Journal of Urban Design

ISSN: 1357-4809 (Print) 1469-9664 (Online) Journal homepage: http://www.tandfonline.com/loi/cjud20

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JOURNAL OF URBAN DESIGN, 2015
http://dx.doi.org/10.1080/13574809.2015.1092377

Routledge
Taylor & Francis Group

An alternative pedagogic model for doctoral research in urban design

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ABSTRACT
This essay presents an alternative to the traditional pedagogic model for urban design doctoral education where, as found in the humanities, individual students work *solo*, advised by a small faculty committee. Derived from the sciences, the alternative model integrates the student into a collaborative, multidisciplinary research laboratory setting, which provides access to the now extensive geospatial data on the built environment and on a range of behaviors. After apprenticing in spatial data analysis, individual students advance selected aspects of on-going lab research projects. The alternative model expands urban design thinking to research on salient issues faced by today's cities.

Introduction

Urban design education aims to complement or add to professional programs preparing architects, landscape architects, and urban planners. Since its inception, urban design education has been based on three main streams of knowledge and skills building: design, theory, and methods. (Pittas and Ferebee 1982) Those are typically grounded in three broad disciplinary areas: the creative arts (e.g., architectural or landscape design), the humanities (e.g., urban and art history), and the social sciences (e.g., psychology, sociology, geography).

Design dominates urban design curricula, focusing on students' ability to conceptualize socio-environmental problems and to resolve them by defining "future" spatial scenarios that redress the problems. Theory can be taught in many different ways, but generally reviews the historical evolution of ideas and paradigms about good cities or good places. Finally, methods cover a wide range of topics, from approaches to person-environment relations to communication techniques including those of digital media. Theory typically permeates both design and methods, though this interface is not necessarily made explicitly. Several textbooks have been published, that assemble theories and methods from academics and practitioners. (Carmona and Tiesdell 2007; Larise and Macdonald 2007; Barnejee and Loukaitou-Sideris 2011) Corresponding settings for urban design education are studios (for design), classes and seminars (for theory and methods), and independent studies or theses

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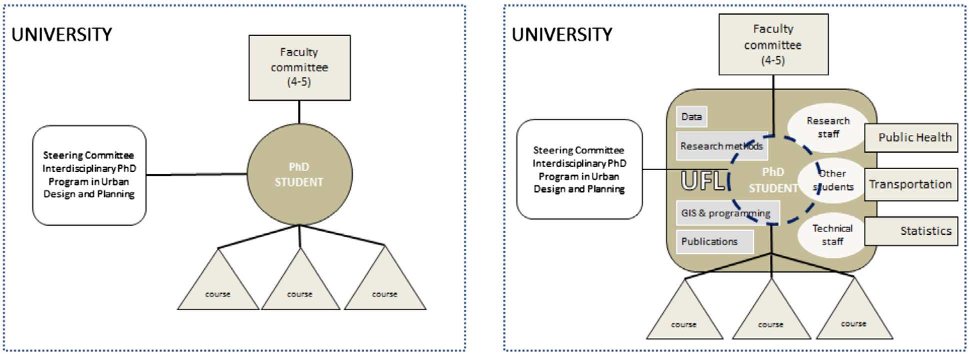

Figure 1. Pedagogic models for doctoral education in urban design. Left: Traditional model derived from the humanities. Right: Alternative model derived from the sciences.

(for individual student work). Some programs recognize internships with public or private entities professing urban design as part of formal education.

The research base in urban design has been limited in so far as the allied professions of architecture, landscape architecture, and urban planning do not themselves have a strong research tradition, except perhaps urban planning where, nonetheless most research has, until recently, addressed policy rather than design issues. (Architectural Research Centers Consortium 2014; Commission on the Doctorate in Planning 1992) Yet, doctoral programs have proliferated over the past two decades or so, the result of pressures within higher education to hire teachers with doctoral degrees. These programs are promising in that their students are formed to reflect on the field as well as to generate new information that will allow the field to progress. Working closely with their faculty advisors, doctoral students contribute to the research that their faculty must, by convention, engage in, in addition to their teaching. Thus advances in the field are now being made not only by the faculty, but also by their doctoral students, as documented in the handful of peer-reviewed journals that focus on urban design.

