More than Trees and Seeds: Changing Student Mindsets and Neighborhood Environments through Service-Learning and Planting Designs

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Abstract

The described service-learning project provides undergraduate landscape architecture students with theoretical city-scale challenges to be addressed at a site-scale level, forcing them to envision a holistic approach to biophysical and social issues. Partnering with a public K-12 school district and a local non-profit allows for different expertise and resources to be integrated into the learning environment. Challenges such as social justice, environmental protection, tree canopy restoration, urban heat island, and client relations are addressed through this project; providing a professional-like experience for the university students. This repeated service-learning project allows students to have shared experiences and built projects they can discuss with fellow students, alumni, and future employers. The project is structured so that students integrate and apply knowledge, skills, and abilities from previous courses, while learning planting design concepts through service to the community and interaction with the environment. This approach has proven effective, as students feel personally responsible for the design process and future users. Through the nature of this annual project, university students are engaged with a professional experience and inspired with a renewed ecological ethic that allows them to integrate practice with service.

Keywords: project reflection, undergraduate education, urban forest restoration, urban aid, social equality, landscape architecture, tree canopy

Introduction

Service-learning has been utilized by educators of K-16 grades for many years (Butin, 2003) and has been a cornerstone of the design professions for almost as long (Angotti et al., 2011). As educators, we often look to instructional methods that provide the greatest educational and transformational value to our students. The "banking" model, or depositing information into students, has been shown to be a less than useful model, while service-learning projects can provide a transformative learning experience (Fink, 2013; Sousa, 2006). For example, only about 5-15% of lecture material will be retained 24-hours post lecture, while students who practice by doing or by teaching other students (e.g., service-learning) retention rates exceed 90% (Sousa, 2006). For a profession such as landscape architecture, service-learning projects incorporate many of our core principles such as addressing social justice and environmental issues, while providing real world experience that applies knowledge. In essence, learning in the design profession is often most effective through service with community partners.

In the design fields, service-learning has been defined as a *". . . teaching and learning strategy that integrates meaningful community service with instruction and reflection"* (Angotti et al., 2011, p. 2). This definition is useful provided there is an inherent emphasis on collaboration and reflection, which leads to deeper learning and transformation. Angotti et al. (2011) ask the critical question of how we deal with boundaries that separate community and university, particularly in communities where class, race, gender, and age differ from the university student groups. This is where reflection by the university students, faculty, and organizers about the project, its goals and the players' roles must be asked and answered repeatedly throughout the project to ensure a successful project for all involved. Without reflection students, faculty and the community are less likely to effectively collaborate and to engage, learn and integrate what they have acquired into future decisions (Angotti et al., 2011; Kinsley, 1997; Roldan et al., 2004). Reflection by the students and

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faculty with the community about why we are designing these spaces is critically important for future project success in a service-learning context.

The Common Issue: Lack of Urban Tree Canopy

Urban forests and their associated canopies provide multiple ecological, social, and health benefits to communities. Urban forests change microclimatic conditions and cool their immediate area by as much as 25-degrees Celsius (McDonald et al., 2016; US EPA, 2017), remove air pollutants (McDonald et al., 2016; Nowak and Dwyer, 2007; US EPA, 2017), provide habitat for a diversity of songbirds and other biota (Alvey, 2006), promote higher real estate values (Nowak and Dwyer, 2007; US EPA, 2017), and provide a connection to nature close to home (Gore, 1998). Unfortunately, many cities are facing urban forest canopy coverage reductions (Nowak and Greenfield, 2012), which are being addressed in part through non-profit organizations that work closely with their local government to specifically address these reductions and resultant restoration efforts.

This project focuses on increasing the Louisville, KY, metro urban tree canopy through a cooperative effort between the University of Kentucky Department of Landscape Architecture (UKLA), the non-profit TreesLouisville, and the Jefferson County Public Schools (JCPS). This article describes an annual service-learning project and the values and benefits gained by undergraduate students, public school properties, and neighborhoods as seen through the reflection of the authors. In addition, this account offers suggestions on service-learning methods for others interested in replicating this work and how the project can be improved in the future.

