Knowledge and skill competency values of an undergraduate university managed cooperative internship program: A case study in design education

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Students from the Purdue University landscape architecture program undergo a year-long managed cooperative internship between their junior and senior years of enrollment. During this paid internship students experience the realities of a professional design office outside of the protection of the academic classroom. Through surveys of faculty members and students, some areas showed significant differences in student perceptions of abilities compared with what faculty members thought they had taught. The significant areas are those that the professionally accredited Landscape Architecture Body of Knowledge describes as not being vital until a practitioner is ready for licensure, suggesting that in a managed cooperative internship some students have with more advanced knowledge compared to students without such assistance. *(Asia-Pacific Journal of Cooperative Education, 2016, 17(1), 21-30)*

As the purpose of architectural education is the training of future architects and designers, combining theoretical "learning" with hands-on "doing" provides opportunities for more permanent concept retention and behavioral change. Like many professional degree program curricula, architectural programs use the internship as the third point in the architectural education triangle: liberal arts, professional foundation and theory courses, and professional apprenticeship. Internships (along with other models of classroom independent education such as study abroad or service-learning projects) Provide opportunities for students to apply classroom concepts to real world issues and "complete" the learning process (Katula & Threnhauser, 2009), allowing them to turn their classroom knowledge into applied skills and experiences.

The internship as a form of experiential education exists to introduce practical realities and processes to students while reinforcing the lessons learned in the traditional classroom. In addition, the experience exposes students to office politics and organizational structures, the wide variety of office standards and regional variability in development code, and most importantly, a sense of independence. The real-life consequences of professional practice encourages students to assume responsibility for their own personal development and choice(s) of areas of expertise. Some practitioners consider the traditional classroom as "a barren place" where students are not able to develop professional judgment (Katula & Threnhauser, 2009; Quinn, 2003) even though there may be real world design issues presented in coursework. Internships (and by extension, design studios following an internship experience) are where classroom taught theory, technology, and style meet the realities of a complete project's robust depth and complexity. The process of experimental learning is difficult to simulate in the classroom and near impossible to gain through self-directed study (at the student level). This makes the internship a singularly unique environment independent of traditional learning styles, vital in preparing design students for full time employment after graduation.

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THE ARCHITECTURAL INTERNSHIP
Internships and Success

The internship experience in Purdue University's landscape architecture program would be best described as a managed cooperative internship instead of a traditional student-driven internship. Unlike university faculty, project managers and professional "mentors" have rarely received training in teaching the skills they themselves have learned, nor are their methods of teaching and management appraised and evaluated by others (Quinn, 2003). This often leaves the success of an intern's experience up to the intern themselves and how active they are willing to be in pursuing new information and responsibility (Boyer & Mitang, 1996).

A managed co–op system exists specifically to address these concerns. This system takes some of the pressure off the student and allows the faculty to use their industry connections to not only expose students to a variety of firms and market sectors, but to be sure that students are finding the best position for their interests and talents, along with a reliable professional mentor to guide them. The contractual agreements between university and design firm typically include clauses covering work conditions and responsibilities; salary and benefit discussions are left to the students due to the difference in cost of living conditions across the country. While some disciplines have formalized the internship process (National Council of Architectural Registration Boards and their Intern Development Program [NCARB IDP] for example), landscape architecture has yet to establish standards for internships either before or after graduation. Some parallels can be drawn from the Landscape Architecture Body of Knowledge (LABOK), defined as containing the "common core of the profession-that which is expected of every landscape architect no matter what type of practice or research pursued" (American Society of Landscape Architects, 2004), when determining the base values important to an internship at the pre-graduation stage.

