Reflections on Teaching Landscape Performance in an Interdisciplinary Graduate Seminar Course

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Course Background

The graduate seminar course entitled *Urban Ecological Systems* is a required course in the professional curriculum in landscape architecture and a recommended course in architecture and urban design curricula. It investigates how novel ecosystems can provide environmental benefits for urban societies. It combines the design and science disciplines to address urban conditions. Fundamentals from the fields of ecology and design are used to inform the conceptualization of design proposals embedded with ecologically oriented hypotheses. A focus of the course is the conceptualization of urban infrastructure projects which deliver an ecological return on investment through the coupling and bundling of ecological services. Having synonymous goals with landscape performance agendas, it was anticipated that grant content would be easily integrated. For the spring 2015 term, 15 students (5 LA, 5 Arch, 5 urban design) were enrolled in the course. Students engaged the material through independent and team investigations where they isolated ecological performance and then re-combined three major performance goals to examine landscape performance and trade-offs.

Goals

1| Develop a working knowledge of the *ecosystem services theory* through the creation of proposals improving the ecological productivity, biological diversity, regulation of water and nutrients in urban sites.
2| Develop skills of identifying, communicating, and quantifying the inputs, outputs, and feedback of contrived ecological systems through diagraming, collage, and calculation.
3| Learn to optimize for an ecological return on investment by selecting for compatible ecological functions through the methods of coupling, bundling and stacking.
4| Advance your knowledge of ecological theory, concepts, and terminology.

Process

The course offers the opportunity to estimate the ecological (landscape) performance of a design proposal. Thus, the students learn the introductory ecological structure and function relationships created in built ecosystems. They are exposed to productivity (energy), nutrients (biogeochemistry), hydrologic cycles, biological diversity, human wellness and ecological narrative. They investigate and teach one another basic ecological concepts ranging from biogeochemical cycles to biological concepts such as ecological niche and social-ecological concepts such as biophilia. Concurrently, in three successive projects, they assess existing performance of a site and estimate performance of one; two and then three services for a proposed design. Each is measured with quantitative methods introduced in class or researched by the student. They use web calculators, calculations, ratios and study findings to estimate performance. For example, they estimate stormwater runoff quantity, then later add nutrient assessment (runoff quality) and lastly add human wellness. Each of those stages is a submittal and presentation. The focus of the class is explaining the methods and defending the validity of their estimations. They practice openness, clarity and objectivity to increase the validity of their estimations. The students work as individuals, in pairs and groups. Evaluation is made through project submittals and presentations.

Reflections

- Overall, students were able to craft and propose ideas that offered co-benefits of landscape performance. At first they had difficulty isolating one ecosystem function from the others to assess its performance. Once that was achieved they realized they could pick and choose a combination of ecological benefits in which to design for. They struggled with designing with the abstract idea of performance and were continually designing for the imagined clients (users) human factors. Through repeated questioning about the structure and function of the designed ecosystem and estimation of the performance variable they began to focus on the combining of ecological benefits. Giving them time to try out different performance benefits during the selection process was essential to learning.
- LAF *Landscape Performance Series (LPS)* material assisted decision making. The web portal of the LAF LPS offered our students both an introductory and in many cases advanced knowledge on the selection and estimation of landscape performance benefits. The breadth was great and the depth was adequate. They did, however, need to be reminded to return to it as a launching point. In the future, I would consider adding a course assignment in which students created literature reviews that could be added to the LAF materials.
- Web-based calculators were the most popular way to develop estimation. The prevalence of web calculators for stormwater, nutrients, and energy (green infrastructure) made it easy for students to estimate performance variables. Less common was the use of peer reviewed scientific literature to support and inform particular performance estimates. Commonly selected calculators were the national tree benefit calculator, green roof calculators, and green infrastructure calculators. Less commonly were i-tree and GIS-

based calculators due a required operational base knowledge. The building architecture graduate students appeared to be comfortable calculating using general mathematic summation and/or formulaic approaches learned in prior course work.

- Students employed a positivist approach and were less inclined to think critically about the trade-offs created by their design proposal. As a result, optimization of a return on investment was not necessarily achieved in the student's work. This could be due mainly to the time required to comprehend the new material, suggesting sequential coursework might be required for more critical thinking.
- Guest lectures enhanced the credibility of the science content. The students in this year's class, as well as years past, responded positively to learning directly from hydrologists, biologists, and biogeochemists about the environment. Several guests are invited to join graduate project and thesis committees.
- The poster, paper, video format was a challenging and enlightening method of tiered communication. The students strongly benefitted by developing a scientific/academic poster or paper in this course. The poster and paper were formatted and themed to be objective estimations of performance. This approach was unusual in their educational background and routine reminders of objectivity were needed.
- The requirement of an interdisciplinary approach was apparent. Disciplinary respect was developed across all design disciplines and to the sciences. Those in the building architecture program tended to share leadership with urban design and landscape architecture students. Landscape architects did assume roles addressing the use and selection of vegetation more commonly, while building architecture tended towards energy and material use and selection. Urban designers varied the most in topical pursuits.

Considerations

- *Use the* LAF *Landscape Performance Series* website*:* The grant materials of landscape performance were easily integrated into the course already based on ecosystem services. The terms 'ecological services' and 'landscape performance' can be used synonymously without confusion. The interdisciplinary nature of the course provided an improved exposure to evidence-based landscape principles. "Performance" as a concept drew non-landscape architects towards landscape content and solidified LA students more deeply in landscape architecture working knowledge. The LAF materials were critical in helping interpret scientific findings into a design student's mode of thinking. They do not easily search peer-reviewed academic literature on applied science, but they did follow the summaries and case studies of the *Landscape Performance Series* website. They were introduced early on to the LAF materials. Looping back to the LAF materials later in the semester during the major project would have improved usage and application. One suggestion is to require one precedent from the site be used in the precedent studies.
- *Emphasize basic ecological principles:* Teaching first year MLA students and advanced graduate architecture students ecological principles allowed for a relatively level playing field. The LA students volunteered for leadership and spoke in class less frequently than other disciplines. This was especially clear during site assessment and design proposal

discussions and team tasking occur. However, when discussion focused on basic ecological principles, they were more active in the course. The occasional switch to' landscape performance' terminology did not create more leadership and engagement in the LA students. Oddly, they retracted a bit. It appeared that building architects and urban designers respectfully waited for LA students to initiate thinking about the 'landscape' content. But when they failed to do so, the other design disciplines initiated the content development. This was unexpected. To provide an even platform in interdisciplinary coursework, I suggest using ecological services language as the guiding pedagogical approach that is further advanced in landscape performance. This provides foundational interdisciplinary knowledge while demonstrating landscape architectures' commitment to knowledge and practice advancement.

- *Introduction and Application:* Critical thinking and discussion were hard to reach in this introduction course. Even though it was at the graduate level, students were still grasping the breadth and depth of ecological knowledge for evidence based design. They did not fully grasp the idea of 'trade-offs,' where some performances outweigh, or even supplant, others, due to incompatibility, context, or stewardship limitations. After teaching this course a number of times, I may try to adjust the content slightly to include 'tradeoffs' as a more important concept without sacrificing introduction and applications of landscape performance. Because it was successful at focusing on estimating performance across design disciplines, emphasizing the knowledge and understanding of why and how ecological services are created should remain the priority of the course. Advanced critical thinking can be advanced in studio and independent research activities.