INTEGRATION OF LANDSCAPE PERFORMANCE INTO SITE ENGINEERING CURRICULUM

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1 ABSTRACT

The breadth and depth of the profession of Landscape Architecture merits a comprehensive professional curriculum. With time intensive studio sequences and a myriad of supporting topics to introduce to students, typical landscape architecture curricula are tight. This challenge is expounded as pressures influence programs to consider changing from five years to four years, while most first professional graduate programs are already compressed to three years. Pedagogical goals and objectives need to be refined and synergies explored to continue to meet the core knowledge, skills, and applications of landscape architecture.

As a recent addition to LAAB, Landscape Performance joins the list of topics under "Assessment and Evaluation" in the Professional Curriculum section of the 2016 Accreditation Standards, making it necessary to address how professional programs are including this important topic in their already tight curriculum. Through the Landscape Architecture Foundation's Landscape Performance Education Grant, there are resources to aid in the incorporation of landscape performance into specific studios, seminars, and special topics courses, but this paper seeks to explore and describe the opportunities and challenges of integrating landscape performance into a core Site Engineering course while enhancing the learning experience in this technically challenging fundamental course. The format and objectives of Site Engineering at the University of Arizona were modified to include Design Decisions and Performance, with a focus of developing an understanding of design decision implications related to the four elements of Earth, Water, Fire, and Air with the means to measure and evaluate landscape performance in each. The success of the course was measured through use of student surveys, interview with the teaching assistant, use of an assessment rubric and an instructor reflection. Findings indicate that Site Engineering is a good fit for introducing landscape performance as required by LAAB Accreditation Standards. While challenges with time and progress in fulfilling other course objectives posed a challenge of prioritization, student understanding and awareness of measurable social and environmental aspects of the landscape helped enhance comprehension and meaning of typical site engineering course material.

1.1 Keywords

Landscape Performance, Site Engineering, Pedagogy

2 INTRODUCTION

2.1 LAAB Standards and Landscape Performance

Landscape Architecture professional curriculum is tight. The diversity and complexity of landscape issues require extensive knowledge in many subject areas. A breadth of skills is also necessary to keep up with technologies and methods of analysis and communication. While professional development is a life-long effort, landscape architecture students need a strong and diverse base to build on, to effectively serve the profession and communities for which they design.

In 2002, The American Society of Landscape Architecture (ASLA) crafted a Policy Statement that defined landscape architecture as:

"…Any service where landscape architectural education, training, experience and the application of mathematical, physical and social science principles are applied in consultation, evaluation, planning design (including, but not limited to, the preparation and filing of plans, drawings, specifications and other contract documents) and administration of contracts relative to projects principally directed at the functional and aesthetic use and preservation of land" (ASLA, 2002).

As indicated from the comprehensiveness and length of this and other definitions of landscape architecture, it is natural that professional curriculum of Landscape Architecture programs across the nation are challenged to give both educational breath and depth in a variety of areas pertaining to the complexities of society and the built and natural environments. With tight frameworks of 4-5 years for undergraduate education (with many programs reducing from 5 years to 4), and 3 years for graduate education, it is challenging to provide a time intensive, studio-based education with a variety of emphases and priorities from one course to another. Efforts of instruction require extensive thought and planning to produce achievable educational goals and objectives that prepare students to enter this diverse profession.

To ensure a minimum level of student preparation based on the delivery of educational material, the Landscape Architectural Accreditation Board (LAAB) has been established to "evaluate, advocate for, and advance the quality of education in landscape architectural programs" (ASLA, 2017). To facilitate the evaluation process, the LAAB established seven standards for evaluation, including Standard 3: Professional Curriculum, which addresses the core knowledge, skills, and applications of landscape architecture that must be addressed in first-professional degree programs in the United States. Included in this standard are nine major themes followed by a varying number of sub-themes (LAAB, 2016). In the 2016 revision of the Accreditation Standards, "Landscape Performance" was added as a sub-theme under major theme of "Assessment and Evaluation" (Foundation, 2016; LAAB, 2016). This act requires all landscape architecture programs to demonstrate how this topic is addressed in their already-tight curriculum starting in the Fall of 2017. The thought of adding more educational requirements can seem daunting, however, as the profession evolves, the need for changes provides an opportunity for creative problem solving to address topics of such importance.

