Chapter

The American Landscape Architecture Research Universe and a Higher Education Ordination: Descriptive Insights into the Discipline and Profession of Landscape Architecture

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Abstract

Landscape scholars, educators, and academics are interested in the structure and nature of the knowledgebase that comprises both the discipline of landscape architecture and the profession of landscape architecture. In this study, the latent nature of the landscape architecture discipline was revealed by constructing a principal component citation analysis representation (the landscape architecture research universe) concerning several decades of literature (1982–2017) in *Landscape Journal*, a preeminent American journal addressing landscape architecture research. In addition, an ordination was developed describing the curriculum relationships between fifteen top American universities teaching landscape architecture as identified by 'DesignIntelligence,' preparing students for practicing in the profession of landscape architecture. The results revealed that in the discipline, the research activity is highly diverse along many dimensions, constantly evolving as new topics are explored. The pattern in landscape architecture research is broad, as the discipline integrates knowledge and ideas in many fields. In contrast, landscape architecture curriculums, teaching the fundamentals of the profession, are fairly closely clustered together and quite similar, with small differences reflecting emphasis in either landscape history or the visual arts, and mathematics or course electives. This dual identity is both a source of conflict and a unique opportunity.

Keywords: information science, multivariate analysis, environmental design, higher education, citation analysis

1. Introduction

Over the past few decades, information scientists, plus others, have been interested in the structure and nature of the knowledgebases that comprises both disciplines/professionals in many academic areas and subjects, including landscape architecture. A discipline is the body of information collected, studied, analyzed, and reported by a group of individuals who collectively are affiliated with a subject [1]. For the most part, a discipline is usually associated with being a science—describing the way of the universe as best as it can be deciphered, interpreted, and explained, usually with the scientific method. On the other hand, a profession is an activity where a group of individuals practice the art of the profession—making decisions about what to do and how to accomplish the task. For example, in the area of medicine, researchers study the body, conduct experiments, and report results in the discipline of medicine. In contrast, medical doctors give advice to patients and perform operations, deciding what to do and what should be done, often without perfect information, practicing the art of medicine. Usually those who study the discipline are found at research institutions and organizations. Those who practice the profession are typically in business applying their art. Doctors, lawyers, architects, planners, musicians, and athletes are all examples of practitioners applying their skill, deciding what to do and what should be done; thus, it is called the 'art of practice.'

In landscape architecture, dominance has been expressed through the activities of the profession, where individuals practice the art of decision making for planning, design, construction, and maintenance of the exterior environment [1]. It was only relatively recently (1980s) that any attention was given to the discipline of landscape architecture, although some may claim landscape research extends back at least to the a thesis by Frank Waugh concerning campus planning and design at Oklahoma State University for a master's degree at Kansas State University in 1894 [2–6]. The debate concerning the difference between professional practice and the need for the accreditation of schools offering professional practice degrees and the role of research in graduate education is illustrated in *Graduate Education in Landscape Architecture: a Compendium* [7]. Much has changed since the 1980s in the discipline of landscape architecture. An undated report by the American Society of Landscape Architects (ASLA) illustrates how little activity in landscape research was undertaken by American landscape architecture programs in the United States in the early 1970s [8]. A report titled: *Metrics Evaluating Multivariate Design Alternatives: Application of the Friedman's Two-way Analysis of Variance by Ranks: A Personal Reflection*, provides some insight into the progression and develop of landscape research over the last 50 years from the viewpoint of one American scholar [9].

Research in landscape architecture can be divided into two aspects. The first is the development of predictions (models) [1]. Models can be equations, graphs, or even 3-dimensional representations. The other aspect is the development of theories (explanations) [1]. In addition, theories can be further divided into scientific theories (explanations about the universe that if shown to be false are discarded) and normative theories (explanations about reasons and ideas forming a a foundation for decision making, such as a set of ideas about why a designer created a design in a particular manner—exceptions can always be found and all of these normative theories are false, but they are not scientific theories and are simply guides or principles to make decisions in an imperfect world of knowledge—for a designer this is very useful) [1]. There is very little in the way of scientific theory in landscape architecture as most of the theory is normative, useful for practitioners. Most books on landscape theory are about normative theory, ideas and approaches for creating and managing landscape. For example, the deployment of a concept in a design is a normative theory [10, 11]. In contrast, landscape scholars often focus their energy upon developing predictive models accepting the models as evidence but rarely focusing upon scientific theory. Examples of predictive models developed by landscape architects are in human perception research related to assessing visual quality [12–15] and in natural resources to develop soil reclamation Eqs. [16–21]. 'Human intrusion theory' in explaining visual quality equations [22] and 'mesic preference theory' for reclaiming surface mines [23] are explanations that are scientific theories developed by landscape scholars. Within this context/framework of models and theories, landscape research has evolved.

