Assessing U.S. Landscape Architecture Faculty Research Contribution

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Abstract: Landscape architecture programs in the United States are assessed based on the quality of the professional education received by their students. Research is becoming an increasingly important part of the profession as evidence-based landscape architecture grows, and it is critical that university faculty provide information that can be used in professional practice to resolve important environmental and social issues. In many universities, individual landscape architecture faculty are encouraged to conduct research and their performance is evaluated based largely on the quantity and quality of their scholarly output. This paper used publicly-available information to conduct a citation analysis for individual faculty and professionally accredited landscape architecture programs across the US. There was a wide range in the contribution level with some programs and some individuals who were very productive, while many others contributed very little. This might point to an attempt by programs to maintain a balance between scholarly contributions and the education of professional landscape architects. As research becomes an increasing important part of the profession, the productive programs and individuals identified in this study might provide models for others to emulate.

Keywords: citation analysis; research evaluation; U.S. landscape architecture faculty

1. Introduction

Universities across the United States have been offering professional programs in Landscape Architecture (LA) for more than a century. Traditionally programs have provided landscape architectural knowledge, skills, and values to students so that they can become successful professionals. However, many of the US professional landscape architecture organizations also consider *research* when evaluating and/or supporting faculty.

The Landscape Architectural Accreditation Board (LAAB) is the official accrediting body for first-professional Bachelor of Landscape Architecture (BLA) and Master of Landscape Architecture (MLA) programs in the United State [1]. They set and maintain the standards for professional programs, including faculty qualifications. In the 1980s some universities began to actively encourage landscape architecture programs to develop a research agenda which resulted in the hiring of faculty who held both an MLA degree and a PhD in a related discipline. After a slow start the number of LA faculty who hold PhD degrees has grown quickly [2] from 15% in 1998 to 42% in 2016, and there are now some universities where almost everyone on faculty holds a PhD. Performance of individual faculty in these programs is considered by the LAAB in evaluating the quality of programs [3] and they require that faculty have "a balance of professional practice and academic experience appropriate to the program mission" [3] (page 15). They also encourage faculty to conduct scholarly, peer-reviewed inquiry and research.

The Landscape Architecture Foundation (LAF) supports faculty and student research activities and to date has invested more than $3,000,000 [4] in case studies and landscape performance research. Their website clearly articulates the value of research to the profession: "Research is essential for evidence-based decision-making and creating spaces and systems that respond to environmental and human needs." [4].

The American Society of Landscape Architects (ASLA) recognizes the value of research to the profession and includes a category for Research in their annual Professional Awards. In 2019 they announced an Award of Excellence to Andropogon, a consulting firm that has a Director of Integrative Research [5]. An increasing number of consulting firms now have a research division and collaborate with academic faculty.

In addition to the support for research from the profession, many universities now evaluate landscape architecture faculty according to the same metrics as they do other disciplines on campus. Tenure and promotion of faculty depends largely on the amount and quality of their research. While the somewhat-opposing goals of professional education and academic research stretch landscape architecture faculty in two directions, this is the reality of the situation and there needs to be clear criteria for measuring the quality of both activities.

Measuring the quantity of scholarly *output* is fairly straightforward—simply count up the number of refereed journal articles or equivalent scholarly contributions (e.g., design awards, patents, juried shows, etc.) that have been published by an individual, and these values have been reported by various studies (e.g., [2]). The *quality* or *impact* of that research is much more difficult to measure and has been the subject of much discussion. Some of the ways that academic disciplines have measured scholarly productivity include the c-index [6], the m-index [7], the i10-index [8], the h-index [9], or simply the total number of citations. In addition, given the professional orientation of the programs, academic impact could also be measured by a variety of measures such as total amount of research grants received as well as non-refereed publications that are directly applicable to professional practice. It is not yet clear which is the most appropriate measure or measures.

