	1
Not technical enough	2
Not enough content for exam	1

**Which elements of the course were the most and least useful in preparing for the exam? Why?**

<b>Category</b>	<b>Responses</b>
Most - Modules	2
Most - Reference	2
Most - Readings	2
Least - Videos	1
Least - Discussions	2

**What were the difficulties in navigating the course platform?**

<b>Category</b>	<b>Responses</b>
Directions	1
Familiarization	5
None	3

**How often do you use your Green Building Knowledge?**

<b>Category</b>	<b>Responses</b>
Personal Interest	3
Work	4
Educate others	3

**Why have you not/had the chance to share your Green Building Knowledge with your peers and/or clients?**

<b>Category</b>	<b>Responses</b>
Environment	1
Additional Information	1
Written articles	1
Work	4
Personal	2

**How or why is this supported/not supported in your workplace or school program if they use it?**

<b>Category</b>	<b>Responses</b>
Cost - Cheaper	2
Gov Supported	1
Co-Workers Supported	1
Clients not interested	1
Personal Interest	1

**Did you use outside resources to prepare for the exam?**

<b>Category</b>	<b>Responses</b>
Co-worker/Previous exam takers	1
Online	5
None	4

**Under what circumstances are you likely to use your Green Building knowledge in the future?**

**What resources did you use?**

<b>Category</b>	<b>Responses</b>
Running LEED Proj	1
Workshops/Consultant	2
Being Green	1
US Green Building Council	1
Clients	2
Gov Projects	1
Jobs	2

**Why would you recommend this course to peers?**

<b>Category</b>	<b>Reponses</b>
Yes	7
No	2
Both	1

**Why would you consider other USGBC educational products in the future?**

<b>Category</b>	<b>Responses</b>
Yes	9
No	1

**This project also evaluates how participating in the course impacted your business. Would you be willing to provide contact information if you allows the evaluation team to interview your colleagues? prefer to know your preference**

<b>Catergory</b>	<b>Responses</b>
Yes	4
No	4
NA	2

## Appendix G

### Asking For Phone or Email Interview Preference

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Dear Sir or Madam,

I am one of the project members in the collaboration between USGBC and the Department of Instructional Systems Technology at Indiana University. Thank you very much for completing our survey at Zoomerang.com.

Your response with both of your e-mail address and phone number at the end of the survey indicated that you are interested in participating in our post-survey interviews so as to enter a drawing to win a USGBC e-book (\$50 value). We very much appreciate your time and effort. Please feel free to let us know by replying to this email if you prefer to be reached via email or phone for the interview. If you prefer phone calls, one of our project members will contact you within this week.

Below is a list of questions for your preview. They are designed for us to conduct content analysis for previous answer patterns from the first online survey. **We will only select a few questions for you.** If you prefer emails, we will send you the selected questions once we receive your response. Again, your name will not be associated to your responses in the post-survey interview and our report.

1. How and why did (not) having the instructor help you in your exam preparation?
2. How and why did (not) the readings assist you in your exam preparation?
3. How and why did (not) the online discussions help you in your exam preparation?
4. How and why did (not) the videos help you in your exam preparation?
5. How and why did (not) the course interaction help you in your exam preparation?
6. How and why did (not) LEED 201 module assist you in your exam preparation?
7. Which elements of the course were the most and least useful in preparing for the exam? Why?
8. What were the difficulties in navigating the course platform?
9. a. How often do you use your green building knowledge?  
b. Why have (not) you had the chance to share your green building knowledge with your peers and/or clients?  
c. Why did (not) is this supported in your workplace or school program if they use it?
10. Did you use outside resources to prepare for the exam?  
a. What resources did you use?
11. Under what circumstances are you likely to use your green building knowledge in the future?
12. Why would you (not) recommend this course to peers?
13. Why would you (not) consider other USGBC educational products in the future?
14. This project also evaluates how participating in the course impacted your work,

study and/or business. Would you be willing to provide contact information if you allows the evaluation team to interview your peers?

Let us know by Wednesday July 20<sup>th</sup> (C.O.B.) will be greatly appreciated and allow us to submit our final evaluation report on time.

Thank you so much again for being a part of this project! Please do not hesitate to ask, if you have questions or concerns. The result of the drawing will be announced by the end of July, 2011.

Regards,

**Yi (Claire) Zhang**

**Other project member:**

Renea Hicks : [rrhicks@indiana.edu](mailto:rrhicks@indiana.edu)

Avriel Lee : [avrlee@indiana.edu](mailto:avrlee@indiana.edu)

**Supervisor at USGBC:**

Kay Kane

LEED Green Associate

Instructional Design Specialist

U.S. Green Building Council

**Appendix H**  
**Email Asking For Assistance in Taking Multiple-Choice Exam**

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Dear Online Green Building student:

Thank you to those that have completed our evaluation survey for the online course “Green Buildings and Preparing for the LEED Green Associate” LEED 205, in collaboration with three graduate students from Indiana University at Instructional Systems Technology.