As the volume of landscape research accumulated. Research about research was of interest to some. One approach to study this research was to derive a structure to examine citations in articles written and published in journals [24]. This general approach was reported in a study by Dr. Burley and his spouse Cheryl (an information scientist) concerning the landscape architecture literature for a journal titled: *Landscape Journal* [25]. The co-authors of this book chapter queried Dr. Burley about the reception of this effort. "Well, for the conference, they gave us a premiere setting at the beginning of the conference. With the exception of a few conference people in the room who were required to attend the session, the room was empty. There were a lot more people in the hotel bar. At the time, I really do not think anyone went to these conferences to learn about research, but rather to escape their academic institution, converse with friends and colleagues, and unwind. No one was interested. A better venue would have been an information science setting. Still, I kept looking for opportunities to expand the research endeavor. I was undaunted, very independent; I still am." reflected and commented Dr. Burley. In 2009, a similar expanded study was reported examining the landscape research literature in transportation [26]. Surprisingly, this study was noticed and featured in a seminal book about landscape research [27]. And the study earned an ASLA state award for research. An interesting finding in the study was that the results indicated a fractured, weakly linked research universe where investigators were deep into their line of research and not tied or integrated into other areas. In contrast, in the landscape architecture discipline, there were many connections and interrelationships. "The blending and borrowing across different subject areas was something that landscape architects have claimed for a long time. The study supported those claims. Often in academia, other disciplines tout their depth and wonder why landscape architects do not do the same? Again, here was evidence that in one area, environmental transportation, they were deep but unconnected. I believe both approaches are beneficial, but the differences illustrate where conflicts from those who believe in one approach over the other can be generated. Because landscape architects borrow and integrate, it can go unappreciated by other academics." assessed Dr. Burley.

The foundation of the research is to employ multivariate principal component analysis (PCA), something that landscape architects rarely study. "During my time as a graduate student, my professors at the University of Manitoba urged me to take as many advanced statistic courses as possible and I took even more at the University of Michigan for my PhD. It was like learning the analytic tools for conducting research. If one does not know the tools, it can be difficult to understand the possibilities. Similarly in landscape architecture, if one does not know the design process, it is difficult to generate a design. Many landscape programs around the world have research programs, but seem to emphasize learning more about the environment and less about the tools of research." noted Dr. Burley. In ecology and other fields, multivariate analysis was essential to study and compare settings and ideas. Curtis studied vegetation communities in Wisconsin and ordinated the communities by recording the frequency, density, and dominance of each plant type in a stand [28]. An ordination of research activity can be accomplished by treating the category of literature cited in an article (like a vegetation type) and the article itself as a stand of vegetation. "When it was first proposed to me about studying research structure of literature with citations, it only took me about 15 seconds to develop the experimental design, but it had taken half a lifetime to be prepared for those 15 seconds." stated Dr. Burley. With this basic analytic tool (PCA), other kinds of studies related to garden design, cemeteries, cultural heritage landscapes, and paintings have been examined by those working with Dr. Burley [29–34].

The intent of the study reported in this book chapter, an expanded investigation of the landscape research literature to visualize the changes across time for *Landscape Journal* were initiated. The study provides insight into how topics studied change and evolved.

2. Methodology

For this investigation, the analysis reveals a latent underlying structure for the landscape architecture discipline (the landscape architecture research universe) concerning the citation literature of *Landscape Journal* from several decades of articles (1982–2018). *Landscape Journal*, is a preeminent American journal addressing landscape architecture research and is affiliated with the Council of Educators in Landscape Architecture (CELA).

For each issue, the study team collected all of the peer reviewed published articles, 'source articles' for the study years. Each source article comprised one observation set. For one observation set there would usually be journal articles cited in the bibliography. These cited journal articles contained within the bibliography of a source article are called 'citation articles'. To classify a citation article, the Library of Congress classification number for the journal title of each citation article was recorded. If the same journal is cited more than once, the tally will be greater than one. Within an observation set, the total number of citation articles for a particular category was tallied. For example, if the subject category 'architecture' had 6 cited architecture citation articles in a source article, the architecture tally for the observation set would be six. The Library of Congress classification was chosen as it was an existing, broad, and easy to use system, recognized by many major state research universities. The Library of Congress system is non-hierarchical, meaning that the new bodies of knowledge that emerge are relatively easily incorporated into the classification system and thus as the system grows over time, it can accommodate modifications and development in the knowledge base. Flexibility over time was an essential component since historical research may span across a wide time frame.

In this study there were 38 subject variables. Thus each observation sets had 38 scores, each representing the tally of each subject from the source article. With the subject areas for all of the journals identified, one could then sort the citation articles from each source article into a subject category. Citations to literature such as monographs, technical reports, and books were not included in this study. I addition, proceedings were included only if they appeared to be published at least annually, meaning it was a serial. Once the subject areas for each source article were tabulated, the dataset could then be entered into a computer for statistical analysis.

Multivariate data analysis was performed using SAS 9.1 [35]. To conduct a PCA, the subject categories were each standardized to a mean of 0.0, standard deviation of 1.0. The standardization is important to the analysis [36]. Otherwise, the results will be dominated by categories with large scores. After standardization principal component analysis can be conducted upon the observation sets (an observation set is comprised of the scores in 38 subject category variables for a source article). The analysis produces a numerical table present eigenvalues which represent independent dimensions, from the largest value to the smallest. For interpretation, eigenvalues for standardized data with values over 1.0 were considered significant dimensions. The significant dimensions represent bodies of knowledge in the landscape research university. Significant dimensions were selected for further analysis by examining the eigenvector coefficients of each dimension which indicate the level of association that a subject category had with the dimension. In other words, eigenvector coefficients numerically illustrate the correlation between a variable (the subject category) and the dimension. The eigenvector coefficients are arranged in a table, sorted by the eigenvalue and would range in score between −1.0 and 1.0. Values near 0 indicate low correlation with the eigenvalue dimension while values near −1.0 or 1.0 indicate a strong association with the dimension. In this study, eigenvector coefficients with a value greater than or equal to 0.400 or less than −0.400 were considered to be affiliated with a particular dimension. Subject categories with more than one significant eigenvector coefficient meant that the subject was significant across more than one dimension, suggesting a dimension connecting subject category. Subject categories with only one significant eigenvector were considered primary to the associated eigenvalue. Primary categories were employed to label (name of identify) a dimension. Weak associations with the dimensions were considered to be eigenvector coefficients ranging from −0.4 to −0.20 and 0.20 to 0.4. The results of the PCA were plotted creating a structural map (universe) of the dimensions, associated subject categories, and connecting subjects. In other words, this map could graphically describe the latent properties of the data. The map would be a graphical depiction of the research universe in a given time frame. Several time frames were examined: the complete time frame from 1982 to 2018, 1997 to 2007, 1999 to 2009, 2001 to 2011, 2003 to 2013, 2005 50 2015, and 2007 to 2017.