Site Location Description

Louisville is a combined city-county government within Jefferson County, and encompasses a population of 597,337 in an area of 103,000 ha (USCB, 2017). In 2014, Louisville hired Davey Resource Group to conduct an urban tree canopy assessment. Davey is a natural resource evaluation company based in Kent, OH and their assessment concluded there was a significant tree canopy coverage decrease from 40% to 37% between 2004 and 2014. This loss equated to approximately 54,000 trees per year over the 10-year span (Davey, 2015). Even more alarming is their prediction that the Emerald Ash Borer (Agrilus planipennis), an invasive exotic insect, is expected to decimate most of the city's ash trees within the next 5 to10-years, which will further reduce the total canopy by 10 to 17% as of 2015. The Davey assessment estimates that such a loss will leave the area with about 31% of total urban canopy coverage (Davey, 2015), well below the recommended level of 40% by the American Forests organization (Hawkins, 2017). Furthermore, the urban forest canopy is unevenly distributed throughout the metro area, with particular sparseness in low socioeconomic neighborhoods and industrial centers.

Figure 1. John F. Kennedy Montessori School neighborhood located in the "Rubbertown" section of Louisville, KY.

Notice the lack of tree canopy within neighborhood. The "Rubbertown" industrial complex is located to the west of Interstate 264, which houses oil refineries, tire manufacturers, and chemical manufacturers. This land use pattern is common with the selected schools.

Many socioeconomically challenged schools through-out the nation are located in landscapes that are desolate, challenging, forgotten, and without natural elements such as trees or engaging plant material (Kendal et al., 2012). We speculate this may be due to cost restraints, value engineering, and administrative priorities (Perkins et al., 2004; Schwarz et al., 2015). JCPS schools are no different as many schools studied during this project were of challenged socioeconomic status, located on floodplains, near industrial sites, and/or within neighborhoods with few mature trees. Figure 1 illustrates the John F. Kennedy Montessori Elementary School site in the "Rubbertown" section of Louisville.

The JCPS Campus Tree Canopy Enhancement Program is a partnership that was initiated by TreesLouisville in the fall of 2015. Goals for the partnership include increasing the metro tree canopy, creating mini-arboreta throughout the metro area, and providing supportive learning environments for JCPS district students. JCPS owns approximately 931-ha of land within the Louisville metro area that presents a large, empty canvas for a well-designed tree canopy project. Selected campuses in low socioeconomic areas were found to average 12.5% overall canopy (TreesLouisville, 2017), typical of conditions in such neighborhoods, resulting in local nature deficit for those communities and young students (Kendall et al., 2012; Louv, 2005). Studies have shown that children who are provided consistent contact with nature in and around schools learn at higher levels than those who are not (Li and Sullivan, 2016; Taylor et al., 2002; Taylor and Kuo, 2006). Thus, knowing that some of Louisville's metro schools lack mature urban tree canopy suggests that increasing urban tree canopy in those areas could potentially increase student learning ability and test scores, especially when tree canopy is structured to improve outdoor play and learning space.

JCPS' interest in increasing tree canopy centers upon improving student learning outcomes, creating

greater social equity, and enhancing community pride, since schools are often the hub of a neighborhood. TreesLouisville has an interest in JCPS campuses because they provide an opportunity to enhance urban tree canopy in a relatively large aggregate area while working with only one landowner. Specific district schools were selected by TreesLouisville and JCPS because they had available underutilized land that lacked tree canopy, were adjacent to neighborhoods with deficient tree canopy, were located in poorer sections of the metro area, and wanted to improve student learning in challenging neighborhood settings. A main criterion for selection was for the school to represent the underserved, with many of the selected schools providing over 90% free or reduced student lunches. School campuses are then presented as potential sites to the university students enrolled in LA 345, Design with Plants, who choose their individual sites based on ecological challenges and the potential for enhancing children's lives through design.

The Partners

Bringing this project to fruition required multiple partners who contributed a variety of resources and expertise to achieve the project goals. TreesLouisville, UKLA, and JCPS came together to foster learning by students in the JCPS district and UKLA. This section describes each partner's resources and expertise.

TreesLouisville

In June 2015, the Louisville metro government created an urban canopy task force to look at ways to increase the declining canopy coverage and mitigate the urban heat island effect (LKGo, 2017). TreesLouisville was created out of this task force and has been developing strategic ways to increase the urban canopy cover (TreesLouisville, 2017). TreesLouisville was formed with the following goals:

- ensure that public and private investment in increasing the community tree canopy is done strategically and collaboratively,
- be a catalyst for broad civic engagement that will launch a public awareness/education campaign to promote preservation and expansion of the tree canopy as a community-wide value and convene interest groups to focus on canopy improvement,
- provide a framework for supporting and coordinating existing tree planting organizations and efforts (TreesLouisville, 2017).