The issue of interest in this essay is how to structure doctoral-level research and how to devise settings for students and their advisors to most productively work in. The question is particularly pertinent that significant changes have taken place in the information available to urban designers regarding built forms and spatial behaviors. As urban design research has covered and will continue to broadly cover social, psychological, morphological, aesthetic, etc., dimensions of urban space, (Carmona and Teh 2014) the availability of data is radically changing how research can be done.

Traditional and new pedagogic models

In most urban design programs to date, the pedagogic model used in doctoral education borrows from the humanities and from the branches of the social sciences that have primarily used qualitative research methods. While pervasive, the model remains implicit, as few, albeit indirect, references to its sources and structure can be found in the literature. (Kahn 2002) In this model, students are accepted into a program after spelling out their area of interest, which, at least in principle, needs to correspond to the interests of one or more faculty and perhaps even matches precisely the faculty's own area of interest. In entering a program, students agree to take classes (some of the programs do not require classes while others have year-long schedules of classes), to take exams in subfields that support their area of research, to collect data (whether in archives or in the field), to carry out analyses, and to produce a thesis or dissertation which will advance the field of urban design. The student works with a committee of 4 or 5 faculty, the chair of which acts as the primary teacher/mentor. Committee members typically bring in expertise and support in the various subfields of interest to the student (Figure 1, left). This traditional model is student-centric in that the individual student defines the issues to be addressed, with the faculty advisors modifying the research topic and eventually approving it. The student typically works closely with the chair of the faculty committee, who has primary responsibility for guiding the work. In terms of the setting, the student works independently from other students, and takes selected classes where s/he may meet and work with other students for the duration of a class. Doctoral students may be given the opportunity to present their work in a variety of venues, including lower-level classes. After completing the dissertation or thesis, the student is expected to publish a few articles or, in the more fortunate cases, a book based on the doctoral research.

An alternative pedagogic model is introduced (Figure 1, right). The model has evolved over the past two decades and borrows more directly from the quantitative than the qualitative sciences. In the current application of the model, student admission follows the same protocol as in the traditional model, with the student being matched to a lead faculty with similar research interests. Students also take the same courses as those required by the doctoral program and they are required to form a supervisory committee of 4 to 5 complementary faculty. However, for training in research, the student is placed in a formal laboratory setting. The lab houses a variety of on-going projects addressing larger, more comprehensive issues than individual students would be able to examine. As such the lab provides students with access to data on the built environment and on a range of behaviors, as well as to experts and research sponsors from fields other than design and planning, exposing them to a broad scope of inquiries and on a multifaceted range of methods and techniques. The lab setting also transcends the individual student's work temporally because the lab exists before students apply to the program and continues after they graduate. The new student thus hops on to a moving train of research, which includes extensive data on environments and behaviors. Doctoral students become part of a fully functioning multidisciplinary team, which in turn expects them to contribute to the collective endeavor.

This essay reviews this alternative model in terms of new issues which affect urban design research in general, and individual students and their advisors specifically. The model is presented as an alternative to and not a replacement of the traditional model. Its generalizability and replicability are discussed.