Students in landscape architecture at Purdue University leave for their co–op internship (40-weeks minimum) after completion of their 3rd year of study and return for the 4th and final year of their academic program. This means that students have progressed through a series of thematic design studios along with basic technical courses – planting design, materials and methods, grading and hydrology, and construction documentation – before they begin their work experience. The long term of employment is attractive to design firms as they are gaining an employee for a year or more (many students opt to work through the entire 15 month period between academic semesters). Students are not yet entry level employees, but they end up as more than traditional interns. Many firms extend full time employment offers to their co-op students before they even begin their final year of academic study as they have already invested the time and efforts in training them towards their office style and standards. The completion of an internship has been found to be "...the most significant variable in terms of influence on the ability to obtain a career-oriented position" (Callanan & Benzing, 2004, p. 86) and students graduating through cooperative programs "displayed more practical job knowledge than non co–op students, and… displayed more general 'tacit knowledge' than non co–op students" (Williams, Sternberg, Rashotte, & Wagner, 1993, p. 51). These findings support the cooperative internship as a vital step in the maturation and education of a design student. In addition, an internship can have a marked influence on a student's career upon entering the full-time work force, as "prior research has identified such subsequent outcomes as improved perceptions of job fit in the early career, greater job stability in the early career, reduced feelings of entry or reality shock on full-time

employment, higher job satisfaction, and a greater degree of ambition." (Callanan & Benzing, 2004, p. 83-84).

Because of these factors, the author believes that students who go through a managed cooperative internship will have a more robust set of skills and knowledge across all areas, and most especially those dealing with professional practice and ethics.

Outcomes of Internships and Co–ops

Unfortunately, a number of traditional, non-managed internship employers seem to see their interns as "grunt–work" employees, asking them to perform a set of tasks that while vital to a project or an office, do not expose a young employee to the breadth and variety of the profession. A study on architectural interns both in and out of the NCARB IDP program found that "...41% reported having to change jobs to gain more diverse experience…", "...construction documents (CDs) monopolized the time of most. Just over half (58%) reported spending most or all of their time on this activity…" and that "...66% of interns reported gaining no experience on engineering-related activities during the same time." (Quinn, 2003, p. 44). Despite the economic downturn of recent years the managed co–op methodology used in Purdue landscape archtiecture's internship program has avoided the common "pigeon–holing" of student interns into pure production roles, with regular check-ups and positive relationships with offices and mentors.

These issues can have long term effects on a young designer's career as former IDP interns felt that they were weak in the day to day business aspects of professional practice e.g., contracting and, project feasibility. This could impact the promotion from designer to project manager or associate without further training in the business aspects of a firm. In addition, the majority of architectural interns were "not at all prepared" to deal with post-occupancy evaluations or other related evaluative measures, though not surisingly they felt most comfortable in their ability to create construction documents and other document creation during similar areas of design development (Quinn, 2003).

Research focused on internships held by business degree graduates demonstrated a significant positive association between completion of an internship and in securing a job in the field (Callanan & Benzing, 2004). Odds were 4.43 times higher for those who completed an internship than those who did not, though it could be stated that another significant effect on finding a job after graduation was the number of interviews completed, showing a need for interview role-playing and training as part of a standard curriculum. The study also found that there was not a significant association between completing a traditional unmanaged internship and an individual's confidence in personal fit at their first firm post-graduation. This could be attributed to students choosing jobs that they are less pleased with due to familiar comfort with their internship firm, or for fear of losing an assured job opportunity if they attempt to apply elsewhere.

Internships are beneficial to not only students and recent graduates, but to businesses and design firms as well. The symbiotic relationship gives an office the chance to evaluate prospective hires with little risk to them as interns rarely receive the benefits and pay of full time employees. Internships also provide an influx of new and state of the art techniques and software into office practices at low cost (other than software licenses and training for existing employees). In return, internships allow young interns and entry level employees to build a social opinion of a firm's culture and style that is often shared through meet-up events and online forums.

A managed co-op program serves as an intermediary, working for both the student and the design firms equally. The university takes advice from practicing offices to provide adequate "preparation, training, and motivation" to students; a common request from offices (Katula & Threnhauser, 2009). Student benefits include regular supervision from faculty and an in-office mentor along with wide exposure to the breadth of the profession. Equally important is the co–op program's ability to place students in firms best suited to their personality, style, and career interests.

Purdue landscape architecture's curriculum committee realized that while course content can be assessed to evaluate what is expected from graduates of the program, the specific roles of non-class experiences in a student's education are more difficult to determine. Since the program requires a year-long managed cooperative internship where each student is exposed to different environments, projects, and people, evaluating the skills and knowledge gained during this experience is vital to understanding the breadth and depth of our student's abilities. Without this data, educators cannot fully adapt the curriculum to meet the needs of students entering an ever-evolving profession.