In contrast to the research universe, an ordination was also developed describing the curriculum relationships between fifteen top American universities teaching landscape architecture as identified by 'DesignIntelligence,' preparing students for practicing in the profession of landscape architecture [37]. Each school was an observation set and the subjects taught in the curriculum were the categories in each observation set. The categories were standardized, and PCA invoked. The results of the latent dimension can be plotted to illustrate the relative position of one school to another. The intent is not to show which is better, but rather to identify similarities and differences. The plots can depict an educational univers in a manner similar to other types of plots [29–34].

3. Results

The results for the complete set of source articles studied (1982–2017) indicated that at least 16 dimensions were significant, meaning they had eigenvalue scores greater than 1.0 (**Table 1**). The eigenvector coefficients for the first four dimensions are included in **Table 2** to illustrate eignevectors from the tables. The complete tables are too extensive to print in this book chapter; however, they are available from the corresponding author. Across different time frames, the number of dimensions ranged for 14 to 17significant dimensions. The large number of dimensions suggest a fair number of topics are being studied within the profession. There is great diversity in what landscape scholars study and what comprises the breadth of the landscape discipline.

Twenty-two subjects were found in the study of the curriculums for the fifteen top 2016 undergraduate school in the United States, PCA analysis revealed that the subjects could be compacted into fourteen dimensions (**Table 3**). **Table 4** illustrates the first two eigenvector coefficients for the first two eigenvalues from **Table 3**.

Dimension	Eigenvalue	Dimension	Eigenvalue
1	3.37416400	20	0.86118014
2	2.37773394	21	0.82850031
3	2.30449507	22	0.79618238
4	1.72251904	23	0.76786013
5	1.57488980	24	0.73251054
6	1.48665358	25	0.70882083
7	1.35165038	26	0.70309916
8	1.28649532	27	0.60824656
9	1.24473535	28	0.60049263
10	1.19781171	29	0.58875709
11	1.14476595	30	0.56176491
12	1.11569426	31	0.53288311
13	1.08994852	32	0.49631484
14	1.05809264	33	0.46083954
15	1.03103935	34	0.42602992
16	1.01171969	35	0.38829465
17	0.98221308	36	0.36183629
18	0.96307548	37	0.32252224
19	0.93616755	38	0.00000000

Table 1.
Eigenvalue scores for the set of source articles from 1982 to 2017.

Categories	Prin1	Prin2	Prin3	Prin4
General works, newspapers, college publications	−.007198	−.002037	*−.310990*	*0.367060*
Psychology/ environmental psychology/ esthetics/ethics	0.042329	*0.302969*	0.021038	−.070908
History	−.075144	−.129145	*0.307017*	*0.367516*
Geography	0.031008	0.149171	0.119874	0.142929
Human ecology, anthropogeography	0.081835	0.098209	−.011167	0.057008
Anthropology/ folklore	−.036767	−.055084	0.141117	0.176610
Recreation/ leisure	−.043616	0.257909	0.133548	−.074602
Social sciences, general	−.056506	*0.333947*	0.004893	0.074859
Economics	0.038984	*0.375711*	0.101212	0.127883
Economics/business	−.028212	0.095794	0.085080	−.043298
Sociology	0.014627	**0.439660**	0.065118	0.061568
Law	0.011909	0.215752	−.020283	0.174770
Education	−.028176	−.037113	0.231629	0.006814
Visual arts	−.031139	−.024711	−.210592	−.046823
Architecture	−.044855	0.106333	−.183968	0.013958
Planning:	−.050149	0.270738	−.000570	−.082755

Categories	Prin1	Prin2	Prin3	Prin4
Science	*0.399670*	−.059300	0.082008	−.044951
Mathematics/computer science	−.028045	−.036028	0.003420	−.138301
Physics/meteorology	0.087573	−.057693	−.042900	−.106514
Geology	0.190450	−.077314	*0.321455*	0.002699
Natural history/ecology	**0.410378**	0.045850	0.015143	−.006438
General biology, zoology, botany	*0.389709*	0.001750	0.142236	0.031558
Agriculture	*0.340821*	0.044523	0.024557	0.049860
Plant sciences	−.017463	−.054205	−.132844	−.088730
Landscape architecture	−.050347	0.225171	−.044795	−.172863
Forestry	0.095814	0.209337	−.070056	0.203556
Technology/engineering	0.068859	0.061201	−.222159	0.284676
Library science	−.014933	−.029205	0.024091	−.037774
Language and literature	−.058329	−.019355	−.122869	−.030357
Military	−.023128	−.080632	−.163174	*0.352283*
Community health,medicine,nursing	*0.376630*	−.028026	−.250960	−.012459
Political sciences	*0.376630*	−.028026	−.250960	−.012459
Africa ecology	0.139597	−.071225	*0.363935*	0.017311
Religion,theology	0.032129	0.151920	0.117238	0.139279
Archeology,genealogy,civilization	−.042456	−.146986	0.195003	**0.412185**
Decorative arts	−.027927	0.047571	−.166330	0.110450
Physiology	−.010245	0.132418	0.042379	−.047434
Environmental sciences	−.026603	−.059235	−.116184	0.265003