2.2 Landscape Performance

Since 2010, the Landscape Architecture Foundation (LAF) has been promoting Landscape Performance as "a measure of the effectiveness with which landscape solutions fulfill their intended purpose and contribute to sustainability" (Foundation, 2017a). Similar to Building Performance, popularized through the LEED rating system, landscape performance removes the focus on landscape elements and pushes the need for evidence-based design decisions that can be quantitatively assessed to demonstrate economic, environmental and social benefits (Wang, Yang, Li, & Binder, 2016; Yang, Li, & Binder, 2016). The increase of attention to this subject is timely with the launching of SITES v2 and the SITES AP designation. The LAAB's decision to integrate Landscape Performance into the accreditation standards further emphasizes that many educators and practitioners agree – as LAF responded – that, "future landscape architects must be able to assess and communicate the environmental, social, and economic impacts of design solutions" (Foundation, 2016).

LAF provides both case studies (Foundation, 2017b) and resources for educators (Foundation, 2017c) to promote landscape performance. The ten existing examples from the resources for educators demonstrate integration of landscape performance into studios, lectures and seminars, but lacks examples of its application to core implementation courses. The effort described in this paper serves to fill that gap by integrating landscape performance into the core site engineering curriculum at the University of Arizona.

2.3 Site Engineering

Site Engineering is a typical course title that most commonly refers to the teaching of grading and drainage for landscape architecture students. This course, in its variations, serves as an important core part of the curriculum in accredited landscape architecture programs by directly addressing the major theme of "Implementation," along with supporting many of the sub-themes required for LAAB accreditation.

As described in one of the common textbooks for the course, the focus of site engineering courses is to provide the "technical ability to transform design ideas into reality" (Strom, Nathan, Woland, & Lamm, 2009). As evidenced by the pleadings in this textbook and others (Sharky, 2014), often the perception of design and its connection to this course becomes muddled by the math heavy calculations and technical communication. Delivery of this content contrasts sharply with early design studios, where the "why" (Sinek, 2009) behind design work is emphasized with design principles and philosophical concepts as the foundation that leads to "how" and "what" of the design and communication. Site engineering often focuses on the "what" and "how" in a technical way first and primarily, with less engaging reasons behind the actions to explain the "why." Few efforts to address this course have been recorded in pedagogical research publications. Among the few, Calkins (2002) recommended a strengthening of instruction to add green building in the construction/engineering course sequence, due to the lack at that time, based on survey results. She also recommended an additional course to "address green building from concept to implementation," and to "tie everything together to strengthen a comprehensive understanding of green building in landscape architecture" (p. 93). Also relating to sustainability, Phillips (2009) proposes an integrated sustainable design curriculum model that includes discussion topics for construction/engineering courses among other core courses. She claims the model results in the integration of principles of sustainable design without largely changing the established course sequence. Most recently, Yglesias (2014) reports on efforts to reduce the emphasis on the "how to" of teaching materials in landscape architecture by using a comprehensive approach that includes history and theory to "cultivate [student's] instincts" (p. 17).

The intent of this study is to explore and describe the opportunities and challenges of incorporating landscape performance with site engineering curriculum, which similarly strengthens comprehensive understanding of the subject areas without requiring a shift in the established course sequence. The hypothesis is that Landscape Performance can be the "why" for site engineering to provide students with a more robust and comprehensive knowledge of their design actions. By reformatting the site engineering course to emphasize landscape performance, the necessary technical skills can be deeply engrained on a foundation of evidence-based design. The increase in understanding of the "why" of this technical work will reinforce creative problem solving processes with defined metrics for success and change the generally negative student perception of this course to be more positive and engaging. Linking creativity and technical skills in this way changes the traditional pedagogy of this course. This shift to a more holistic and engaging approach might better prepare students for professional practice where creative abilities are linked with technical knowledge and the evaluative tools provided by application of landscape performance.