Several studies have evaluated the scholarliness of landscape architecture faculty over the past three decades using quantitative analysis. Chenoweth and Chidister [10] assessed the attitudes of faculty toward research and identified levels of contribution. Milburn et al. [11] and Milburn and Brown [12] revisited and expanded on the Chenoweth and Chidister study to assess how the situation had changed over a 20-year period. They found generally positive attitudes and an increase in research productivity. But the actual number of journal articles produced by faculty was still very low compared to other professional disciplines such as Urban Planning [13]. Total citation number and median value index (http://tomwsanchez.com/2018-urban-planning-faculty-citation-analysis/) from Urban Planning schools are much higher than those from LA schools (Table 1). Christensen and Michael [14] similarly found that the level of research contribution of landscape architecture faculty was low compared to other disciplines. In 2016 Milburn and Brown [2] reported a continuation of the trend toward a gradual increase in the number of journal articles per faculty member over more than 30 years. All of these studies measured number of publications, but more recently there has been an interest in reporting on not just quantity of research contribution, but also quality. Gobster et al. [15] used citation analysis to measure the contribution of an academic journal, and Sanchez [16] used citation analysis to evaluate planning faculty and departments in North America.

There is no universal agreement on how to measure the contribution of a person's research, but two methods have been widely used in other fields and were used in this study: total number of citations per individual; and the h-index [9].

The h-index was included in this study as it indicates both the productivity and the impact of work done by an individual. It is defined as the as "the maximum value of h such that the given author/journal has published h papers that have each been cited at least h times" [17]. The formula of the h-index is as follows,

$$\text{h-index } (f) = \text{Max Min } (f\,(i),\, i) \tag{1}$$

where i is the number of citations for each publication, and f is the function corresponding to the value of i. For example, if a person has published three papers that have each been cited at least three times, their h-index is 3. Someone with an h-index of 25 has published 25 papers that have each been cited at least 25 times. It is a simple formula, but a powerful indication of the impact of an individual's work.

Table 1. Citations per faculty member as of December 2018.

	Rank	Faculty	Citations	Median	Mean
1	Michigan State University	3	864	224	288
2	Texas A&M University	11	9214	200	838
3	University of Pennsylvania	4	622	197	156
4	University of Wisconsin—Madison	5	784	183	157
5	State University of New York	8	2198	169	275
6	University of Michigan	5	9370	146	1874
7	University of Washington Seattle	7	1372	141	196
8	University of Massachusetts Amherst	10	8439	141	844
9	University of California Berkeley	8	2040	139.5	255
10	University of Texas Austin	5	557	61	111
	Universities with high Mean Values and low Median Values				
	University of Illinois	4	9433	0	2358
	Rutgers University	8	4008	11.5	501
	University of Maryland	7	2695	33	385

Note that when the number of faculty was an even number the median was the average of the middle two values.

As the primary goal of research and scholarship is to provide new information and/or insights about topics while building on what is already known, having a paper cited by another researcher is an indication of the value of that previous work. There has been a lot of discussion about the advantages and limitations of using citations as a measure of quality, but it is generally accepted that it is an appropriate approach [16].

The goal of this study was to assess the contribution of landscape architecture faculty research. The study focused on measurements taken at one point in time: 1 January 2019. It used citation analysis and h-index analysis to identify the contribution of the 73 landscape architecture departments with programs accredited by the American Society of Landscape Architects.

2. Method

All data for the study were accessed from public websites. The population for the study was tenured and tenure-track landscape architecture faculty in university programs accredited by the Landscape Architecture Accreditation Board (LAAB) a component of the American Society of Landscape Architects (ASLA), who hold at least one professional degree in landscape architecture (LA).

Only faculty listed in university websites as Assistant Professor, Associate Professor and Professor who were actively working at the end of December 2018 and met all of the population criteria were included in the study. The reason for this is that these individuals would have gone through, or are scheduled to go through, the tenure review process and can be expected to provide evidence of a scholarly or research agenda.