*Note: *Bold* coefficients in red indicate categories with a *strong* association for a particular principal component (dimension); *Italic* blude coefficients indicate categories with *a modest* association for a particular principal component (dimension); *Underlined* coefficients indicate categories associated with more than one dimension.*

Table 2.
Eigenvector coefficients for the first four dimensions from source articles 1982 to 2017.

4. Discussion

4.1 Landscape research universe

The plotting and description concerning all the time frames examined would be longer than allowed for the space allotted to this book chapter. However three time periods from and the universe of research the educational program universe are of particular interest (**Figures 1-4**). For the decade from 1992 to 2002, the research universe had expanded to many more dimensions from 10 in as first reported by Burley and Burley to 16 with environmental science as the largest dimensions giving way to agriculture [25]. Yet by the decade from 1998 to 2008, agriculture gave way to a more amorphous environmental science dimension and a total of 17 dimensions within the universe. The trend for amorphous categories continued until the dominant dimension in 2006–2016 was an amorphous unlabeled dimension. This suggests that some of landscape research was clustered in undefined and uncategorized set, defying description. For some this may be refreshing and or others this may be disturbing. While the categories change and the size of them varies, the complexity remains across the time frames. In any one time frame, much of the remaining research not

Eigenvalues of the Covariance Matrix				
	Eigenvalue	**Difference**	**Proportion**	**Cumulative**
1	4.488223	1.336905	0.1951	0.1951
2	3.151318	0.154661	0.137	0.3322
3	2.996657	0.213096	0.1303	0.4624
4	2.783561	0.550254	0.121	0.5835
5	2.233306	0.506218	0.0971	0.6806
6	1.727088	0.097973	0.0751	0.7557
7	1.629115	0.473776	0.0708	0.8265
8	1.155339	0.28917	0.0502	0.8767
9	0.86617	0.29367	0.0377	0.9144
10	0.5725	0.072126	0.0249	0.9393
11	0.500374	0.029942	0.0218	0.961
12	0.470432	0.233565	0.0205	0.9815
13	0.236867	0.047816	0.0103	0.9918
14	0.189051	0.189051	0.0082	1

Table 3.
Eigenvalue scores for the set of subjects studied at the 15 schools.

	Prin1	**Prin2**
Psychology	0.321304	0.194173
History	0.403998	0.070797
Geography	−0.02829	−0.00676
Anthropology	0.003392	−0.38156
Social sciences	0.123925	0.021618
Economics	−0.15176	0.295427
Sociology	−0.02066	−0.12461
Visual arts	−0.23055	0.162509
Architecture	0.011708	0.154676
Planning	0.271037	0.243036
Mathematics/computer science	−0.09343	0.446772
Physics	0.399808	0.055758
Geology	−0.04178	−0.00577
Natural history/ecology	0.39242	−0.00639
General biology, zoology, botany	−0.24822	0.074506
Agriculture	−0.0826	−0.1556
Plant sciences	−0.02562	−0.06083
Landscape architecture	−0.24405	0.145394
Language and literature	−0.08476	−0.04105
Political Sciences	0.266506	0.152063

	Prin1	Prin2
Electives (dark matter)	0.046689	−0.51369
Humanities	−0.16304	0.149757
Chemistry	−0.08505	0.174573

*Note: *Bold* coefficients in red indicate categories with a *strong* association for a particular principal component (dimension);*

Table 4.
Eigenvalue scores for the subjects in the first wo dimensions. Studied at the 15 schools.

placed in a dimension, representing the proportion of research not placed in an significant dimension is 35.84 percent (the sum of eignevalues in **Table 1** that are less than one and then divided by 38) of the research activity. This means that about 1/3rd of the research activity is not in a cluster and not categorized. There is a fair amount independent exploration.

Are **Figures 1-3**, what one expects to see? or desires to see? Some may call for a more unified focus and other may call for even more anarchy and diffusion in landscape research.

4.2 Landscape education universe

In comparison to **Figures 1**, **2**, and **3**, **Figure 4** presents a very different universe. Landscape architecture dominates with 54.9 percent of the subject material taught and in second place it the amorphous dark matter of electives which defy categorization. **Table 5** illustrates the average percent of academic categories taught at the five schools.