While other organizations exist in the Louisville metro area that aid in tree canopy recovery, none promote this as their sole purpose. TreesLouisville's main organizational goal is to attain an equitable 45% tree canopy coverage for the Louisville metro area over the coming decades (Davey, 2015; TreesLouisville, 2017). This will be a challenge, as most property in the county is privately held and the current urban tree canopy coverage is trending downward. As part of a broader organizational strategy, TreesLouisville reached out to the UKLA for technical expertise in designing school properties to increase the urban tree canopy one JCPS school campus at a time. TreesLouisville provides funding for the materials and handles institutional communication and agreement between the three parties involved with the projects.

University of Kentucky – Department of Landscape Architecture

UKLA is an undergraduate program in the College of Agriculture, Food and Environment. The department has a reputation built over decades for aiding Commonwealth communities through design and planning efforts to advance common environmental goals. These types of collaborations allow the department to fulfill vital components of the land grant system's mission, and more specifically the UK College of Agriculture, Food and Environment's mission of improving the lives of Kentuckians (UKCAFE, 2017).

The department is known and recognized throughout the Commonwealth for conducting service-learning projects that help communities envision alternative planning and design scenarios. The department has completed projects ranging from regional planning in rural Kentucky to newly envisioned main streets and streetscapes in both rural and urban areas. These projects provide students with a heightened sense of pride, advance professional behaviors, and connect students to real-world problems they will be expected to solve as professional landscape architects. In addition, such projects serve the department's core mission: *"…to provide a broad-based education that instills the ability to think critically, fosters creative problem solving in students, develops a theoretical foundation for landscape architecture and an understanding of technologies. An emphasis on teaching, research and public service will facilitate human habitat design which appropriately responds to environmental, social and aesthetic issues"* (UKLA, 2017).

TreesLouisville Executive Director, Cindi Sullivan, approached UKLA during the summer of 2015 for assistance to design elementary, middle, and high school campuses in Jefferson County, Kentucky. This request fit well with the purpose of the LA 345 - Design with Plants course, specifically to use plants in the design of spaces and improve a site's environmental quality.

Jefferson County Public Schools

JCPS is a vital project partner serving as the client, landowner, and maintenance provider. The major resource provided by JCPS is the large amount of land needed to increase the urban tree canopy within neighborhoods. The schools chosen for design enhancement were identified by TreesLouisville based on criteria related to existing tree canopy (or lack thereof), the school's individual commitment to the project, and the school's understanding of how well-designed tree canopies could improve the school's environment and benefit their students and greater neighborhood area.

JCPS administration and maintenance crews also have to be committed to the projects, as they are ultimately be responsible for the tree care. This commitment, and subsequent on-site education and instruction by TreesLouisville is important for tree success and survival on all campuses.

For this project to be successful and exemplary, two things must happen. First, the three institutions have to come together to provide the expertise and resources needed to serve as the backbone of support for the projects and university students. Second, the university students have to synthesize the knowledge and skills learned in their previous courses to design a complete project in a non-capstone course.

Service-Learning Course Project Objectives

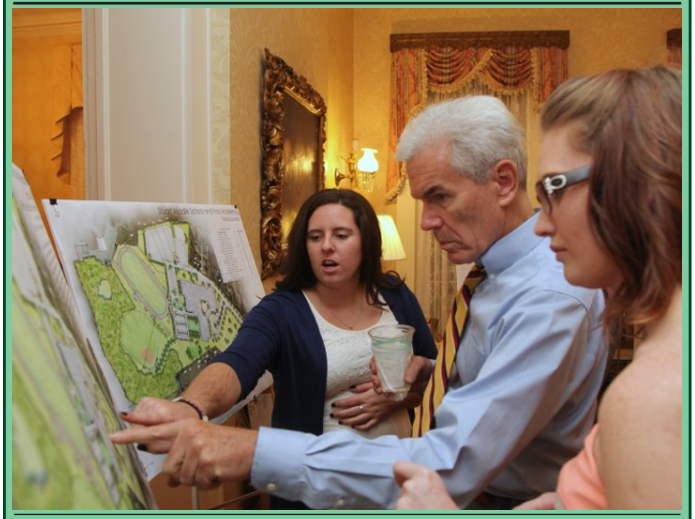
The learning objectives for the service-learning project are four fold. First, on a practical level, landscape architecture students need to learn how to use plants and planting design as tools for environmental improvement. Second, a project needs to be created in which students must synthesize all previous coursework to complete the task at a high level of competency. Third, schools should be selected for the project in low-income neighborhoods that are devoid of natural elements and could benefit from increased tree canopy coverage in order to enhance student learning (Figure 1). Fourth, is to promote volunteerism as a component of professional values for future landscape architects. More specifically, the project was developed to engage university students in creating designs that use durable woody vegetation and plant material, instill a sense of responsibility for those who live in inadequately supported environments, promote professional attitudes and behaviors, and integrate site specific needs along with the activities of school age children. These multi-pronged objectives posed higher-level educational challenges for university students enrolled in LA 345 to design these spaces by synthesizing previous knowledge and skill sets.