METHODS
Survey Instrument

The survey used in this study was originally created during a re-evaluation of Purdue's landscape architecture departmental outcomes and assessment measures for accreditation and curriculum evaluation purposes. The author used the Landscape Architecture Body of Knowledge [LABOK] (ASLA, 2004) as a base document to create a metric to assess perceived knowledge and skill competencies. The LABOK was created by the majority of landscape architectural organizations in North America through a series of surveys and task groups. It describes the core competencies that define the profession (of landscape architecture) and describes the fundamental body of knowledge that should be expected from first degree graduates of accredited programs. Widely accepted by the North American landscape architectural organizations in 2004, the LABOK remains the only published measure of discrete skills and knowledge areas within the profession.

Some LABOK statements were adapted to better fit the education-oriented nature of the survey and new entries were added to assess the success of Purdue Landscape Architecture's mission statement goals, although most of the survey collected data using a previously accepted and tested series of question statements. The adapted survey instrument consisted of 68 statements measuring "knowledge" and 45 assessing "skills and competencies" for a total of 113 items. These were categorized into 9 parent clusters shared between the knowledge and skill areas (theory, history, and criticism; natural and cultural systems; design and planning theories and methodologies; policy and regulation; design at various scales and applications; site design and engineering; construction documentation and administration; communication; and values and ethics in practice), though the skills and competencies section did not include the "design and planning theories and methodologies" category.

To measure perceived levels within these items, a modified Fink's taxonomy (Fink, 2013) was selected due to its design oriented language and easy adaptability to architectural education and design processes. Responses were rated along a four (4) point scale, see Table 1.

TABLE 1: A modified Fink's Taxonomy used across faculty and student graduate surveys

	Faculty response criteria	Graduating student response criteria
1	This topic is not covered at all	I do not feel that I learned anything on this topic at all.
2	Foundation knowledge of this topic is covered and students are expected to recognize and remember (name and describe) the terminology and existence of the skill or concept.	I feel that I learned basic knowledge of this topic or skill set so that I can recognize and remember (name and describe) the material.
3	Application of this knowledge is performed in and students are expected to be able to analyze a situation and correctly use the skills/knowledge in isolation.	I feel that I learned this material to an intermediate level so that I am able to analyze a situation and correctly use the skills/knowledge in isolation.
4	Integration and Synthesis: Students are expected to be able to integrate and adapt this skill/knowledge with others in order to create a new idea/experience/product.	I feel that I reached an advanced understanding of this material and am able to integrate and adapt this skill/knowledge with others in order to create a new idea/experience/product.

Data Collection

Each professor (n=5) within the Department of Landscape Architecture was asked to assess the curriculum as a whole experience and report the level that they believed students should achieve upon graduation for each item. Faculty were asked to focus on material presented in academic courses at Purdue and not to include skills or knowledge students may have gained elsewhere or through self-study. Students (n=23) were asked to assess their entire experience while at Purdue including the mandatory co–op internship period. Reponses were then averaged across each item to determine the levels of perceived taught material through the entire landscape architecture curriculum. Due to time constraints, this study was unable to take advantage of course specific student evaluations of learning and content, though future research will take these responses into account.

Faculty responses were collected through e-mail (using Microsoft Excel) while the student survey was delivered through Qualtrics (http://purdue.qualtrics.com/) in order to ease data collection and analysis. Items and categories were presented in the same vocabulary, order, and style to avoid bias between the differing delivery methods.

There are some issues with small sample sizes, specifically on the faculty side. With only 5 faculty available to respond to the survey, some care needs to be taken in the analysis of the data. This is an especially sensitive issue due to self-reporting bias possibilities. From the faculty side, few professors want to admit that they are not presenting or delivering material to a high level, so results may be slightly skewed towards higher levels of understanding and synthesis. In regards to students, they too are likely to suffer from an over-valuation of abilities and understanding, but even more so their responses can be heavily influenced by mood and attitude at the time of the survey, especially when evaluating their time in a degree program.