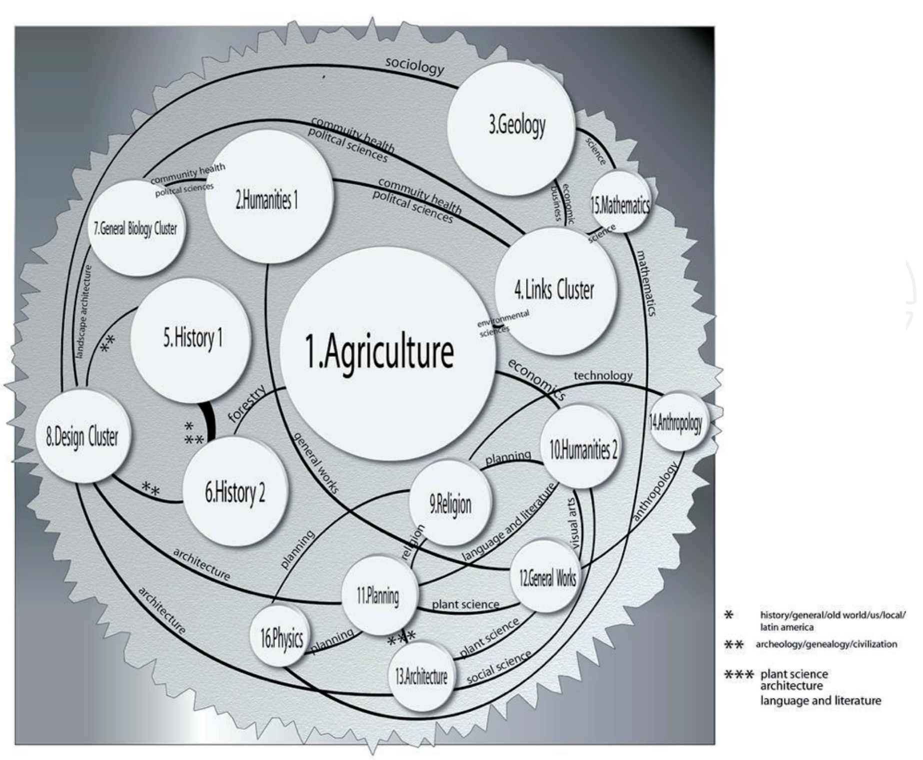

Figure 1.
A drawing of the landscape research universe from 1992 to 2002.

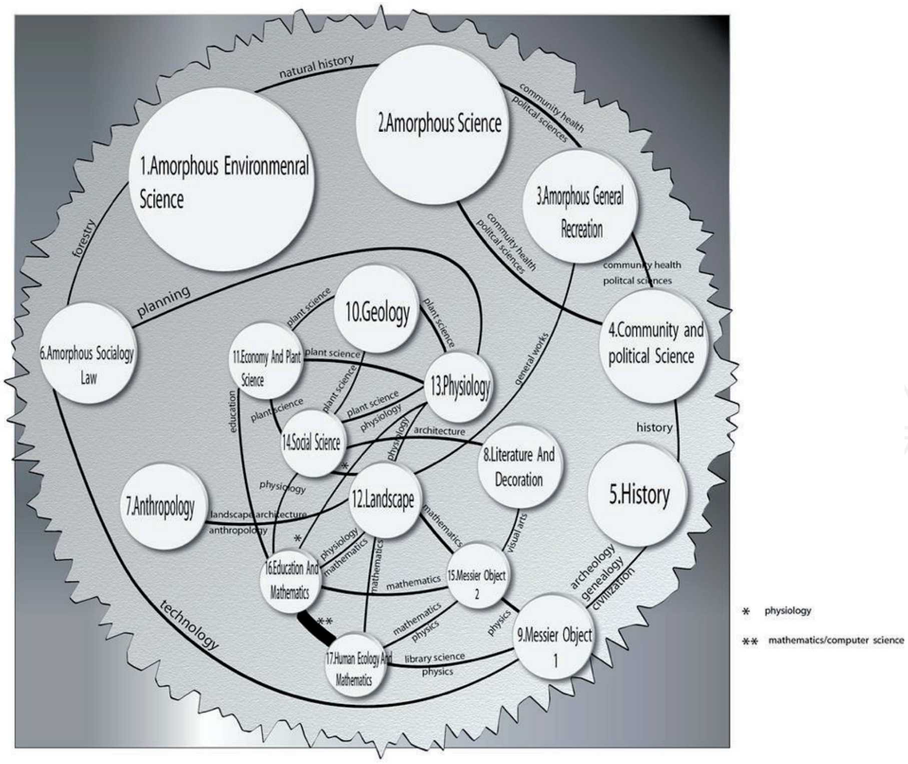

Figure 2.
A drawing of the landscape research universe from 1998 to 2008.

