

Teaching Proposal:

Landscape Architecture Foundation Landscape Performance Education Grant (LPEG), 2015

Principal Investigator: Kenneth R. Brooks, FASLA, FCELA, PLA
Professor of Landscape Architecture
The Design School at Arizona State University

Principal Investigator / Instructor Reflections

Background:

This project was conducted during the spring 2015 semester in The Design School at Arizona State University. The scope of the project was to explore the teaching and learning of landscape performance as a primary learning objective within the framework of the Master of Landscape Architecture (MLA) thesis studio. The project was proposed as a continuation and expansion of the 2014 LPEG sponsored-project of a similar nature.

The principle goal of the project was to engage MLA and Master of Urban Design (MUD) students in their final studio course in a thesis project that required the creation of a design project that used landscape performance strategies, concepts and tools to enhance and evaluate the design. The studio course was supplemented with a weekly seminar on “Design Performance” (in the Design School at Arizona State University, I have been using the term “design performance” instead of “landscape performance” with the explicit understanding that the two terms mean essentially the same thing, but “design performance” is more broadly inclusive, representing all of the design disciplines within The Design School (6 disciplines and 16 different degree programs).

The Design School has professional studio-based masters programs in the disciplines of architecture (MArch), industrial design (MID), interior architecture (MIA), landscape architecture (MLA), visual communications design (MVCD), and urban design (MUD). Although most of these masters programs were established relatively recently, the MArch program has operated for many years and it has successfully used the applied studio project format for a culminating project for quite some time. It makes it easier to manage our programs – both in terms of communicating degree requirements to students and accountability policies with the ASU Graduate School by using these thesis/applied project options consistently for all of these degree programs across The Design School. This studio course was the final, required core studio in the professional curriculum for MLA and MUD students.

Within the MLA program, a thesis or an applied culminating project is a core requirement in the concluding semester of the degree program. At ASU the difference between a “Thesis” and an “Applied Culminating Project” is that process and product of a “Thesis” must following standard ASU Graduate School format and procedures typical of traditional master’s theses in most disciplines in most research institutions. The “Applied Culminating Project” permits the student to engage in an independent investigation in format and process that has much more flexibility in both the process and the deliverable products. Although students have the option to choose either approach (thesis or applied project), almost all choose, or are encouraged to choose the applied project format. In our School, this generally means that most of our MLA students enroll in a semester-long research project that explores a significant design issue and plies the findings of that research through a prototype design project that illustrates the application of those research findings in a professional design setting. Most of those students will enroll in a studio course that has a single faculty instructor. Some highly-capable and motivated students will be given permission by the faculty to work on their Applied Project independently of the studio with a Landscape Architecture faculty member of their choice. Each of the students will have a principle faculty critic and all of them will present and defend their work before a jury that includes the landscape architecture faculty as well as outside reviewers.

The Design School

PO Box 871605, Tempe, AZ 85287-1605
480.965.3536 Fax: 480.965.0968 design.asu.edu

Our MArch and MLA programs are each accredited by the respective accrediting agencies (NAAB and LAAB). Both the MArch and the MLA degree programs have a two-year track for students that come from a professional undergraduate degree background and a three-year track that accommodates students without professional undergraduate background in the related discipline. The MUD program is structured as a post-professional degree, requiring a student to already have advanced professional education in either architecture or landscape architecture as a prerequisite to entry into the program. The instruction in the MUD program is carried out by architecture and landscape architecture faculty members of The Design School. MArch, MLA and MUD students have several overlapping courses within their curricula. Within the MLA Applied Project Studio this past spring, there were nine MLA and two MUD students enrolled. Two of the nine MLA students were also completing concurrent Master of Architecture (MArch) degrees and their studio project also included an architectural design component related to and integrated with their landscape architecture design.