Data Analysis

A series of ANOVAs were run to measure significance for each individual question response and for the grand mean of each question category. A one-way ANOVA was initially used to test mean significance between groups but a Levene Test of Homogeneity demonstrated a heterogeneity of variance for some means. In response, Welsh and Browning-Forsyth tests were run do to unequal sample sizes between groups and heterogeneous variance. The comparison of median response opposed to mean response should help to test around some reporting biases and to avoid allowing a single outlier in responses on the faculty side from skewing the results. After running the ANOVAs to detect significant differences between groups, Cohen's d (Cohen, 1988) was run to determine whether there was a meaningful effect size in the differences between faculty and students. Hedge's g, an alternative to Cohen's d, was also run to account for small sample sizes.

RESULTS

Cohen's *d*/Hedges' *g* results revealed that student perception of knowledge and skills was consistently higher compared to faculty responses, though it should be noted that for the majority of data, faculty and student responses mirrored each other. This bias is visible as well when comparing grand means of individual responses into their parent categories as seen in figures 1 and 2. Because of this bias, the majority of responses demonstrated at least a small effect size measure. Those data with large effect sizes are described in Table 2.

TABLE 2: Response points with large effect size (Cohen's *d*/Hedges' *g)*

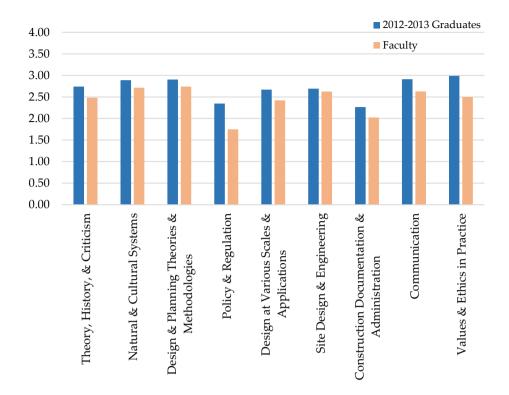| Knowledge:	Skills and Competencies:
• Current theories and theorists • Land information sources (surveys, demographics, zoning, etc.) • Visual resource assessment • Designing for special populations (elderly, children, etc.) • Accessibility regulations • Noise attenuation and mitigation techniques • Grading, drainage, and stormwater treatment • Organizational management principles	• Examine economic, political, social, ecological, and esthetic relationships and their influences • The ability to critique work and understand the relevance in addressing current issues and problems • The ability to synthesize and make connections between aspects of LA and with outside disciplines • Confirm code compliance (zoning, environmental, and accessibility) • Assist in preparing ordinances, regulations, standards, and guidelines • Prepare CDs including plans, working drawings, and technical specifications • Train, educate, and mentor other professionals

FIGURE 1: Grand means of perceived knowledge levels of faculty and graduates broken down by parent category.
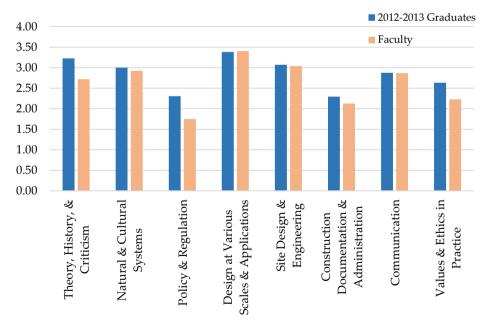

FIGURE 2: Grand means of perceived skill and competency levels of faculty and graduates broken down by parent category.

Analysis of Variance (checked and confirmed with a Welsh test) and Independent Samples T–Tests highlighted the significant questions and question categories (α=.05), with the majority of results falling in skills and competencies areas.

TABLE 3: Significant knowledge and skill competency areas

Individual Questions:	Question Categories:
Knowledge: • Designing for special populations (elderly, children, etc.) Skills and Competencies: • The ability to synthesize and make connections between aspects of LA and with outside disciplines • Confirm code compliance (zoning, environmental, and accessibility) • Train, educate, and mentor other professionals	Skills and Competencies: • Landscape Architecture History and Criticism • Policy and Regulation

DISCUSSION

The findings of this study agree with responses from the LABOK (ASLA, 2004). The knowledge and skill areas deemed by the LABOK as "very important" and "important" show no statistical significance between student and faculty responses in the current study. The significant data points fell into areas labeled as "relatively less important at time of first professional degree, yet of significantly higher importance as individuals take professional responsibility" (ASLA, 2004, 26) and in the case of graduating students at Purdue University, they seemed to feel that they were more capable in these areas than faculty teach in the standard curriculum.