Some of the faculty in landscape architecture departments do not hold a professional LA degree and were excluded from this study. For example, some programs have an individual on faculty to teach plant material or research methods, but who have no formal education in landscape architecture. While these individuals provide support for the program, they seldom teach the professional components of the program that are typically taught through design studios. Additionally, different disciplines have different opportunities and expectations for publication. For example, Sabharwal [18] reported that physical scientists published more than twice as many journal articles, on average, as social scientists. This is not because they are better researchers, only that the norms, standards, and opportunities differ greatly between disciplines. In order to compare the productivity of landscape architecture researchers,

only individuals who hold at least one professional degree in landscape architecture were included in this study. In some cases, individuals were found to hold degrees from international universities and it was unclear whether or not it was a professional degree. If the degree seemed to be equivalent to a professional degree from an American university it was included in the study.

The primary source of information on individual faculty was from Google Scholar Citations. Many faculties have their profile posted and publicly accessible. When individuals did not have a published Google Scholar profile, other sources were used to identify their contributions including "publish or perish" (Harzing.com), SCOPUS, Web of Science, and Mendeley. Those four-database cover a wide variety of major peer-reviewed landscape journals that includes not only natural and social science but also landscape design issues. These include *Landscape Architecture, Landscapes, Landscape & Urban Planning, Landscape Ecology, Landscape Journal, Landscape Research, Living Reviews in Landscape Research, Places, Studies in the History of Gardens & Designed Landscapes, Garden History, Landscape History, Buildings & Landscapes, Environment and Behavior, Environment and Planning* and so on. According to our data, 21.8% of faculty members had a Google Scholar profile. So, data of 57.5% individuals were from publish or perish, 10.7% from SCOPUS, 3.9% from Mendeley, 6.1% from other sources.

A data base was developed that listed the number of citations and the h-index of each Assistant Professor, Associate Professor, and Professor at all universities in the US that have a program that is accredited by the Landscape Architecture Accreditation Board (LAAB) as a component of the American Society of Landscape Architects (ASLA). These values were intended as much as possible to represent conditions at one point in time—the end of December 2018.

Analysis of the data consisted of five main metrics for landscape architecture faculty: total citations per university; median number of citations per university; median h-index per university; total citations per individual; and h-index per individual. Many universities had a small number of productive scholars but many of their colleagues had few or no citations. This meant that a mean value was not an appropriate measure. There is no perfect measure, but we followed the lead of other studies (e.g., [16]) and reported the median values.

3. Results

The universities were first ranked based on the median number of citations per faculty (following [16]). The 10 most productive universities are listed in Table 1. Some small faculties such as Michigan State University ranked very high because all of their faculty were engaged in research. All three of their faculty were productive researchers. The University of Illinois had the highest total number of citations but they were mostly attributed to one person so their median value was not in the top 10.

Many of the universities ranked in the top 10 in citations were also ranked in the top 10 in median h-index values (see Table 2). Notably the top three positions were held in both lists by Michigan State University, Texas A&M University, and the University of Pennsylvania.

Table 2. h-index per faculty member as of December 2018.

	Rank	Range	Median
1	Michigan State University	3–11	9
2	Texas A&M University	0–27	7
3	University of Pennsylvania	3–8	6.5
4	University of Massachusetts Amherst	0–22	5
5	University of Michigan	2–35	5
6	University of Arizona	0–7	4
7	University of Wisconsin—Madison	0–7	4
8	University of California Davis	1–14	3.5
9	University of California—Berkeley	0–13	3
10	University of Washington–Seattle	0–10	3
11	University of Texas—Austin	0–5	3

The 10 most-cited researchers came from a variety of universities (see Table 3) and they all have Google Scholar profiles. The 10 individuals with the highest h-indexes have been listed along with the discipline of their terminal degree in Table 4. Six of these individuals studied a bio-physical science for their terminal degree (micrometeorology, ecology, natural resources, and land resources), three studied design (urban design and planning, and landscape architecture) and one studied human behavior (environment and behavior).

Table 3. Top ten cited faculty as of December 2018.