LA 345 is an elective, undergraduate junior/senior level course that focuses on the use of plant material to make spaces aesthetically pleasing while providing ecological function and integrity. Students who choose to take this course must have completed courses that include graphic representation, site analysis, site design, plant identification, soil science, community engagement, and landscape construction. While on the surface the project might simply appear to be about planting a tree, the intent is for students to hone their professional skills, while renewing a neighborhood's sense of value for the other social benefits that develop through this type of service learning project.

Methods

Each fall semester since 2015, this project has been presented to the LA 345 students as the second project in the course. Students are encouraged to pair up into design teams and work with one of the pre-selected

Figure 2. Students presenting their designs at White Hall in Louisville, Kentucky, to the Tree Louisville Board and citizens.



(Photo credit: Hayman, 2016)

K-12 Louisville metro schools. The project is scheduled to last 6-weeks and result in plausible design solutions that could be implemented as funding is secured for each school campus. Since this is a recurring service-learning project, important educational processes occur each year. Enrolled students visit and review sites completed by previous students, talk with the recipient school's staff, and reflect upon what our design students have accomplished for themselves and those they have served.

Pragmatically, a complete set of design documents is produced, that include an inventory and analysis of the site's existing conditions, existing plant material, building footprint, site uses (e.g., playground, field day, parking, etc.) and existing utility infrastructure. Completion of the project includes producing multiple schematic designs that go through a revision process that leads to a final schematic design. This final design is drawn as an illustrative plan with a complete planting design plan, plant palette, and the construction details necessary to implement the design team's intentions. TreesLouisville and professional landscapers complete the implementation and planting of each design assisted by students who volunteer to help during the implementation process. The students work as self-selected pairs and benefit from the experience by developing interpersonal skills necessary to accomplish the task while improving professional traits, such as good communication and graphic representation. In the final presentation, students share their designs with TreesLouisville and members of their board, school principals, and other interested parties (Figure 2).

In-Class Student Preparation

LA 345 students prepare for this project using a mixture of educational approaches. First, the students complete a short case study of existing planting projects near the university and present them to the class. The case study is used to help students understand how plants, especially woody plants, can be used to

form space. Each case study informs the class about the detailed plan of a space, how a space is actually used compared to its intended use, how plant material can enforce or influence those uses, and the aesthetic qualities of plant material, as well as other characteristics the student found interesting or useful for future design implementation. The case studies challenge students to incorporate knowledge and skills from earlier classes such as post occupancy evaluations, plant identification, site analysis, history, and basic design concepts from studio experiences.

Next, students are assigned readings that are discussed in class to provide a theoretical basis for approaching the planting design process. These readings include research on elementary school age children and learning environments in the context of natural aesthetics and play areas, such as what children might design if they could, societal and ecological problems corresponding to lack of tree canopy, issues faced by children with little nature to interact with while in school, tree species requirements, planning and zoning regulations for Louisville, and general design guidelines for school campuses. These readings provide the groundwork for understanding the client (school aged children) and designing with plants.

Prior to the site visit day, the university students formulate questions synthesized from the readings and case studies. Then they meet with the school principal, maintenance staff, and Tree Louisville staff at each site for an hour in order to understand the issues faced at each individual school campus. These site visits provide the opportunity for students to ask questions about the site, gain an understanding of the community context, and meet teachers to determine their visions for the space. Students take notes and photographs to take back to the studio to help with site analysis and design. Once students return to the university, a specific site is chosen to work on by each design team. No duplication of effort is allowed for any particular site.