Project Organization:

The LAF LPEG project was integrated into the core of the studio course requirements. The assignment to the students was to propose and pursue a complex design project appropriate for the profession with a program and site for the Phoenix, AZ, USA region. Recent project types have included mixed use urban design, transit-oriented development, riparian area restoration, complete streets, urban park systems, neighborhood in-fill development and others. The project must also identify a specific significant issue or challenge to resolve with design. Significant issues might be topics such as water or energy conservation, sustainability, walkability, urban heat island, urban food production and others. As the student explores design alternatives, they apply and test various design performance strategies to determine the most effective ways to address the significant issue. Assessment considers the application of evidence-based research and best practices. When the design concept has been developed, it is then evaluated against a quadruple bottom-line, with the goal to show how the proposal contributes to outcomes in these four areas – ecologic, economic, socio-cultural and aesthetic.

The projects were to be developed as prototype models, rather than as one-off endeavors. The goal was to draw conclusions about lessons learned from this design and its assessment that can be applied to future similar designs. Students are challenged to show “What difference does the design make?” “How do you know?” This approach to design integrates evidence-based science related to landscape performance into design decision making.

Another major component of this LPEG project was the creation of an integrated seminar course dedicated to the topic of “Design Performance” that formally met for an hour each week to explore and discuss issues, philosophies, history and strategies for using “Design Performance” tools and techniques in evaluating, enhancing and promoting better design. When we taught the integrated seminar of Design Performance last spring (2014) we had participation by two students in the seminar who were not enrolled and participating in the studio course. This year (2015) only students in the studio participated in the seminar. An observation from this is that a program would not need a separate course and enrollment for studio and seminar is the instructional objectives were organized and delivered to a single cohort of students.

The activities of the seminar included reading and discussing topics of design performance based on the book *Urban Design and the Bottom Line: Optimizing the Return on Perception*, by Dennis Jerke, Douglas R. Porter and Terry J. Lassar and published by ULI in 2008. The LPEG introductory webinar, hosted by LAF LPEG

Program Manager, Arianna Koudounas, was the feature of one of the early seminar sessions. Another activity of the seminar was to review and discuss the 2014 LAF-produced Webinar on incorporating landscape performance research into design, presented by Allyson Mendenhall, PLA, Associate, Director of DW Legacy Design; Design Workshop; Deb Mitchell, FASLA, PLA, Senior Vice President, SmithGroupJJR; and Skip Graffam, ASLA, PLA, Partner, Director of Research, OLIN. We contacted Allyson Mendenhall of Design Workshop as a follow-up and she shared the DW Legacy Design check sheets that the firm uses in early design conception to explore the ways in which they will develop their performance expectations. The students were then able to use these check sheets to begin to outline the performance expectations for their projects. The web-based resources for LAF's Landscape Performance and the Sustainable Sites Initiative were also reviewed.

Students discussed the nature of the quadruple bottom line as advocated by Jerke (economic, ecological, social and aesthetic – sometimes referred to by others as Planet, Profit, People and Poetics) and sought way to demonstrate quadruple-bottom-line benefits into their own projects. We also explored a variety of historic and contemporary approaches, strategies and theories related to design performance, illustrated as:

Strategies of design performance:

- Traditional, historic and/or conventional concepts of design performance evaluation:
 - Vitruvius – “firmness, commodity & delight”
 - Sullivan/Wright – “form follows function”; “form and function are one”
 - Precedence-based design
 - AIA: “Standard of Practice”
 - Pro Forma studies
 - Case Study Investigations
 - Health, Safety, & Welfare
 - Bottom Line
- Contemporary advances to design performance evaluation:
 - Life-cycle cost analysis
 - Value engineering
 - Return on Investment (ROI)
 - Post-occupancy evaluation (POE)
 - Value-added design
- Quality assessment applied to project, firm and/or design management:
 - Total Quality Management (TQM)
 - ISO 9000
 - Six Sigma Management (6σ)
- Innovation and Experimental approaches
 - Best Practices
 - Triple Bottom Line
 - Quadruple Bottom Line
 - House of Quality

The seminar also included a guest lecture from Chris Brown, FASLA, of Floor Associates of Phoenix. Brown shared the firms experience with applying landscape performance strategies in the design and development of the George "Doc" Cavalliere Park in Scottsdale, AZ. The park is featured as one of the LAF landscape performance case studies and also is one of the Sustainable Sites Initiative-rated design projects.