3 METHODS

With support from a 2016 Landscape Architecture Performance Education Grant, LAR 554 – Site Engineering at the University of Arizona was modified from its standard course format as taught in the Fall of 2015 to a new format in the Fall of 2016, which integrated Landscape Performance. The course objectives were enhanced from the previous year, with attempts to expand upon the course and not diminish any existing objectives (see Table 1).

Table 1. Site engineering course objectives comparison.

Fall 2015	Fall 2016
	Communication
Be able to graphically communicate your work using appropriate symbols and notation using both hand drafting and AutoCAD.	Develop the ability to clearly communicate your work visually using hand drafting tools and CAD, and by using appropriate symbols and notations.

	Design Decisions and Performance Develop an understanding of design decision implications related to the four elements of Earth, Water, Fire and Air with the means to measure and evaluate landscape performance in those areas.
Demonstrated the ability to professionally complete grading for relatively simple sites that include both hard and soft surfaces. Have developed a thorough working knowledge of the conceptual approaches to grading and drainage. By doing so you should be able to transfer this knowledge to a variety of similar situations.	*Comprehension and Skills* Develop a thorough working knowledge of the conceptual approaches to grading and drainage through understanding the trade-offs and synergies for social and environmental welfare related to: Human safety, comfort and universal accessibility Surface water management Aesthetic and spatial perception Environmental health and stewardship
Be able to review site grading and drainage plans and note deficiencies and areas of special consideration.	Develop familiarity with SITES and LEED rating systems and evidence-based design precedents and opportunities.
Know the appropriate uses of simple survey instruments and how to skillfully use equipment in various situations to obtain desired information.	Develop an understanding of techniques and operation of measuring equipment for surveying and performance analysis.
Interpolated contours based on a grid using various techniques.	

Four tools were used to observe and record the opportunities and challenges of integrating landscape performance into the site engineering curriculum, and measure the success of the course in meeting the learning objectives resulting from the incorporation of landscape performance. Student Surveys, a Key Informant Interview, an Assessment Rubric, and an Instructor Reflection were each analyzed to evaluate the course both in comparison to the success of the course in the previous semester and as a stand-alone evaluation.

Landscape Performance Introductory Surveys were distributed to the students enrolled in the course at the beginning of the semester to evaluate pre-knowledge related to landscape performance. 17 out of the 17 enrolled students completed the voluntary survey during a lull in class time. The same questions were distributed in form of a survey to the students after the semester ended and resulted in 6 out of 17 respondents. The teaching assistant (TA) for the course was interviewed after the semester had ended as a key informant in evaluating the success of the course. The TA took the course as a student in the previous year with the same instructor, and was asked to reflect on and critically compare the similarities and differences of the course between the Fall of 2015, without the integration of landscape performance, and the Fall of 2016 with the integration of landscape performance. An assessment rubric was also created based on the objectives of the original course and used to assess the level of fulfillment as demonstrated in the student's final comprehensive project in both the Fall of 2015 course without landscape performance, and the Fall of 2016 course with landscape performance. Finally, an instructor reflection was crafted promptly at the end of the 2016 class as a response to the Landscape Architecture Foundation requirement for the Landscape Performance Education Grant. This reflection was written before reading the student survey results and before the key informant interview was conducted.

Most weight in this study is put on the student survey responses and the key informant interview to minimize bias. The assessment rubric and teacher reflection, both produced by the author before reviewing

the surveys and interview, are used objectively to demonstrate agreement or disagreement to the survey and interview.

4 COURSE DESCRIPTION AND RESULTS

4.1 Course Description

LAR 554 – Site Engineering is a four credit hour course intended for first professional graduate students in the LAAB accredited Master of Landscape Architecture program at the University of Arizona. The course is recommended to be taken in semester one of six along with a heavy load of other courses, including Design Studio I, Plant Materials, Landscape Analysis, and Contemporary Landscape Architecture, totaling 19 credit hours. Being in the first semester of the first professional degree program, students are not expected to have prerequisite knowledge of site engineering or landscape performance. In addition to site engineering topics, primarily grading and drainage, the course also serves as the program's primary introduction to drafting software.