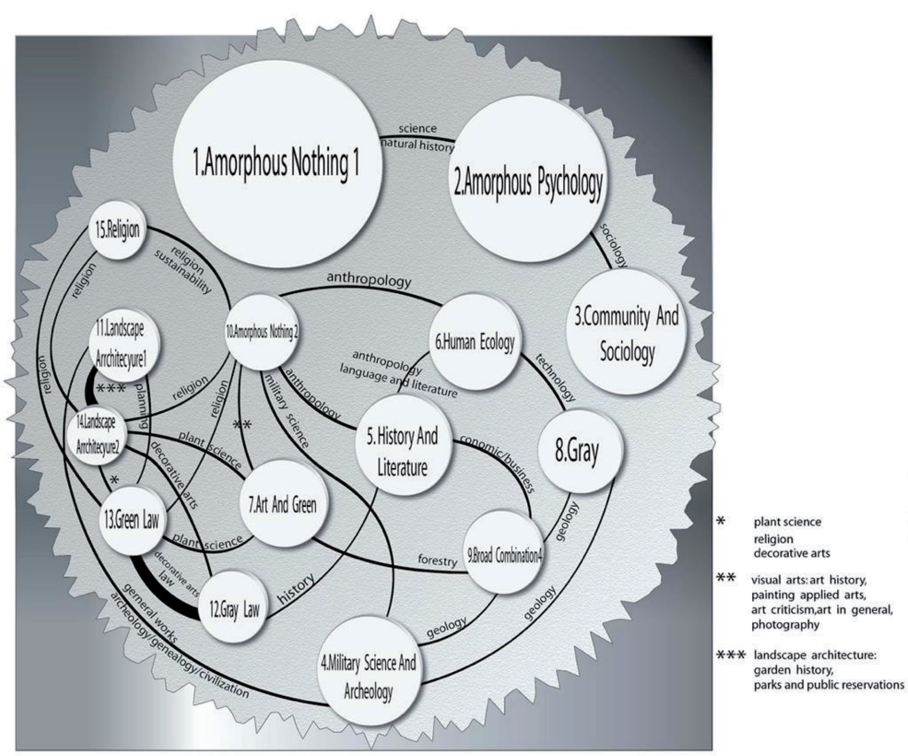

Figure 3.
A drawing of the landscape research universe from 2006 to 2016.

Figure 5 is an ordination plot of the fifteen schools based upon the first two dimensions. All fifteen schools are very good schools and share much in common. However, some schools emphasize one area over another. While the MSU landscape architectural program is not highly mathematical or visual in emphasis, it is relatively more than its peer institutions. If the schools were drastically different, the scale on the dimensions would be in the tens not the single digits.

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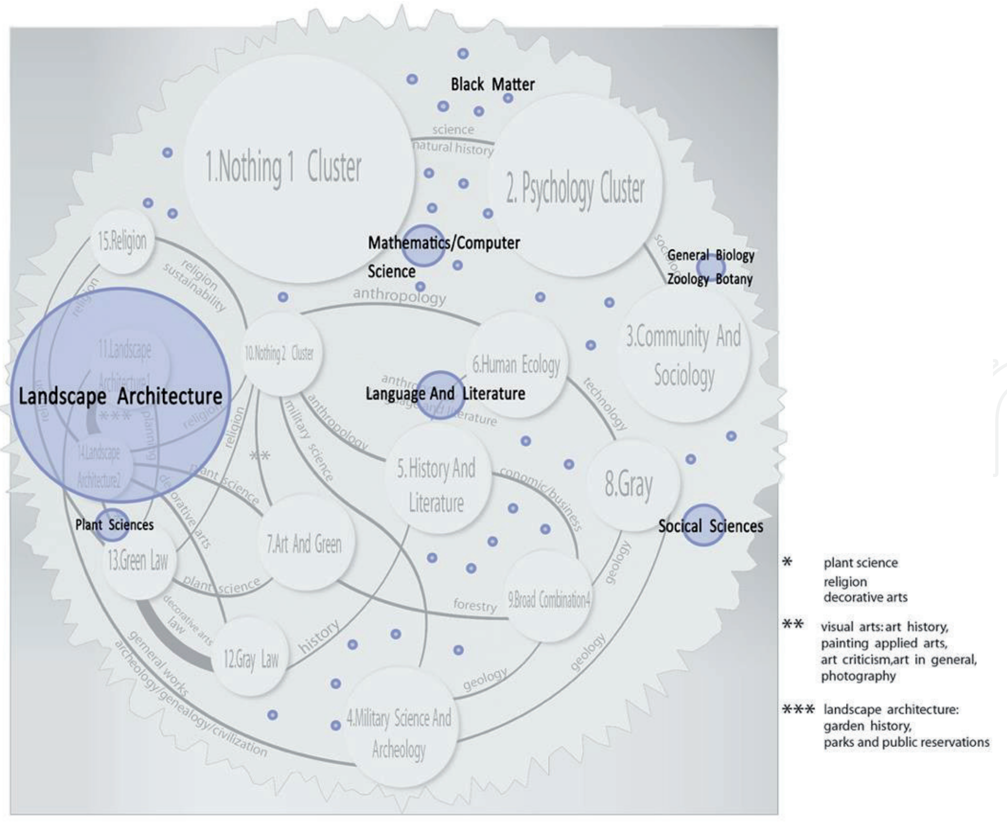

Figure 4.
A drawing of the landscape architectural program education universe 2016 overlaid upon **Figure 3**.

Category	Average
Psychology	0.16%
History	1.2%
Geography	0.26%
Anthropology	0.41%
Social sciences	2.42%
Economics	0.57%
Sociology	0.91%
Visual arts	1.67%
Architecture	1.28%
Planning	1.25%
Mathematics/computer science	3.81%
Physics	0.92%
Geology	0.75%
Natural history/ecology	0.79%
General biology, zoology, botany	2.33%
Agriculture	0.47%
Plant sciences	2.59%
Landscape architecture	54.91%
Language and literature	5.66%
Political Sciences	0.56%

Category	Average
Electives	15.04%
Humanities	1.78%
Chemistry	0.26%

Table 5.
Percentage of subject categories taught at the top 15 American undergraduate schools.