New problematic

Urban design research today faces a new problematic (Bachelard 1966 [1949]) that suggests the need for an alternative pedagogic model. The problematic first presents itself in the form of massive amounts of secondary data, which are now available on just about everything the urban designer needs to know about the built environment: land cover, land use, building footprints, building heights, parks, sidewalks, street medians, street trees, etc. These are geospatial data where each attribute or feature of the built environment is tabulated and located in space, or georeferenced. Software derived from advances in cartography and in geographic information systems (GIS) enables databases of these built environment features to generate both graphic and quantitative outputs, thus marrying the visual tradition in design with the numeric basis of the sciences. The data come in small spatial units such as parcels or tax lots and capture the characteristics of lived-in places that correspond closely to the palette of elements used by urban designers, including buildings, open spaces, and their related characteristics. Unlike traditional paper maps, which contain a fixed number of preselected attributes, geospatial data come in large databases from which the researcher can select any attribute of interest. By using geospatial data therefore, the researcher can not only make any map depicting attributes of his or her choice, but also derive statistics on all aspects of the selected attributes.

Data on the urban environment are not new: the first parcel based data were developed in the 1950s, GIS software was available in the early 1980s, and by the late 1990s, it was processed to respond to user-friendly, menu-driven queries. (Chrisman 2004; Dueker 2014) Today, geospatial data are ubiquitous. (Federal Geographic Data Committee 2014) Every branch of the public sector related to the urban environment (transportation, tax assessment, parks and recreation, housing services, etc.) uses spatially referenced data for inventory and management purposes. The data support what public agencies term "asset management," by providing a spatially explicit inventory of the "physical elements" they manage. Thus, for example, transit agencies collect data on bus stops and stations, complete with the benches, lights, trees, etc., that come with the stops. The data are georeferenced, meaning that they can be shown on a map, and they can be counted or otherwise analyzed by their exact location. Each agency regularly updates their data.

Expanding the scope of urban design

The availability of geospatial data can radically transform the urban design research process. First the data preempt the need for initial field work that characterized the first steps of urban design research. Researchers can examine a wide range of characteristics in the area(s) of interest directly from their desk and thus can more quickly scope and shape the nature of their project. The data then facilitate further field work by providing accurate visual displays, maps, and counts of attributes of interest.

More importantly, geospatial data expand the frontiers of urban design from the traditional focus on discrete sites or individual neighborhoods, to include entire city-regions. Indeed, fine-grained data are available at the jurisdictional and regional levels, thus covering large and very large spatial extents. For example, parks, neighborhood commercial centers, plazas, building types, etc., can be studied not only for specific districts, but for entire regions. This is the problematic that perhaps has the greatest potential for urban design to evolve as a field. Urban design was born to focus on discrete, relatively small areas in cities, such as neighborhoods, public spaces, streets, etc. Indeed both urban designers and non-urban designers continue to see the field as addressing "city fragments." (Barnett 1996) The city-fragment-based approach has restricted urban design activity to small, albeit often iconic interventions. The availability of fine-grained data on the built environment of entire regions now lifts the main barrier to applying an urban design approach to entire cities and city-regions. A region-wide urban design approach begins to acknowledge the significant growth in urban populations and the changes that occurred in cities since the mid-twentieth century, when urban design emerged as a field of research and practice.

Different from a city-fragment approach, a city- or region-wide approach suggests that urban design "thinking" can be applied to the plethora of important urban issues that exist in such allied fields as transportation, land development, land use regulation, etc. Some may argue that urban and regional planners are already addressing many of these issues. Yet planners generally fail to consider the finer-grained, physical dimension of urban form because they typically divide the city into areas (i.e. zones) where the specifics of the built environment remain aggregated. In contrast, urban design "thinking" addresses more closely aspects of urban environments that relate to human behavior, which are essential to consider in such domains as the economics of cities (what people buy and where), in real estate (where to invest and build), in transportation (what travel mode people select), housing (where people select to live), etc. In sum, fine-grained data on the built environment of urban regions opens the door for a "new urban design," one that can contribute to the definition of policies addressing contemporary urban issues.

Accessing and using the data

If not outrightly in the public domain, geospatial data are available for university-based research. However, because they are generated and maintained by GIS specialists in different departments and agencies, the data are not necessarily readily accessible, especially to individual students. In large cities, each department or agency has its own GIS department with which special arrangements must be made for accessing the data, including signing various protocols limiting the use and dissemination of the data. A university lab setting can more appropriately act as a facilitator and enabler, establishing and maintaining contact with the various public agencies to assemble and develop the data for use in research. Furthermore, the lab staff can extend students access to technical expertise.