In the Fall semester of 2015, the course was structured after the traditional way it had been previously taught (see Table 2). The sequence of material started with simple problems that progressively grew to be more complex, loosely following the associated textbooks. This approach introduced key forms and elements with defined parameters to be communicated with contour lines in plan view by using the slope formula and interpolation. Principles and calculations related to stormwater management were later introduced and a final project tested the student's ability to provide and communicate positive drainage and detention for a simple site with a building slab, parking lot, path, and street with few grading constraints.

Table 2. Site engineering course material sequence and comparison.

Fall 2015	Fall 2016
Contours and communication	Earth:
	Contours and communication
Interpolation and Slopes	Interpolation and Slopes
	Streets and Swales
Surveying Tools	Stairs and Walls
	Accessibility (Start of Landscape Performance)
Swales	Slabs
	Cut and Fill
Slabs	
	Water:
Roads, Curbs, and Shoulders	Stormwater Management
	Permeability
Intersections	Quantity and Quality Measures
	Rainwater Harvesting
Stormwater Management	
	Fire and Air:
Synthesis	Soil Compaction
	Safety and Visual Access
	Thermal Comfort
	Synthesis and Reflection

In the Fall semester of 2016 site engineering course, the order and delivery of material was restructured to facilitate the integration of landscape performance. The course was refocused into modules centered on the four elements of Earth, Water, Fire and Air, which served as an organizational strategy that broadly encapsulates the various forces involved in site engineering. Each module involved weekly lectures and individual assignments that covered many of the principles from the previous version of the course, but consolidated and ordered them to facilitate relevant discussions related to landscape performance. Performance topics discussed were focused on (1) Human safety, comfort, and universal accessibility, (2)

Surface water management, (3) Aesthetic and spatial perception, (4) Environmental health and stewardship, each pertaining to one or more of the four modules. Class field exercises associated with each module were also used to more tangibly reinforce the classroom conversation and to give examples of measuring performance on the campus landscape. Rather than building on complexity, lectures and assignments naturally transitioned to the following subjects, and the final project allowed for comprehensive synthesis of the information, including diagramming and reflection relating to social and environmental landscape performance as a supplement to the grading plan construction document.

AutoCAD tutorials were concurrently introduced in the beginning four weeks of both versions of the course as the primary introduction to this tool for the MLA program curriculum. Early exercises were hand drafted to fill the gap for the software learning curve and focus on landscape performance began at the end of the AutoCAD orientation with a kickoff webinar provided by LAF. The first four weeks allowed for introductory concepts, language, and communication for the course to be introduced as a foundation to the later conversations about landscape performance.

4.2 Student Surveys

The student surveys asked enrolled students to reflect on six questions before covering the subject early in the semester (pre-survey), and after the semester concluded (post-survey). Both surveys were identical, asking: 1) What is Landscape Performance?; 2) How does Landscape Performance affect people?; 3) What measures are available to measure landscape performance?; 4) What are some landscape elements or strategies that may affect landscape performance?; 5) How would you rank your overall understanding of Landscape Performance (circle one) with 1-5 indicating Low Understanding, Moderate Understanding, and High Understanding; 6) What thoughts or questions do you have about Landscape Performance?

The most quantifiable question was number five, which showed a self-assessed increase in student understanding of Landscape Performance from an average level of 2 (Range 1-3) to 3 (Range 2-4) by the end of the course. Question one suggests a confirmation of this increase in understanding with 1 out of 17 pre-surveys using the term “measure” in their definition of what is Landscape Performance, compared to 4 out of 6 post-surveys using the same term in their response. Question six also indicates that the majority of responses in the pre-survey questions were merely a guess, as many repeated question one here as their response. In the post-survey question six indicated a curiosity to learn more, asking about other resources, databases, and studies related to landscape performance.

While most of the questions demonstrated a more informed response to the post-survey compared to the pre-survey, the response to question four remained consistent between the two surveys. The question asked for elements or strategies that affect landscape performance, which had many students responding with elements such as water, drainage, sun/shade, air quality, transportation, culture, vegetation, materials, and strategies such as green infrastructure, constructed wetlands, passive and active water harvesting, accessibility and way finding, maintenance, shade, and filtration. Most of the wording and descriptions seemed to indicate site scaled responses to landscape performance, with exception of two of the post-survey responses addressing contextual location and climate.