School Campus Visits

The one person at each school who most influences the success or failure of the proposed designs is the principal as they control and administer the day-to-day operation of the campus. Principals at each site meet with the university students to express their thoughts regarding learning environments and possible solutions they envision for using trees in the design of their campus. This provides an excellent opportunity for each design team to ask questions of the principals, since they are the most cognizant of the challenges at their schools and knowledgeable of the student body and community the school serves. University students spent approximately an hour to an hour and a half at each site documenting existing conditions and understanding issues raised by the principals. At the end of the day, TreesLouisville provides their perspective of each site and summarizes what they see as possible solutions. Most of the schools have been sited in floodplains, near industrial centers, coal fired power plants, waste treatment plants, and in neighborhoods with low canopy coverage. There are many opportunities at these schools to create spaces that could become community assets in the context of their challenged urban environments.

Design phase

Each student design team chooses a site they feel a connection to based on the site visits. Providing choice is important, as students tend to feel empowered, autonomous, and more motivated (Patall et al., 2010; Stefanou et al., 2004). Students pool information gathered during their site visits to develop a site inventory and then analyze the data for their chosen school campus in order to begin their individual design process. Corrected base maps are assembled for each site so students can begin multiple schematic designs and revisions of those design ideas toward a singular, refined design for further development. Each team's design process and refined design is presented to the class where comment and critique can help address early shortcomings. The comments often remind teams about concepts that may have been previously discussed but forgotten during the early design phase. This provides a chance for students to again refine each design and respond to previous studies, readings, and critique comments. Students recognize the value of critique, reflection and reiteration as a way of ensuring the best possible solution for their client, in this case JCPS. Using a learner-centered (Weimer, 2013) process enriches each design by addressing school campus specific challenges and opportunities. Students are able to accomplish what Dr. Richard Sternberg notes as, "active concerned citizenship and ethical leadership," in their design solutions and critiques of each other's work (Berrett, 2016).

Generally, when a landscape architect works on a planting design project, they develop a plant palette that is germane to the people, site, and geographic region. This palette in some ways can be thought of as a menu of options; similar to the way a painter views a paint palette. As part of their plant palette, design teams provide the schools and TreesLouisville with suggestions regarding the tree species they deemed appropriate for each site. This allows students a chance to defend their design choices and practice making plant choices for specific site conditions. Knowledge from previously completed plant and soil science courses is essential in building a case for each species selected. Sometimes the plant choices are challenged and subsequently changed by TreesLouisville due to site appropriateness, tree availability, costs, and/or comments. However, the exercise is academically vital for each student's decision-making process regarding species selection and application of knowledge. This process requires students to know their material and be able to adapt quickly during discussions. For example, a student might select a particular tree, but the tree is cost prohibitive and TreesLouisville asks for an alternative recommendation on the spot. The university student must be able to choose an

alternate or defend why the cost is worth the choice, much like working in a real setting.

To finish the project, students are asked to reflect on the experience from both academic and personal levels. Some prompting questions used are, "What did you personally gain by completing this project" and "what was not included that you felt should be?" The students' responses are kept anonymous and the comments are distilled and used to prepare the next year's project assignments and objectives.

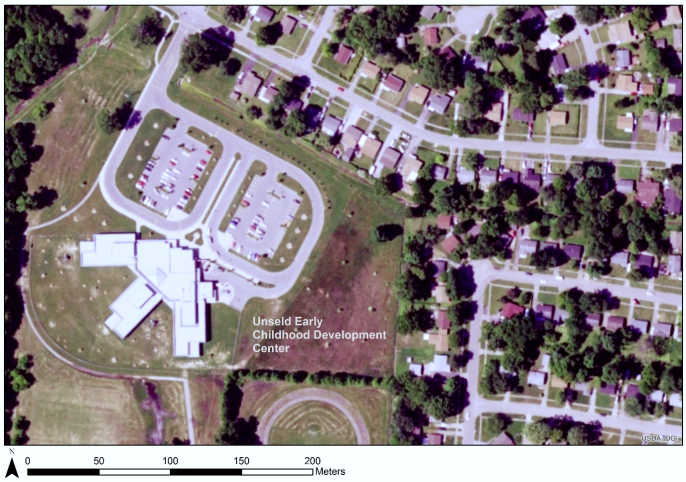
Results and Discussion

The results from this continuing effort to rethink JCPS campuses in the context of urban conditions not only provide improved environments for each campus, but also enhance the sense of pride in the university students and communities associated with each school. Pride is evidenced by the actions of principals and others who "show off" their campuses and through multiple comments made by community members and stakeholders to TreesLouisville. The value of these projects and their benefits to communities and students can be illustrated through two very different projects: The George Unseld Early Childhood Center Campus Plan and the Shacklette Elementary Campus Plan. These two projects touched on many of the objectives of the program and were deemed successes by the university students, TreesLouisville, and the community.