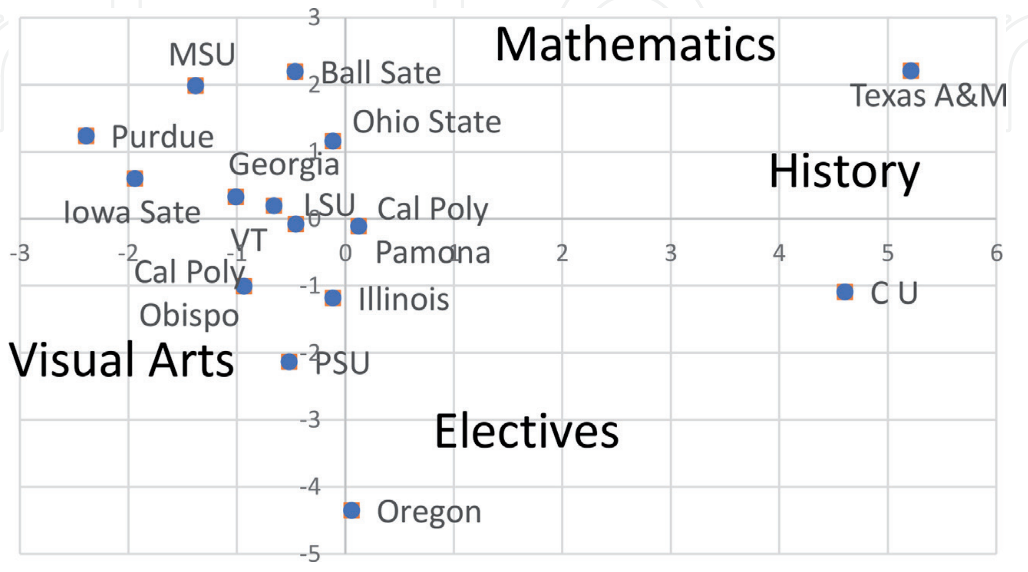

Figure 5.
An ordination plot of the fifteen school based upon the first two dimensions (dimension one horizontal, dimension 2 vertical).

4.3 Blending the two universes

It becomes apparent, that to teach landscape architecture and to do research in landscape architecture occupy two different realms. This understanding is not new to those who work in the academic treadmill. However, the results revealed in this study supports this belief. A tenure stream academic in landscape architecture may have to balance two worlds: the more narrow focus of training landscape architects and the extremely broad and diverse world of landscape research. And it is not surprising that many landscape architecture undergraduates would have little connection or interest in research. And it is not surprising that many newly hired professors coming from their professional training would be unprepared to tackle a research endeavor.

The co-authors asked Dr. Burley about his observations concerning this change, as he has observed, witnessed, and participated in this transition. "I believe much of the change began in the 1970s. The push for research has to do with money and university ranking. Schools around the world are now competing with each other for status and position. Administrators compete for a ranking, as the ranking is based upon publications, citations, and money. Therefore, administrators need to coerce/urge their faculty to obtain grants, publish, and be cited. I was told by someone who had been a faculty member in the MSU department of geography that in the mid-1970s, it was very rare for anyone to have a grant, although in their department many published. In the 1970s very few published, if ever in landscape architecture at MSU. This was frustrating for MSU administration. The merits of landscape architecture in service to society are admirable; however, these merits do not contribute to university ranking and comparatively, teaching landscape architecture as a major is expensive (small classrooms, dedicated studio space). The landscape program at Michigan State University was slated for closure in the 1980s because the faculty were slow to adopt the mission of publication and grant writing. Then Dr. Jo Westphal was hired in the landscape program and the transition began. The hiring of myself and Dr. Mary Ann Kniseley was the second phase of that transition. To explain further, university priorities change based upon where the money is to be found. In the past the state often funded many public schools, but that money has long disappeared at many institutions. The money has been found by raising tuition quickly and by seeking eternal funding for research. Majors in the humanities and general education may give way to majors in medicine and physics. Schools change their identity. It is in this academic environment landscape architecture educators and students find themselves placed within. It is easy to imagine where conflict can arise and also where opportunities may exist. In the 1970s, the mindset of landscape architecture academics was purely in a setting similar to **Figure 4**. But now on the research side of things it has evolved in the last 40 years to something similar to **Figure 3**. I was a part of that change. I am not saying it is for the good and the better, nor suggesting that it is negative either. That is for others to decide. I am too close to the middle of it to make a judgment. But indeed, it has been fun to discover and uncover measures and analytic approaches to understand what has happened and to work with fine colleagues from around the world." stated Dr. Burley.

The co-authors also asked Dr. Burley about his interpretation of what this change means for landscape architecture faculty. "Well, first it is a source of conflict at many levels. I have witnessed it many times around the world at many landscape architecture programs and in discussions with many faculty. To illustrate how successful this has been, not one hired landscape architecture assistant professor has made it to full professor at MSU in over the last 40 years. That is a tragic track record. But it really does not matter from the university's perspective because very few know this track record--administrators and most faculty have a very short time frame in their positions. The two deans who were recently hired to oversee our department/school did not even finish one full term—they left. When I was hired, there were four of us as new assistant professors in a multi-disciplinary department, but after 8 years, I was the only one who remained, the rest had left. Of the last nine landscape faculty to leave the landscape program over the last 30 years, I can say all left somewhat disgruntled, jaded and often disillusioned. I am sure it will be no different for me. Yet the university can present a positive perspective to the outside world. From the thousands of professors it hires, it only needs to show possibly 20 or so success stories each year to market the university in a very positive manner (that is 4/10ths of one percent of the instructor population at MSU). In the 30 years I have been at MSU, rarely are individuals in my department/school ever featured. It has happened; however planning and design scholars are not a priority (remember in the 1980s they tried to dispose of this group) and not what the university may wish to project as an image. Often, I see publications featuring laboratories and medicine. There is often an optimistic attitude about the future. While past events may have resulted in dismal failure, the belief that the next person hired will bring a bright and happy future is a consistent theme. Then reality sets in, problems occur, people leave, and the bright and happy future of the next forthcoming hire is all that is discussed. Over 40 years ago at another institution, I would listen to a certain dean's yearly report to stakeholders. He would always paint a bright and beautiful future. But after several years of this, I would recall the new initiatives he had promoted the years before, most ending in an unpleasant manner. But it did not matter, no one remembered them (but I did). All that mattered was that the forthcoming year was going to be marvelous. Universities struggle with this all the time. The quest for money, publications, and citations at an ever increasing level generate many internal problems. And because most universities accept this incremental race for recognition and prestige, in many ways they generate the problems and issues that arise at the institution. As has been said before, 'We have met the enemy and it is us.' While universities may claim to be bastions upholding diversity and equity; often instead, they are halls of elitism, intolerance, insecurity, and arrogance with no chance for true inclusion and diversity – in fact it can be quite brutal. This is often what I have observed for landscape architecture faculty at many institutions around the world. Still many try, and some do succeed; but one will rarely hear about the many who did not succeed. I am not attempting to present a dreary image, but rather I have been in academic for over 45 years and at one institution for nearly 30 years, plus have lectured at around 35 universities world-wide, and at many more conferences, so eventually one gets an understanding of what is occurring. **Figures 3** and **4**, make a lot of sense to me. They help to explain the setting and the situation." noted Dr. Burley.