The UFL as an example

The Urban Form Lab (UFL) is an example of a teaching and research lab that emerged to take advantage of the availability of geospatial data since the mid-1990s. The lab was launched by one project examining six urban and six suburban neighborhoods. (Hess et al. 1999) The analyses showed that the built environment mattered: three times more people walked into urban than suburban commercial centers of neighborhoods that had the same densities and land use mix, but different urban form attributes: higher sidewalk coverage, smaller street-blocks, and smaller commercial zones, all related to more people walking to the neighborhood commercial centers. The project demonstrated in a simple way how urban design thinking could demonstrate that urban form influenced travel mode choice.

The UFL subsequently became known for its research on built environment and walking using the latest GIS cartographic techniques. Over the years, the research included the region-wide identification of locations with urban forms that supported walking, bicycling, and transit use. (Moudon, Sohn, et al. 2011) Pedestrian safety research ensued, using geocoded collisions to specify the built environment characteristics of locations where pedestrians were at high risk of colliding with motor-vehicles. (Moudon, Lin, et al. 2011) Research on children walking or bicycling to school was also carried out as part of the new federal Safe Routes to School program (SRTS) (Stewart 2011).

Table 1. Summary of the large set of geospatial data available for built environment research, classified by domain and variable of interest (data structure, sources, number of observations in King County, WA).

Domains	Variables*	Data structure, and original data sources	Number of discrete observations
Neighbourhood environment	residential units (houses, apartments, condos, mobile homes)	parcels, county assessor's office	489,000 parcels
	employment/jobs	parcels, UFL	21,000 parcels
	residential wealth (property values)	parcels, county assessor's office	489,000 parcels
	vacant lands	parcels, county assessor's office	51,000 parcels
Routine destinations	food facilities (stores versus restaurants, healthy versus unhealthy)	parcels, food permits from Public Health Seattle King Co	1,500 food stores 6,500 restaurants
	physical activity and fitness facilities	parcels, InfoUSA	880 parcels
	retail services	parcels, county assessor's office	5,652 parcels
	schools and educational facilities	parcels, county assessor's office, National Center for Educational Statistics	737 parcels
	offices	parcels, county assessor's office	4,393 parcels
	medical offices	parcels, county assessor's office	769 parcels
	public services (libraries, etc.)	parcels, county assessor's office	
	open space and parks	parcels, UFL	1,541 parks
	facilities in parks	within each park	103 types of facilities per park
Transportation infrastructure	street (freeways and expressways, arterials, collector and local streets)	networks, King County GIS ESRI StreetMap Premium North America NAVTEQ	14,000 linear miles
	intersection density	points, UFL	64,000 intersections
	trails	networks, King County GIS	829 linear miles
	sidewalks	networks, UFL	1,708 linear miles
	traffic signals	points, King County GIS	2000 signals
	parking	rasters, UFL	2.7 million stalls
	passenger rail stations	points, UFL	17 stations
	bus stops	King Co Metro	8,635 stops
Traffic conditions	vehicular volumes	networks, Puget Sound Regional Council	86 million daily vehicle-miles
	bus ridership	King County Metro	364,000 daily trips
	pedestrian/bike collisions	points, Washington State DOT	1,150 annual collisions

*measures typically include counts, densities, and distances between features of interest. Both airline and network measures are calculated; UFL = data already has been collected by the UW Urban Form Lab.