Better Spaces for Kids to Learn: Unseld and Shacklette

The George Unseld Early Childhood Learning Center is located in south-central Louisville, Kentucky. It is abutted on the east by a residential neighborhood, a middle school to the south, and light industrial to the west and north (Figure 3). The school lies in the Newburg neighborhood and illustrates a demographic in 2010 of 19% of the households being below the poverty line, while median family size is three with an annual income of $34,000 (USCB, 2017). The student population receiving free or reduced lunch was 81.6% in 2016 (JCPS, 2017).

Figure 3. George Unseld Early Childhood Learning Center (ECLC) and neighborhood.



The neighborhood is mostly devoid of tree canopy except to the west of Unseld ECLC. Notice the lack of woody vegetation around the school itself and the need for shade respite for preschool aged students.

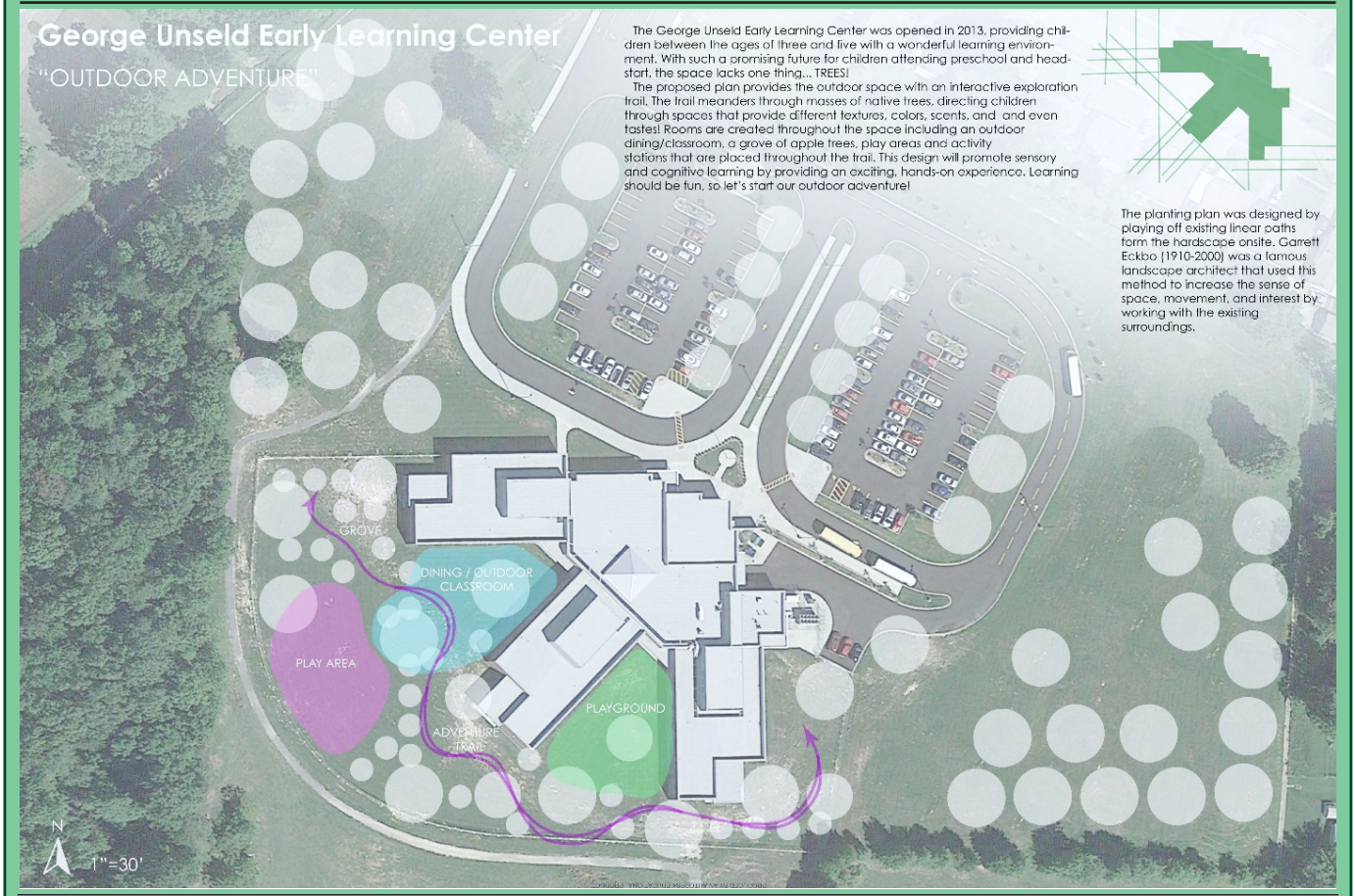
Tree canopy in the neighborhood is very low (22%) (Davey, 2015) and is almost non-existent around the school; somewhat perplexing for a neighborhood with streets named for vegetation such as Ilex Avenue, Silverleaf Drive, and Red Oak Lane. The Unseld Early Childhood Learning Center was chosen as a design example because it was a newer school (built in 2012) with little tree canopy or other vegetation installed during construction. The fenced play areas consisted of lawns with no shade areas for respite from direct sunlight for preschoolers (Figure 3). A university student who was interested in nature play and child development chose the Unseld site for their focused project and created a design solution that included aspects of an "outdoor adventureland" for the pre-kindergarten students. The design included multiple, native flowering and fruiting trees along with trees that could be climbed and would provide shade in the future. A lap track was interwoven between trees and created a short "tree walk" for the children (Figure 4).