To cope with this duality, one approach that universities have been employing is something known by some as the 'Stanford Academic Educational Model.' The model establishes two classes of instructors and researchers. In the Stanford Academic Educational Model, one academic class of employees, the researchers, are highly paid, in the tenure stream, teaching only advanced graduate student courses, focus upon producing research papers in the most highly respected journals possible, usually seeking research grants to support their efforts. The other academic class of employees, the instructors, are paid at a lower level, not in the tenure stream, teaching the masses of undergraduate students, have no research responsibilities, and are not required to produce journal articles. The researchers may have a very high opinion of themselves and the instructors will wonder why the researchers are not as engaged with the students. It is the difference between **Figures 3** and **4**. At some institutions and within departments this causes great internal strife and battles. The differences are reflected in the expectations of those serving educational professional practice and those serving the search for new knowledge. Universities attempt to be entrepreneurial with their research faculty and still serve the needs of the student body, searching for relevance, contributions, and meaning for the public [38–40].

"At MSU, it used to be that most of the faculty were a blend between the two types, one in the tenure stream, conducting research, writing papers, and teaching all levels of students. There were very few employees in the purely instructional model. But MSU has drifted towards the Stanford Academic Educational Model where now about half of the faculty are instructors. This approach saves the university substantial salary money. Since the instructors are not in the tenure stream, it brings administrators more flexibility to hire, fire, and change academic offerings/majors. It used to be that the instructors were not even considered faculty, but with about half of the academics now being non-tenured stream, universities have found means to label them as faculty. Titles are easy to give/anoint and cost almost nothing. And it would not help the university's cause for it to be known that the number of what had been known as faculty staffing had been reduced in half. Universities struggle to find approaches that still serve their student body clientele bringing in tuition dollars and striving to maintain their academic ranking and position with journal articles, citations, and research dollars. I find neither fault nor praise for what has transpired, but rather based upon the differences between **Figures 3** and **4**, I understand why this has happened. At one time there was an interesting documentary film shown on American Public Television, describing the struggles and challenges of one part-time instructor at Stanford, but I have been unable to find a citation for this film. It is very revealing. Stanford has a very well respected Department of Art and Art History which produces many excellent documentaries." reflected Dr. Burley.

"The push to maintain university rank and standing continues. In the past most educators in landscape architecture had master's degrees. I recall one European nation that urged landscape faculty to each earn a PhD., using termination as a stick and the promise of increased pay as a carrot. Eventually most earned a PhD. Upon conclusion, there no terminations but also was no money to support pay increases, but the faculty had earned PhD.s and started writing and publishing as part of their duties—mission accomplished. Faculty need to recognize that the goals and requirements for faculty by universities are going to constantly change, universities are going to expect more, not less and it will be driven by the need to sustain ranking and status above all else. For landscape architecture faculty, they need to understand that their existence is based both on the expectations of planning and design professionals to produce students illustrated in **Figure 4**, and to conduct research illustrated in **Figure 3**. And they need to understand that they are in competition with other departments and professional schools in their university. According to recent metrics in GoogleScholar, the top landscape architectural citated author in the world, William Sullivan at the University of Illinois, he has over 13,000 citations as of July 2021; but for example as my institution, the top cited authority was Joey Hudson a physicist, with over 336,000 citations. It was not until one reached down to about the 140th cited researcher that one was at the 13,000 metric. Approaching 1,000 citations, I am usually in the top 40 of cited landscape architecture researchers in the world, but I am not even close to the top 500 at my university. Universities look at these standings. It is not easy for landscape architecture faculty to compete in such an environment with the other departments and professional schools. When universities make decisions about where to invest, it is easy to understand their priorities. **Figures 3** and **4** offer insight into those challenges." observed Dr. Burley.

5. Conclusion

This study revealed that the landscape research universe has become complex with many dimensions growing and diminishing but always remaining complex. In contrast the landscape educational universe is more simplified and not congruent with the organization of the research universe. For landscape architecture academics, many reside in both of these dual worlds. Interest in this topic continues with recent published articles by Ozdil and by Newman (et al.) [41, 42].

Conflict of interest

The authors declare no conflict of interest."

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