Since you are the most recent group to complete the course, we’d like some additional feedback from you.

Below is a link to a quiz as a part of the data we are collecting for this comprehensive evaluation project. This test will allow us to assess learning over time. This test is for research purposes only.

There are 25 multiple-choice questions in this test. There is only one correct answer. For those of you who are preparing for the LEED Green Associate exam, this may be an opportunity for you to review the green building knowledge that you previously learned. Once you complete and submit the test, the thank-you page will show you how to get answer keys.

For questions or concerns, please feel free to email any of the project team members.

Your prompt responses will be greatly appreciated. **Please complete the survey by July 24th.**

Please click [here](#) to take the test.

Thank you very much in advance for your time and effort,

Regards,

**Yi (Claire) Zhang**

**Other project member:**

Renea Hicks : [rrhicks@indiana.edu](mailto:rrhicks@indiana.edu)

Avriel Lee : [avrlee@indiana.edu](mailto:avrlee@indiana.edu)

**Supervisor at USGBC:**

Kay Kane

LEED Green Associate

Instructional Design Specialist

U.S. Green Building Council

**Appendix I**  
**Comprehension Test for LEED 205:**  
**Green Buildings and Preparing for the LEED Green Associate**

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**Content 1: Content Selection**

1. Which one of the following strategies can reduce storm water runoff?
  - a. Decreasing impervious surfaces
  - b. Decreasing percolation rates
  - c. Eliminating sewage piping
  - d. Reducing potable water usage
  
2. Which one of the following is a measure of transportation demand that estimates the travel miles and best indicates transportation impacts associated with a project?
  - a. Parking capacity
  - b. Availability of public transportation
  - c. Transportation alternatives
  - d. Vehicle miles traveled
  
3. A building adjacent to forestland plans to minimize the impact of its site lighting. To achieve this, exterior lighting is installed to do which of the following?
  - a. Reducing the need for night-time security
  - b. Not trespassing onto adjacent properties
  - c. Adequately illuminating the night sky
  - d. Providing for tasteful, decorative appearance
  
4. Which one of the following strategies can be employed to make projects more accessible and connected to surrounding areas?
  - a. Managing storm water runoff
  - b. Designing effective and safe sidewalks
  - c. Implementing a recycling program
  - d. Protecting buffer zones
  
5. The site of Exelon's headquarters is located in downtown Chicago and is easily accessible by public transportation or bicycle. With a development density of more than 800,000 square feet per acre, the project encourages community connectivity and reduces sprawl. All parking areas are located underground. Which of the following Sustainable Sites goals are illustrated in this project as described?
  - a. Using native and adaptive plantings
  - b. Reducing heat island effect
  - c. Reducing emissions
  - d. Restoring a site with environmental degradation

## **Content 2: Water Efficiency**

6. What is the baseline water use for the water closet?
- 1.6 gallons per flush
  - 2.4 gallons per flush
  - 1.2 gallons per flush
  - 3.0 gallons per flush
7. Which one of the following includes used water from bathtubs, showers, and bathroom basins?
- Brown water
  - Potable water
  - Black water
  - Gray water
8. Which one of the following is a strategy to conserve indoor water?
- Irrigation metering
  - Utilizing drip irrigation
  - Using low-flow toilets
  - Xeriscaping
9. In Portland, OR, the Rosa Parks Elementary School uses native, drought-tolerant vegetation for landscaping which reduces the use of drinkable water and maintenance. During the school's construction, existing trees were kept to prevent soil erosion. Compared with a conventional school, this project is expected to cut irrigation needs by 60% and total water usage by 24%. Which of the following measures of project performance in water efficiency is used in this project as described?
- Gallons per flush
  - Percentage of potable water needed for irrigation
  - Process water
  - Maximum flow rate

## **Content 3: Energy and Atmosphere**

10. Which one of the following is the most common source of energy generated on-site?
- Hydroelectric
  - Coal
  - Solar
  - Nuclear
11. Which one of the following can be an advantage of using whole building computer simulation?
- Creating automation of energy systems
  - Prioritizing irrigation system maximization
  - Prioritizing use of regional resources
  - Prioritizing energy conservation opportunities

12. Which of the following best describes the purpose of commissioning?
- a. Collecting one year of energy performance data to establish an ENERGY STAR score based on comparisons with similar buildings
  - b. Identifying the highest performing homes by using home energy performance scores to help buyers
  - c. Allowing facility managers to establish an energy end-use profile
  - d. Defining project requirements and ensures that a project performs as designed

13. Efficiency strategies for a company include a direct-indirect lighting system with daylight dimming and controllable task lighting for every employee; ENERGY STAR equipment and appliances; demand-based ventilation; and an automated system that controls the project's lighting, heating, and cooling systems. The project is expected to use 43% less energy than its previous offices. Which Energy & Atmosphere goal does this scenario address?