The second design example project, Shacklette Elementary School (grades K-5), is located in southwest Louisville in a floodplain located in the Pleasure Ridge Park neighborhood. The school functions as a community center and is surrounded by residential development. As of 2010, demographics for the area illustrate approximately 6% of families live below the poverty line with a median annual income of $53,000 (USCB, 2017). The student population receiving free or reduced lunch was 87.5% in 2016 (JCPS, 2017).

This school was chosen as an example because there has been considerable community and school support for the project. The project design team wanted to create a native tree museum on site to aid in teaching environmental science. This was accomplished by using native tree material in the design, which seamlessly provided canopy between the school and landscape. A new school garden club for students was formed to help keep the campus clean and focus activities on campus aesthetics and environmental learning. The neighborhood uses the school's lap track more often now because newly planted trees create a more pleasant space. Ann Trompeter, Library Media Specialist said, *"TreesLouisville has remedied all of our issues regarding shady respite for the community and our students. The team was impressive as they studied all of the various microclimates and soil types throughout the school grounds. The plans and ultimately the planting was celebrated by our entire school and neighborhood community. The science teacher at our school has used the Native KY trees as part of his curriculum. We have been so appreciative about what TreesLouisville brought to us that we hope other schools can be given the same opportunity."* (TreesLouisville, pers. comm. 9/1/2017).

Even though these two schools serve different age groups and demographics, the implemented projects

Figure 4. "Outdoor Adventure" plan



This is an example illustrative plan for the George Unseld site. Many trees have been planted in the locations designated for a total of 66 trees on-site to date.

provide similar outcomes and benefits to the communities and students. As of 2017, a total of eleven school campuses have received design plans to improve their tree canopy coverage resulting in the planting of over 700 trees since the program's inception. Sam Cowan, Gilmore Lane Elementary Principal and recipient of a campus design states, *"I have experienced first-hand the immense effects of this project at my school. My campus is more appealing to all stakeholders. Furthermore, teachers in my school are in the process of planning many educational initiatives and various instructional units that will be enhanced by our new trees."* (TreesLouisville, pers. comm. 9/1/2017).

University Student Reflections

As a part of the project reflection process, students are asked to write about what they thought the value in a project like this was for them as future professionals. The following are some of the general values expressed by the university students and distilled by the authors:

- The opportunity to work on real-life projects with a non-profit organization that was passionate about making their community better was exciting and helped students understand their importance and place in the design environment.
- Watching the right person successfully pull diverse groups together to pursue a common goal (speaking of TreesLouisville executive director).
- Introduction to city zoning requirements and plant availability; information not often gone over in class due to time restrictions.
- The value in learning how design impacts a community on personal levels and noted this was the most important takeaway from the project.