Principal Investigator / Instructor Reflections
LAF Landscape Performance Education Grant 2015
Kenneth R. Brooks, LAF LPEG Fellow
Page 4

The Studio Project Topics:

There were 11 projects, each with a different agenda of critical issues and problems to solve, developed by the students during the semester. The projects are described below. The final deliverables for each student included:

- an illustrated image file to be presented with the final oral presentation. The images were created with text and images from the student's research and design concepts work and composited with presentation software. The files were submitted in a .pdf format. The final formal presentations were 30 minutes in length with the student presenting their work in 15 minutes to jury of invited professional experts and faculty and the jury having 15 minutes for question and answer, comments and suggestions.
- a poster, in .pdf format, with a hardcopy printed out for hanging and reference at the final jury presentations and at the open house presentation during The Design School final review week. Each student was required to have at least one 2' x 6' poster, though at the student's option, they were given the option to have multiple boards. The boards were a collage of images, text and other information that provides a summary of the design proposal. Students opting for more than one board must have a first board that can summarize the work by itself if the project is chosen to be included in The Design School summer show in the Design Gallery.
- a professional report in an 8 1/2" x 11" format, submitted as .pdf document. The report will contain a written summary of the research exploration, background, investigations, design concepts, and design evaluation and assessment.

Samples of student products are submitted as representative of the students' efforts and achievements.

MLA/MUD Thesis Project Abstracts:

Ali Abbaszadegan (MArch/MLA) "Structural Complexity in Architectural Green Roof Systems"

The objective of this thesis project at its core is to argue the need for implementing sustainable infrastructure into both the natural and built environments, specifically how we as designers need to use green roof systems in various types of building typologies to enhance structural components as well as to balance our natural systems around their specific context. The methodology of the project includes multiple scales tied to the issue from looking at large master plans to the detail involved in the constructability of efficient living systems. The design solutions and strategies proposed in this project are a small key in a larger scheme on how to implement certain ecological and architectural solutions to the dire challenges of climate change that we as designers will be facing for years to come.

Nate Bochniak (MLA) "Urban Stream Regeneration"

The focus of my thesis is to examine how urban streams and riparian areas are affected by new housing developments. The site which I have chosen to study is the Gila River located South of Buckeye, AZ and the man-made lakes created from the mining in the area. While working with the City of Buckeye last spring in Professor Petrucci's and Professors Ewan's studio; we examined this area to see how development would happen. I will develop strategies on how these watersheds and riparian areas can still be developed while also maintaining a natural and sustainable ecosystem.

The Design School

PO Box 871605, Tempe, AZ 85287-1605
480.965.3536 Fax: 480.965.0968 design.asu.edu

Roman Cervantes (MArch/MLA) "Characterizing Urban Landscapes through Imagability"

According to the Oxford Dictionary, a monument is defined as "a building, structure, or site that is of historical importance or interest". Louis Kahn defines monumentality as "a spiritual quality inherent in a structure which conveys the feeling of its eternity that it cannot be added to or changed. Monumentality is enigmatic. It cannot be intentionally created. Neither the finest material nor the most advanced technology need enter a work of monumental character for the same reason that the finest ink was not required to draw up the Magna Carta". The scope of this project does not set out to create a sense of "spiritual monumentality" in urban landscapes. Instead it aims at understanding and identifying characteristics and or conditions of existing monumental urban landscapes, in order to develop a framework for their application to the design of future spaces. The research will look at spaces like Central Park, Millennium Park, Emerald Necklace, Indian Bend Wash, etc. and study their monumentality related to history, culture, activity, district, physicality, etc. The application of these characteristics/conditions would enable the interaction between the physical environment and society, user and site, cultivating an experience of monumentality.