- a. Recognizing energy efficiency baselines
- b. Reducing negative energy impacts and increase sustainability
- c. Purchasing off-site renewable energy
- d. conducting energy simulation

#### **Content 4: Materials and Resources**

14. LEED has established the threshold for regionally sourced materials as those located within what distance of the project site?

- a. 100 miles
- b. 250 miles
- c. 500 miles
- d. 750 miles

15. What is the plant/harvest cycle of rapidly renewable resources as defined by LEED?

- a. 15 years or less
- b. 10 years or less
- c. 5 years or less
- d. 20 years or less

16. Which one of the following is an example of reusing materials?

- a. Creating construction aggregate from existing on-site materials
- b. Using renewable materials.
- c. Landscaping with native species
- d. Using regional materials

17. What is the purpose of conducting a waste stream audit?

- a. Determining potable and nonpotable water waste of a building
- b. Determining the nearest location for recycling separation
- c. Identifying the waste sources of a building
- d. Identifying the heat island effect of a building site

18. The Wayne L. Morse Courthouse, Eugene, OR project utilized materials with recycled content, more than 20% of materials, by cost. Much of the recycled content was in the steel and aluminum components. This included rebar, structural steel, steel decking, cold-metal framing, metal stairs, formed-metal fabrications, stainless-steel detention equipment and furniture, aluminum entrances and storefronts, and the factory-formed metal wall panels of the building's outer skin. Which of the following Materials & Resources goals is illustrated in this project?

- a. **Using recycled content**
- b. Reducing impacts of food production and distribution
- c. Using regional materials
- d. Using renewable materials

### **Content 5: Indoor Environmental Quality**

19. Which one of the following can be a strategy that improves indoor air quality?

- a. Reducing storm water runoff
- b. Using recycled materials
- c. **Increasing ventilation**
- d. Eliminating refrigerants with ozone depleting potential

20. Which one of the following strategies can dilute indoor air contaminants and thus improve indoor air quality?

- a. **Designing systems to deliver ample outdoor air**
- b. Eliminating refrigerants with ozone depleting potential
- c. Using advanced framing techniques
- d. Using air filters with a low minimum efficiency reporting value (MERV) rating

21. What will cause a demand-controlled ventilation to increase outdoor airflow?

- a. Individual thermal comfort control
- b. Humidity levels based upon humidity detection
- c. **Carbon dioxide concentrations**
- d. Volatile organic compound concentration

22. ASHRAE Standard 55 defines the environmental factors of thermal comfort as which of the following?

- a. **Temperature, humidity, and air speed**
- b. Air speed, density, and temperature
- c. Humidity, ventilation, and controllability
- d. Ventilation, temperature, and humidity

23. In Prewitt, NM, the building project of Baca Dlo'ayazhi a Community School was designed to make full use of New Mexico's plentiful natural sunlight. In both the gymnasium and the library in the central core of the building, skylights were installed. As defined by LEED, 91% of the indoor area has sufficient views. To ensure that the indoor environment would be healthy upon occupancy, steps taken during construction included: not starting the HVAC system until ceiling and other finishes were completed, placing plastic coverings over the end of air ducts during installation, regularly replacing

temporary construction air filters and completing a two-week building flush out prior to building occupancy. Which of the following LEED goals for Indoor Environment Quality is described by this scenario?

- a. Controlling thermal comfort
- b. Considering acoustics
- c. Conducting occupant surveys
- d. Providing daylight/views

**Content 6: Innovation in Design**

24. Which one of the following may result in an Innovation in Design credit for innovative strategies?

- a. Including two LEED Accredited Professionals on the project team.
- b. Issuing a press release to announce LEED project registration
- c. Developing a green housekeeping policy
- d. Developing an education outreach program

25. A project team is considering pursuing an Innovation in Design credit for a project that will require a large capital expense. The team decides that it will implement the strategy only if the project will be eligible for an Innovation in Design credit. What steps should the team take to determine whether its strategy will be eligible for the credit?

- a. Calculating of the strategy's overall environmental impact
- b. Researching existing CIRs to see whether the strategy has been previously addressed
- c. Draft a compelling narrative for the LEED submittal
- d. Checking the LEED rating system

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