4.3 Key Informant Interview

The Key Informant Interview with the Teaching Assistant (TA) of the course was important to establish some of the differences between the course in the Fall of 2015 and the Fall of 2016. The TA originally took the course in the Fall of 2015 as a student, and was in attendance for the delivery of all of the 2016 changes. He was asked to 1) explain how the courses differed, 2) address how the conversation and activities of landscape performance factored into the new course, 3) assess the preparation of the students, 4) describe the clarity of information presented in relation landscape performance, and 5) give other observations and feedback.

When asked about his previous experience taking the course, the TA confirmed some of the connotations associated with the class, saying that he and his classmates referred to it, as “the class where we have to learn grading.” He described the content and delivery as a “progressive linear ramp up of complexity” and confirmed the focus on the “how” and “what” with his summary of the approach being, “here are some tasks that you’ll be expected to do in professional practice… we will teach you how to do those things.” He positively described the new organization as “Segments of a broader idea that get packed together and synthesized at the end of class.”

The TA explained that the value of adding landscape performance to the class in 2016 created a stronger connection between the engineering side and design side of landscape architecture, and that the engineering was “more digestible” in that frame of reference. He felt that students engaged in this material would be better-informed designers in their approach even at a conceptual level compared to student gain from the prior delivery that merely provided a simple understanding about “direction of water and what slope is for purposes of site analysis.” Regarding technical skills, he felt that students are “equally prepared or better” in the 2016 course, but suggested that much of that may be do to the restructuring of the course. As a parting comment, he expressed that it is important, but also a challenge, to continue the conversation of landscape performance outside of class.

4.4 Assessment Rubric

To further compare the difference in the site engineering classes between the Fall of 2015 and 2016, an assessment rubric (see table 3) was adapted from the University of Arizona MLA Learning Assessment Rubric to be based on the learning objectives of the original course. This rubric was used by the investigator to assess the level of fulfillment related to communication, content, and comprehension as demonstrated in the student’s final comprehensive project for both the Fall 2015 and 2016 versions of the course and compared between the classes (see table 4). The scale used is as follows: 1 – Unsatisfactory, 2 – Meets Requirements, and 3 – Exceeds Requirements.

Table 3. Final project assessment for site engineering.

Dimensions	Communication	Content	Comprehension (Synthesis)
3- Exceeds Requirements	The student presents clear and concise technical communication. Drafting is precise and demonstrates clear hierarchy of information with appropriate use of symbols and notation.	The student demonstrates a high level of response to the project prompt and other resources provided in class demonstrating in-depth detail. The student is able to go beyond the focus of the content by demonstrating how the plan fits into a wider context of theory and practice.	The student's design demonstrates technical accuracy and innovation. The student is able to synthesis diverse aspects of site engineering including grading, drainage, vegetation, layout, and earthworks into a comprehensive and complex plan.
2- Meets Requirements	The student presents work clearly but layout, precision and hierarchy could be more comprehensive.	The student demonstrates understanding of the content and mostly responded to the project instructions, but may have omitted some necessary information.	The student's site engineering plan is primarily technically accurate and understandable to reviewers. Most of design variables are coordinated into a cohesive plan. The construction techniques are feasible, but in some cases, may need to make minor adjustments to their approaches
1-Unsatisfactory	The student fails to communicate a clear grading plan. Organization is unclear and appears incomplete.	The student demonstrates only a minimal knowledge of the information needed to communicate his/her ideas and fails to respond	The student's design implementation concepts are not well developed and methods and techniqes would fail if

		completely to the project prompt.	implemented in the built environment.
Score (circle)	1 2 3	1 2 3	1 2 3
			Total:

Table 4. Final project assessment scoring.

Learning Outcomes	LAR 554 Fall 2015 (n=14)	LAR 554 Fall 2016 (n=16)
Communication	2.00	2.13
Content	2.14	2.00
Comprehension	1.86	2.06
Overall	2.00	2.06

While the overall improvement from the Fall of 2015 to the Fall of 2016 is modest, it is noteworthy that the level of comprehension increased, suggesting a greater ability to synthesize the diverse course material into a comprehensive and cohesive plan. The decrease in "Content" involves the level of responsiveness to the project requirements and in class instruction, while the increase in "Communication" indicates improvements in graphic representation and precision.