Gurnoor Kaur (MUD) "Streetscape for Pedestrians in a Light Rail TOD"

The ELEMENTS or ARTIFACTS - IDENTIFIED, to be STUDIED, ANALYZED and REDEFINED in THEIR EXPERIENCE OF are: The STREET and the VOLUME surrounding the street. The project will build upon existing research, site conditions and contexts to propose a TOOL KIT of STRATEGIES and TACTICS that will be specific to the site of the 3.1 mile Light Rail extension into Mesa but also, contain the FLEXIBILITY of installation into similar sites and situations. The strategies and tactics are tangible but they aim, -to recreate the intangible memory of a humanized street experience and -regenerate, revitalize the economic, social and aesthetic standards of the area.

Sijia Liu (MLA) "Edible Housing: Home food production meets the family nutrition needs"

Project statement: Humans need nutrients to support life and health. People without healthy food and essential nutrients are like fish without clean water. So this project aims to propose a home food production system that can meet family nutrition needs.

Meiling Cai (MUD) "Vacant to Vibrant: Infill and Urban Renewal of Gateway District"

Defined as uncontrolled expansion of urban areas, urban sprawl brings negative impacts like environmental, social and economic impacts to the society. This thesis project is focused on how to redeveloping vacant land in urban area (due to urban sprawl) into vibrant and vital spaces. Vacant land creates several negative impacts including social, economic and safety issues, as well as environmental issue. There is urgent call for redevelopment of vacant lands. The project located in Gateway District in Phoenix. And this thesis project is trying to find solutions and strategies to transfer vacant land to vibrant and vital.

Cris Portugal (MLA) "Plaza (A)Dorada: An Urban Design for Culture & Community"

The outcome is for the diverse, but dominantly Latino population of Phoenix Residents living in the neighborhood of "Plaza (A)Dorada" to come together in a single place that they can be proud to collectively call their home. To express the rich and dynamic history of South Phoenix, as well as encourage dialogue and solidarity among its people and the residents of the greater Phoenix area. To celebrate this place, its history and its future, as it is, while providing a setting for conversation and expression of individual identity. Project Location: The Intersection of Southern and Central Avenues in Phoenix, Arizona.

Lisa Santy (MLA) "Growing Connections: Mentors in the Garden"

A toolkit for customized mentoring programs using the garden as a medium for positive, mutually beneficial interaction and personal growth. Depending on context, this model can be tailored to school, community or church gardens and applied to youth-to youth, as well as more traditional mentor/mentee relationships. Garden mentorship programs abound for those wanting to learn about gardening and school and community gardens are becoming commonplace. The idea of using the garden as a mechanism for building meaningful relationships and fostering positive life skills is not only an idea with merit, but a unique angle that deserves greater exploration.

Junyu Su (MLA) "Greening The Light Rail Station"

The light rail system plays an important role in public transportation in PHX. Anyway, the railway system showed some potential parts to be developed. Light rail station and the rail system show an impact in decentralizing the central areas, and a mixed road conditions with light rail had the potential danger to the residents and drivers. The project is aimed to develop an open space based on the location of the light rail station (the light rail station will be part of the green open space), a green space extended through the residential areas to the commercial areas across the street. The project will be able to solve the problems and provide a new kind of green infrastructure with public open spaces for the residents, reform the road conditions, adding it more connection to the commercial area with residents' areas. More values will be brought to surrounding areas: lands values will increase, more population will be attracted to the area, public transportation will be supported and improved. Also, more green lands will be added to the city, noise, UHI and carbon dioxide emission can be reduced also the storm water can be absorbed by the green areas. Site: Light rail station on Montebello and the 19th street, the station on W Camelback Road with 19th Ave. Context (issues): 1. Light rail and light rail stations had a decentralization impact on the mixed use area in PHX. Separate the two areas from the streets. 2. Light rail causes noise to the surrounding areas. 3. The mixed use with light rail and roads made it an unsafe potential situation for the user and people in PHX. 4. Storm water in the urban areas can cause a water flooding. 5. No enough open spaces in the mixed use areas in PHX. 6. The station of the light rail is not a friendly place in the summer time in PHX, that's another reason why the public transportation is not well organized and used here.