	Faculty	University	Citations
1	William Sullivan	University of Illinois	9433
2	Joan Iverson Nassauer	University of Michigan	6804
3	Jack Ahern	University of Massachusetts, Amherst	5192
4	Chanam Lee	Texas A&M University	3755
5	Robert D. Brown	Texas A&M University	3182
6	MaryCarol Hunter	University of Michigan	2288
7	Laura J. Lawson	Rutgers University	1628
8	Elisabeth Brabec	University of Massachusetts, Amherst	1618
9	Byoung-Suk Kweon	University of Maryland, College Park	1474
10	Brian Orland	University of Georgia	1284

Table 4. Top ten h-index of faculty as of December 2018.

	Faculty	Terminal Degree	h-Index
1	Joan Iverson Nassauer	Landscape Architecture	35
2	William Sullivan	Environment and Behavior	27
3	Robert D. Brown	Micrometeorology	27
4	Chanam Lee	Urban Design and Planning	23
5	Jack Ahern	Environmental Sciences	22
6	Mary Carol Hunter	Ecology	21
7	Brian Orland	Landscape Architecture	21
8	Jean Marie Hartman	Ecology	17
9	Robert Ryan	Natural Resources	17
10	David Tulloch	Land Resources	17

4. Discussion

As landscape architecture becomes an increasingly evidence-based profession [19,20], university faculty will be increasingly required to provide evidence through their research programs. This study has documented the level of contribution of individuals and universities. The number of citations is low compared to other disciplines and professions such as planning. For example, the person with the highest number of citations in this study would not rank in the top ten in planning schools (http://tomwsanchez.com/2018-urban-planning-faculty-citation-analysis/) and the median citation value for the top ranked university in this study would not be in the top 25 planning schools. There does not seem to be any comparative studies in architecture, but a recent article [21] argued that art, architecture, and design-related disciplines are "not well served by the popular citation-based instruments" (page 218) and recommend that they be supplemented through the use of altmetrics.

The results of this study suggest areas of additional research. The first would be to expand the study to include all landscape architecture programs in the world. The second would be to identify the characteristics of the highly productive landscape architecture researchers. It would also be important to know the productivity of non-professionals teaching in landscape architecture programs, and the use of altmetrics should be explored further.

This assessment was done for a single point in time and the rankings will undoubtedly change somewhat from year to year as new faculty are hired and older faculty retire. It would be valuable to establish a website, similar to that for planning, to monitor contribution over time.

5. Study Limitation

The key reason for choosing h-index was its wide acceptability and applicability with high accuracy in the measurement of author's cumulative scientific research contributions. Based on its multiple cases of application and investigation in academia, the pros and cons as well as strength and weakness are relatively well known. However, there are limitations in that h-index used in this study, unlike the recent versions, do not take account the multiple authors in a paper that should be normalized for team authorships. Other limitations and criticisms of the h-index include: it does not take into consideration possible differences between fields within one discipline [22]; there is a possibility that it can be manipulated through self-citation [23]; and its accuracy does not seem to be any higher than simply using total number of citations [24]. In addition, there is a small but growing field of *research through designing* [25] that could provide alternative means of assessment in future, but currently is being published (and cited) in the scholarly literature.

Some researchers fall outside the definition of our study population and so they were excluded. This is a limitation of our study. Data were collected at only one point in time—the end of December 2018. It was difficult to assess LA faculty research due to the unavailability of robust data sources. Future study can focus on advanced methodological approach to assess this broad and diverse discipline. Outputs from other forms of applied research and scholarship that did not generate citations were not included in the study.

6. Conclusions

This study provides a first assessment of the scholarly contributions of faculty in accredited landscape architecture programs in the US. The results of this study showed that a few universities have an active research/scholarship agenda while many others do not. This might point to an attempt by programs to maintain a balance between scholarly output and the education of professional landscape architects.

The list of the top ten universities by median citation was very similar to the median h-index list and the individuals on the citation list were very similar to those on the h-index list. A small number of individuals with very high citation and/or h-index values were at universities where their colleagues were not nearly as productive. However, most of the highly-productive faculty were at universities that were also very productive as a group of faculties.

As research becomes an increasingly important part of the profession of landscape architecture it is important to identify the locations and individuals that are actively contributing as they might provide models for other universities to emulate.

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