The average score for individual projects from the assessment of the Fall 2015 version of the course creates a more normal distribution of scores (see figure 1), however the Fall 2016 assessment indicates more of a bimodal distribution with a greater divide between the upper and lower scores from the assessment (see figure 2). This may be indicative that the course changes helped improve the performance of some students within a middle group, while further inhibiting improvement among the lower scoring students.

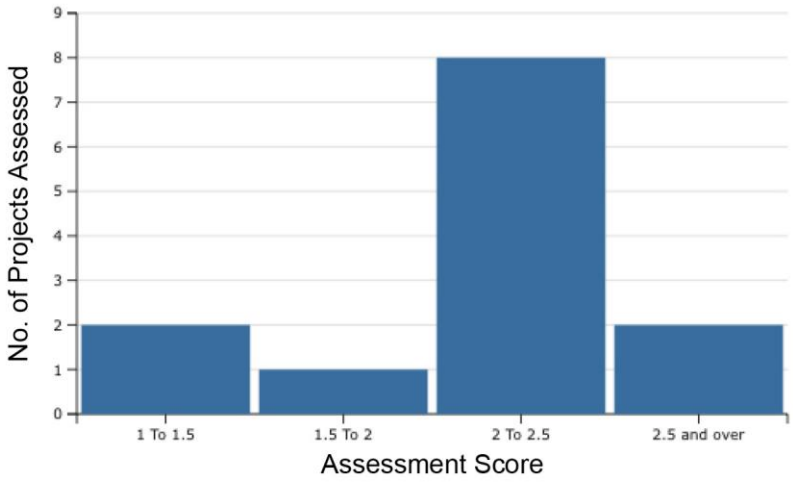

Figure 1. LAR 554 Fall 2015 assessment histogram.

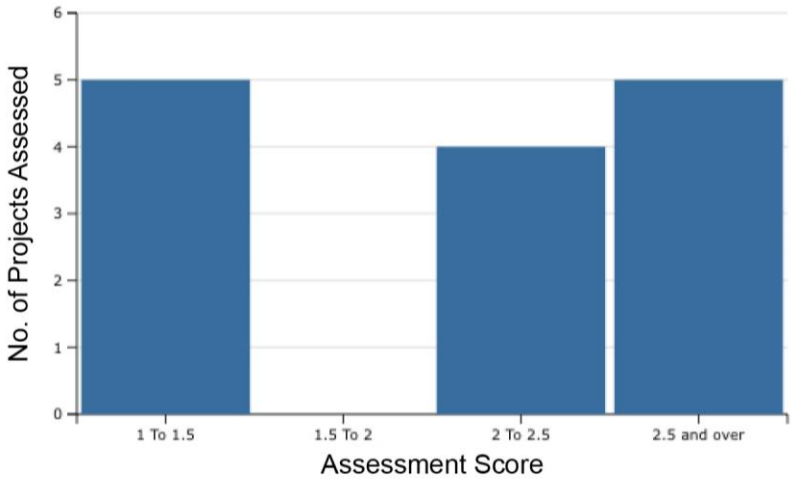

Figure 2. LAR 554 Fall 2016 assessment histogram.

4.5 Instructor Reflection

The instructor reflection explained immediate observations of the opportunities and challenges that arose with the changes to the course in incorporating landscape performance. The reflection indicates that while students were required to think deeper about their work, some did get lost in more trivial material beyond the focus of the course. The interpretation of the student reflections also indicated an "emerging understanding" of landscape performance, which pertains to the mention of the opportune timing of the course being in the first semester of the three-year program. This allows students to further explore more on the subject through a variety of future courses and projects.

There is positive mention of the thoughts on Landscape Performance spurring the restructuring of the course content, but that much more time and planning would be required to develop additional resources and more fully integrate the field exercises into the regular lecture. Overall the reflection is positive with the desire for further refinement of incorporating landscape performance into site engineering.