One final student response that provided a different frame of reference was: *"From an outside perspective, the real value of the TreesLouisville project was in its dual purpose as a teaching mechanism for design and horticulture students like ourselves and in providing organizations…with a cost-effective way to acquire an informed level of consultation. If you were to take it a step further, you could orchestrate a class that takes students through the entire process of an urban forestry project: design, fundraising, budgeting/acquisition of materials, and implementation through organizing community planting events and on the ground practice. Considering the relative success of the TreesLouisville project we did, one could consider it a successful prototype for such a course."* This statement is true and could serve as a skeleton for developing a holistic, semester-long course based on regional service-learning and the process of working the project from beginning to end.

Authors' Reflections

This continuing service-learning project provides impressionable university students the opportunity to design natural settings and engage youth development and growth activities, while learning to solve large-scale issues using incremental steps. The designs and selected tree species in effect create mini-arboreta on school campuses that allow teachers to explain and demonstrate scientific understanding of how important trees and nature are to our well-being as humans (Li and Sullivan, 2016; Nowak and Dwyer, 2007). The university students in this non-capstone class learn additional information and remobilize multiple aspects of their landscape architecture education, which provides them with opportunities to resynthesize and apply that knowledge specifically to challenging sites and projects. Unlike many service-learning projects, this project has the potential to engage multiple students over multiple years providing a commonality for students and alumni. This also allows us to observe a population and locale over a longer time span so that we can assess what has changed and learn from previous years' designs and choices. Reflections regarding the tree canopy school projects by JCPS, TreesLouisville and the Mayor of Louisville, Greg Fischer can be found at: https://www.youtube.com/watch?v=ida1qy6t6os&feature=youtu.be

Summary

As seen through the results, the university students took away positive learning outcomes from this service-learning project. Our students began to understand that small steps do make a difference toward a holistic solution, and that these types of pro-bono projects can make a difference to neighborhoods and communities. As the instructor, I have received emails from past students who have continued to visit the sites they designed and are excited to report what is growing, how things have changed, issues they see, and what they might have done differently. It is refreshing to see the students' continued engagement in the project even after the assignment is complete.

Why This Project Works

This project is successful for a variety of reasons. First, there is a close match between community objectives (improve the declining urban tree canopy) and course learning outcomes (apply planting design knowledge to professional level projects). Multiple types of expertise are required to get these design projects completed and implemented. TreesLouisville provides plant selection expertise, while the LA 345 course provides students with design guidance and public presentation skills. JCPS provides the maintenance expertise and the physical grounds for tree planting. The individual contributions of UKLA, TreesLouisville, and the recipient schools together create a common bond to improve the local physical environment and shared the belief that tree canopy can provide multiple health benefits, a natural aesthetic, and a better learning environment for children. In essence, a healthy urban tree canopy can improve the quality of life for all people.

While the projects seem to be successful, further steps by the course instructor to improve the course and outcomes will be undertaken as this project continues. Steps include providing student involvement during the planting phase of their designed project, receiving additional feedback from other interested parties, and having the students assess the ecological impacts of their designs. While physical results are important, further reflection and examination regarding the social context and change for future landscape architects is fundamental. An additional question to further student reflection would be, *"What if the canopy was fully restored to the recommended amount and home prices became too high for the residents?"* Or perhaps a question to begin the project based readings like, *"How might your biases change the way you design space for selected neighborhoods, for example rich versus poor?*"

The TreesLouisville service-learning project effectively connects the macro-scale theoretical issues of urban heat islands and human nature deficit to a local, small-scale urban canopy improvement project, thus helping university students better understand urban environmental challenges and creative strategies for greening underserved urban neighborhoods. Students were able to realize the feasibility of their ideas by working with a local non-profit group who had the capacity to implement the students' designs. The project clients, including K-12 school children, neighborhood residents, teachers, and school staff, were able to better understand and pursue opportunities for public space improvement through increased tree canopy and see the benefits from the implemented solutions. The benefits will accrue as the tree canopy grows and time progresses. While this project physically is about improving the social and ecosystem services as a result of more robust and well-designed tree canopy, it provides an equally robust learning opportunity for the University of Kentucky students, the project organizers, and school clients.

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