Mary Villarreal (MLA) "Layering sustainable water management for landscapes within rapidly densifying TODs". Water is a vital resource in arid urban environments. As the Phoenix metropolitan region implements TOD along new legs of the Metro Light Rail system, there is an opportunity to use this resource responsibly. With the expected urbanization that accompanies Light Rail development, numerous sustainable water management practices can be utilized. Greywater systems can develop alongside new mid-rise buildings, increased impermeable surfaces can harvest rainwater for landscape use and stormwater capture can be incorporated within public spaces of the TOD. By layering sustainable water management practices, we can test the economic, ecologic, social and cultural saliency of this approach. Importantly, this can be a vital tool in forming policy for the greater region.

Yudan Wang (MLA) "Creating Sustainability in Low-Income Communities"

This project discusses the current living issues of low-income communities in South Phoenix. Aims to give some design solutions to transfer low-income community to a sustainable community. The sustainable community provides an economic model for local food supply, green network deal with urban island effect and air pollution, water harvesting system and some new technologies making community more energy efficient. To create a health, walkable, safe, green and energy efficient community.

Student Work Evaluation and Critique:

During the semester, students has regular desk critiques during studio production time. At regular intervals, all students make semi-formal progress presentations to a review panel made up of faculty. These faculty members included the regular landscape architecture faculty, some adjunct faculty members, several of the architecture/urban design faculty and occasionally critics from outside the university. These may have been public officials serving a “client role” for a specific project or they may have been technical or professional experts providing additional mentoring in a particular student’s project. These monthly progress reviews were scheduled and announced from the beginning of the course and were designated as open, public reviews.

At the end of the semester, there was a final, formal, public presentation of the projects by the students. A jury for these presentations was composed of:

- Mr. Hunter Beckham, FASLA, PLA, SWT, St. Louis and ASLA VP of Practice
- Mr. Chris Brown, FASLA, PLA, Floor Associates, Phoenix
- Ms. Michele Shelor, ASLA, PLA, Colwel-Shelor, Phoenix
- Ms. Cynthia Beckham, architect, Exec. Director - Facility Design, Sisters of Mercy Health System
- ASU Landscape Architecture & Urban Design Faculty

Project Assessment – Studio Component:

The spring 2015 semester was the second year in a row for the particular instructional format and goals that governed the course. I believe that it was easier for students to conceptualize a challenging but manageable project that had interesting design opportunities and significant performance benefit potentials. We made a thematic push to apply one of the concepts presented in the LAF LPEG Orientation Webinar – the concept that design development can be explored as “Features leading to Functions leading to Benefits”. For example, a landscape design feature might be the development of a streetscape using best practices of “complete streets”. The functions of the design might be to articulate separate spaces for activities and operations by motorized vehicles, bicycles, and pedestrians with components that also provide spatial separation and definition, shade, and human scale. The resulting benefits of these features and their functions might be measured in outcomes of reduction of urban heat island, improved wayfinding by users, increased safety and satisfaction by pedestrians.

The assessment of the jury was that the project work demonstrated a high level of competence and creativity and the students were commended for their professionalism and vision. Several of the students and their work has already been recognized within The Design Schools awards and “Design Excellence” program and I expect others to receive regional and national visibility. The course and the products will serve as good models for the application of landscape design performance concepts in advanced studio design courses.

Potential for Improving the Instructional Components:

There are a couple of considerations for the future improvement of the course. The first is related to offering both the studio and the seminar courses as concurrent interdependent courses. It is extremely challenging to manage the institutional and structural aspects of offering multiple courses for multiple enrollment by students and it would be easier to just combine the learning activities of both into the single studio course with the seminar content just offered as a lecture/discussion component of the studio.

The second recommendation resolves around the open-ended nature of design. Design exploration (at any educational level) tends to expand any available time. The course could be improved with a more assertive effort on the part of the instructor to move the students from activities of design conceptualization and visualization into processes of design evaluation and performance assessment at a faster and more deliberate rate. No matter how advanced, experienced and sophisticated the students are, we're still challenging them to operate at a critical level beyond their previous experience and that means that we need to be especially assertive in coaching the students to constantly explore the justification and the evidence to support their design speculation. We (faculty mentors, jurors, critics and finally the students themselves) need to constantly be asking, "What are you doing (related to design decisions)? Why did you do it? What is the benefit/consequence? How do you know?"