5 ANALYSIS

5.1 Site Engineering as an introduction to Landscape Performance

The results from the student surveys, interview with the TA, Final Project Assessment and Instructor Reflection all suggest that integrating landscape performance into site engineering is positive as an introduction, but should not be a stand-alone course in addressing the LAAB requirement. This works well in this case with the course being taught as a first-semester course of a three-year graduate MLA program. In the student surveys, the ranking of overall understanding of Landscape Performance in the student surveys improved from an average of 2 at the beginning of the course to an average of 3 at the end of the course, with the free responses indicating a more confident and accurate definition of what is landscape performance. The average of 2 at the beginning of the class may be seen as an over confidence in their guess of what is landscape performance and their average of 3 at the end of the course is a more true assessment of their familiarity with the subject, but acknowledgement of the potential breadth of possibilities. This serves well to demonstrate that the students did gain with the integration of landscape performance into site engineering, but would further benefit with it seen as an introduction that may be reinforced and enhanced in personal study or follow-up courses. It should be noted however, that the response rate for the follow-up survey was low and is used as descriptive evidence and may not be reflective of the entire class.

Also evidenced in the pre-surveys, students indicate knowledge about techniques and elements that provide landscape benefits, and have an interest there, but seem to lack familiarity with the term landscape performance. The small step in reformatting the class to emphasize and reinforce language and communication for the awareness of landscape performance, without sacrificing the original learning

objectives of the course, indicates that the content is a good fit. However, limiting landscape performance to just site engineering perhaps gives a narrowed view regarding scale, and students would benefit from its application in other courses, especially those that may take a larger scale approach. Additionally, as indicated by the key informant interview, it is hard to keep the conversation continuing outside of class when it's a solitary course discussing the subject. It may be beneficial to carry the subject into its follow-up course of site construction, as well as concurrent or proceeding studio and seminar courses.

5.2 Enhancing the learning experience

Overall the learning experience seemed to be improved from the course offering in the Fall of 2015 to the Fall of 2016. The results from the Key Informant Interview, Final Project Assessments, and the Instructor Reflection all suggest that the addition of content and conversation regarding landscape performance produced the "why" behind the "how" in site engineering. The TA spoke clearly about this advantage providing a strong connection between design and engineering, and the enhanced comprehension is further evident in the final project assessment.

While the interview with the TA along with the assessments and instructor reflection indicate a positive shift in learning, some issues are apparent. Even though the assessment average increased from one year to the next, there was a larger gap in the distribution of individual assessment scores, suggesting that not all students benefitted from the changes of the course and content. As indicated by the instructor reflection, some students had a tendency to get stuck on trivial matters when required to think more freely about the content. This may also relate to the course deemphasizing the "how to" approach, which may also explain why the assessment shows an overall decrease in the "content" score, which was based primarily on following instructions. As indicated, time was also a limiting factor potentially resulting in less individual instruction and feedback.

Also emerging from the key informant interview and instructor reflection is the question of the role the course restructuring plays in the outcomes of the two classes. While it is difficult to know what was the greater benefit, reformatting the class, or incorporating landscape performance, the action of incorporating landscape performance forced the reformatting of the course and provided more clarity to the content. The TA suggested that the advantage of technical competency in the students of the second class was likely due to the restructuring, whereas the instructor reflection indicated that time was a constraint in creating more cohesion between field exercises and classroom activities. The reflection also mentioned the need for further refinement for more full integration.

6 CONCLUSION

The purpose of this paper was to explore the integration of landscape performance into a core Site Engineering course to meet the new LAAB requirement and enhance the learning experience in this technically challenging fundamental course. It was hypothesized that Landscape Performance would give enhanced meaning to the site engineering material to provide students with a more robust and comprehensive knowledge of their design actions. The success of the course was described through use of student surveys, key informant interview, an assessment rubric, and an instructor reflection. Findings indicate that Site Engineering is a good fit for incorporating landscape performance, but as an introduction to the theme. Ideally the subject of landscape performance would be reinforced in follow-up courses to challenge students to more fully create defensible design solutions with a higher level of social and environmental sensitivity. It was also found that, generally, student understanding and awareness of measurable social and environmental aspects of the landscape helped enhance comprehension and meaning of typical site engineering course material without sacrificing necessary skill development.

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