Since the faculty believe that they do not teach these areas to the extent that students believe they are capable of, it can be concluded by this study that these skills and competencies were gained by students while on their managed internships.

The significant categories are of interest as they showed no significance by individual question, but when combined to a grand mean, student responses showed a higher perceived proficiency than faculty believed they taught. This was to be expected in the Policy and Regulation category, but the Landscape Architecture History and Criticism category was surprising. Informal discussions with students after the surveys were completed seem to indicate that this result stems from students having a better understanding of the realities of design and the design process with real project clients, budgets, and constraints, which then gave them a new perspective on the built environment and the intricacies of development history.

This study serves as a direct comparison between Purdue University student understanding and faculty perceptions of teaching, and as such, should not be used as a guide or reasoning to use Purdue landscape architecture's curriculum structure as the ideal for student success

after graduation. Responses were taken as is so there may be some reporting bias by professors overstating the value and scope of material taught in their courses, though instructions were implicit that honesty was vital to the results of the study. Because students tend to believe that they know more than they actually do (Koriat, 1993), there is likely some self-reporting bias to take into account in that data set as well.

The majority of students returning for their 5th year of study after their internships arrive with standing job offers from their co–op firm. This is beneficial for design firms as they have invested a good amount of time in training students to their office culture and standards while greatly reducing the stress levels of students during their intensive capstone project year at Purdue. Students are able to focus time and effort on producing high quality work without the distraction of worrying about life after graduation. While not all students choose to accept the job offer presented to them, the feelings of self-worth and affirmation from knowing that their skills and time is valued has a noticeable effect on student confidence which is reflected in their work. Students are also able to enter into the workforce as "advanced entry-level" employees. If we can assume that the faculty perception of taught material represents the baseline knowledge and skill sets common to landscape architectural design education across North America (figures 1 and 2), the significant items shown compared with student responses (tables 2 and 3) demonstrate knowledge beyond the scope of standard design curricula. As they have over a year of office work on their resumes, graduates of Purdue Universities' landscape architecture program are able to function as productive members of a design team earlier in their career at a firm.

The close ties built through the co–op internship program between professional practice and academia helps to keep Purdue landscape architecture up to date and connected to the industry to a depth that would likely be lacking without such a strong relationship. The profession keeps the program informed of the trends and demands of the modern working office while academia provides a depth of theory and technological exploration that helps keep firms at the forefront of innovation and style. Through this cooperative partnership, the typical arguments between practice and academia are largely dissolved, creating well-rounded students who are grounded in "the real world" of practice while being able to dream and explore the theoretical and impractical.

CONCLUSIONS

Outside of an obvious maturity, work ethic and awareness of the realities of the professional world (for all its opportunities and constraints), students in the co–op program at Purdue do appear to gain education and experience in areas not presented, or not presented to a high level, in the standard curriculum. While this could likely be said of any internship, the managed placement and attention given by the faculty assures that an internship delivers a wide spectrum of experience and professional exposure. The assignment of an official mentor at a design firm along with a set of basic contractual goals between Purdue University and a professional mentor creates a less stressful situation for a student while offering an ideal extension of the classroom outside of the university's walls. The original hypothesis is partly confirmed, not all areas within categories demonstrated significance, but many vital job performance and exposure specific skills and competencies showed a variation between taught material and perceived knowledge.

There is a strong need for further research on cooperative internships, their difference from unmanaged internships, and in knowledge and skill gained across all professions. Future

studies will refine this data along with surveys of students before they leave for their co–op internship to create a direct comparison between the pre- and post-condition. More granular data could also be gathered on a course by course basis to determine the goal driven educational value of each course in the curriculum. End of year data is currently being collected in Purdue landscape architecture's program on a class by class level for a more granular view of knowledge and skill gained both pre- and post-managed co-op. Studies on graduates of programs both with and without managed cooperatives, compared with self-initiated student internships could be used to "check" the data gathered in this case study. Furthermore, research on effective co-op management and processes including contracted vs. implied duties, check-up and evaluation timing and methods, could help academic programs deliver a more effective internship program.

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