LPEG Component on Assessment of Landscape Performance Knowledge

There was an additional component to this LPEG project. It centered on the development of assessment tools for evaluating the learning that students have related to understanding and applying aspects of landscape design performance. This exploration was conducted by the LPEG Fellow parallel but independent from the activities and responsibilities of the students. The goals of learning assessment are to determine "What do students know" (or what should they know) and "How well do they know it?"

The "What should students know about landscape design performance?" topics are taken from LAF's Landscape Performance Series Benefit Toolkit website (<http://landscapeperformance.org/benefits-toolkit>). These topics include:

- Land
 - Soil creation, preservation & restoration
- Water
 - Stormwater management
 - Water conservation
 - Water quality
 - Flood protection
 - Water body/groundwater recharge
- Habitat
 - Populations & species richness
- Carbon, Energy & Air Quality
 - Energy use
 - Air quality
 - Temperature & urban heat island
 - Carbon sequestration & avoidance
- Materials & Waste
 - Reused/recycled materials
 - Waste reduction
- Social
 - Recreational & social value
 - Educational value
 - Food production

Economic

- Property values
- Operations & maintenance savings
- Construction cost savings
- Other economic

The question about how well someone knows about something is best described by theory developed by Benjamin Bloom and now referred to as Bloom’s Taxonomy of Learning. According to Anderson and Krathwohl (2001), Bloom’s Taxonomy says that how well someone knows about a topic is demonstrated by how that person can use that information. At the lowest level of the knowledge is basic awareness and remembering – the ability to retrieve, recognize or recall related knowledge from long-term memory. The second level is comprehension or understanding – having the ability to explain information or concepts. The third level is application – the capacity to use the information. The fourth level is analysis – the capacity to break up complex information into constituent parts, determining how the parts operate and their relationship to the whole of the system. The fifth level is evaluation – the exercise of judgement based on criteria and standards. The sixth and highest level is creating – the ability to develop new ways of seeing and understanding information related to the topic.

In creating testing and assessment tools for determining how well someone knows about a topic considers how a question asks a student to recognize, use or apply the information. The table below illustrates these

Level of Knowledge	Use / verbs	Products
Understanding		
6 Creating (creating new understanding)	change, combine, compose, create, design, formulate, hypothesize, improve, invent, predict	booklet, cartoon, multimedia, new game, poem, skit.
5 Evaluating (defend concept or ideas)	appraise, defend, dispute, editorialize, judge, justify, prioritize, rate, select, support, verify	critique, judgement, opinion, recommendation, report, self-evaluation
4 Analyzing (distinguish different parts)	appraise, compare, contrast, differentiate, distinguish, examine, infer, outline, sequence, test	chart, plan, questionnaire, spreadsheet, summary, survey
3 Applying (use information in new ways)	classify, demonstrate, dramatize, illustrate, practice, solve, use	collection, interview, model-building, presentation, role playing, scrap book, simulation
2 Understanding (explain information or concepts)	calculate, describe, discuss, expand, explain, identify, locate, outline, report, restate	drawing, paraphrasing, peer teaching, show & tell, story problems, summary
1 Remembering (remembering information)	define, duplication, list name, recall, reproduce, tell underline	definitions, fact charts, lists, recitations, worksheets

Principal Investigator / Instructor Reflections
 LAF Landscape Performance Education Grant 2015
 Kenneth R. Brooks, LAF LPEG Fellow
 Page 10

Another table, provided by Lord & Bavisar (2007), provides an additional perspective towards the creation of questions or evaluative activities for an assessment of level of understanding:

Bloom's Level	Potential action(s) of student	Question cues / verbs
6 evaluation / creation	Evaluate, argue in support/against, panel discussion	Assess, decide, grade, recommend, justify, judge, debate, verify, argue, recommend
5 synthesis / evaluation /	Create something new from different concepts	Create, design, invent, plan, propose, devise, compose, construct
4 analysis	Break concepts into parts and analyze how different parts are related to one another	Review, design, analyze, construct, investigate, categorize, separate, compare and contrast
3 application	Apply rules or concepts to a problem	Apply, calculate, solve, show, illustrate, construct, classify
2 comprehension / understanding	Summarize in own words, paint a picture, make a flow chart	Describe, categorize, summarize, explain, interpret, outline, compare, distinguish, predict, translate
1 knowledge / awareness / remembering	Recall the memorized information	List, define, label, identify, name, find, write, state, describe, tell

There is already precedents for knowledge assessment related to design performance in the testing that is done related to LEED credentialing by the USGBC. The test preparation materials for the LEED Green Associate include these sample questions:

1. *When applying for innovation credits, a project team*
 - (A) *Cannot submit any previously awarded innovation credit.*
 - (B) May receive credit for performance that doubles a credit requirement threshold.**
 - (C) *May submit a product or strategy that is being used in an existing LEED® credit.*
 - (D) *May receive a credit for each LEED Accredited Professional that is on the project team.*

This question represents Knowledge Domain A. LEED Process, credit categories and Task Domain A. LEED Green Associate Tasks

2. *A developer wants to make a profit by building a new office that maximizes daylighting and views. What actions might the developer take to fulfill all parts of the triple bottom line?*
 - (A) *Restore habitat onsite*
 - (B) *Purchase ergonomic furniture*
 - (C) *Pursue local grants and incentives*
 - (D) Provide lighting controllability for occupants**

This question represents Knowledge Domain I. Project Surroundings and Outreach, environmental impacts of the built environment and Task Domain A. LEED Green Associate Tasks, assist others with sustainability goals.

Principal Investigator / Instructor Reflections
 LAF Landscape Performance Education Grant 2015
 Kenneth R. Brooks, LAF LPEG Fellow
 Page 11

Based on the above presented listing of knowledge topics (what one knows) and the framework for Bloom’s Taxonomy (how well one knows it), the following table organizes an outline for developing assessment questions or assessment activities.

	Awareness	Understanding	Application	Analysis	Evaluation	Creation
Land Soil creation, preservation & restoration						
Water Stormwater management, water conservation, water quality, flood protection, water body/groundwater recharge						
Habitat Populations & species richness						
Carbon, Energy & Air Quality Energy use, air quality, temperature & urban heat island, carbon sequestration & avoidance						
Materials & Waste Reused/recycled materials, waste reduction						
Social Recreational & social value, educational value, food production						
Economic Property values, operations & maintenance savings, construction cost savings, other economic						

Principal Investigator / Instructor Reflections
LAF Landscape Performance Education Grant 2015
Kenneth R. Brooks, LAF LPEG Fellow
Page 12

Work to develop assessment tools that educators can use to evaluate students' performance knowledge continues at this point and remains an on-going project. I expect to continue to work on developing these concepts and tools and to report on them through contributions to conference presentations and papers.

Published References to cited work in this report:

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York: Longman.

Jerke, Dennis; Porter, Douglas R. and Lassar, Terry J. 2009. *Urban Design and the Bottom Line: Optimizing the Return on Perception*, Washington, DC: Urban Land Institute

Lord, T., & Baviskar, S. (2007). Moving students from information recitation to information understanding: Exploiting Bloom's Taxonomy in creating science questions. *Journal of College Science Teaching*, 36(5), 40-44.

USGBC 2015. Credentialing Materials for LEED-accredited Professionals. www.usgbc.org/redentials#ga.

Organizations Referenced in this Report:

Landscape Architecture Foundation (LAF). www.lafoundation.org

Sustainable Sites Initiative (SSI). www.sustainablesites.org

US Green Building Council (USGBC). www.usgbc.org



Kenneth R. Brooks, FASLA, FCELA, RLA
Professor of Landscape Architecture
Kenneth.Brooks@asu.edu