By 2000, the UFL began to collaborate with public health professionals interested in endorsing walking as a means of augmenting physical activity. Public health research enabled the collection of primary behavior data, thus adding an important dimension to the GIS-based environment data. (Moudon 2005) Whereas transportation professionals use secondary regional or national data on travel behavior, public health requires that data be collected to address the specific aims of each unique research project. In 15 years, we collected health and travel data on about 10,000 people, most of whom lived in the Seattle region. For about 2,000 of these individuals, we acquired objective data on location (from global positional systems [GPS]) and activity (from accelerometers) collected every 30 seconds over the course of 7 days. Combining GPS locations with GIS data yields about 30,000 data points for each individual roaming the 2,500 km^2 of the region over a week (Hurvitz et al. 2014).

The UFL's distinction was its ability to model the built environment, which could in turn be analyzed in relation to travel or health behaviors. Having access to multiple sets of environmental data and knowing how to select from the large number of attributes and measures defining the built environment was the lab's area of expertise. An impressive four hundred variables depicting the built environment could be used in the analyses, which included the characteristics of neighborhood composition; numerous parcel- and building-level uses, comprising all types of retail facilities, institutional and service settings, places for recreation and leisure, etc.; descriptions of building size, coverage and construction type; characteristics of streets, their networks, sidewalks, and trees; traffic conditions, including traffic volumes, transit ridership, collisions (Table 1) (Lee and Moudon 2006).

With access to the rich data and the ability to analyze them providing a competitive edge, several public health faculty sought to partner with the lab to examine potential environmental influences on a variety of health outcomes. Specialists in exercise physiology and nutrition, whose research had previously considered individual behavior as separate from its spatial context, wanted to examine the effects of everyday living on levels of activity and on diet (Matthews, Moudon, and Daniel 2009).

For students, the GIS environment and behavior data changed what was required from them. Students wanting to join the lab had to acquire skills in GIS and related analytic techniques. In the mid-2000s, few urban design and planning students had these skills or saw them as being important to acquire for their future professional careers. Students from other fields, including Geography, who had these skills, were also few. It would take at least one year, but typically two years of training for students to be able to contribute to the lab's research. Today, most students are fully conversant with mapping and mobility assisted technology, and it would be a pity to keep them away from the rich databases behind the products aimed at wider public consumption, yet so useful for research and professional endeavors. Basic GIS skills have become more common in the entering student population, so more students can be considered for inclusion in the lab.

What the alternative model implies

Students now entering the UFL have at their disposal comprehensive data on the built environment as well as on a range of behaviors related to travel and health. They directly participate in research and readily communicate with faculty, staff, and students from multiple disciplines, including urban design, planning, transportation, public health, and statistics. They share space with and have access to staff and other students with a range of technical skills (GIS, database management, programming, etc.). In short, new students come to work and do research not just as individuals but as part of a team. Rather than starting their studies with a new project, they first join on-going projects; and only when they are fully trained in research design and have acquired the necessary technical abilities to handle data and analyses do they formulate their own individual project, which typically fits into and add to the larger team efforts. This articulates a pedagogic model that resembles that used in the sciences more than that followed in the humanities.

The science-inspired pedagogic model introduces an intermediary level of organization and infrastructure within the university setting: whereas in the humanities model students stand alone in their relationship with individual faculty, students, and other disciplinary units in the university, and therefore have to create their own "bubble" of personal connections and access to data and information, in the scientific model, the student joins a laboratory setting made of a team of faculty, research staff, and other students who have on-going connections and access to the latest information streams. The laboratory thus welcomes the new student to a ready-made context, which is a short-cut to the student fitting into the larger university. In the case of the UFL, connections are established across colleges and schools (especially with urban design and planning, transportation engineering, and public health), something that is difficult or at least time-consuming to achieve for individual students who typically remain within a single college or school (e.g., College of Architecture and Planning).

Urban designers are familiar with aspects of the alternative pedagogic model lab setting. The lab setting is reminiscent of the design studio in the way it fosters communication between individuals sharing the same space and espouses a "learning by doing" approach. However, the pedagogic model operates under a team-based multidisciplinary structure, whereas the studio emphasizes individual-level work. The lab setting also takes after some of the research labs now housed in many architecture and planning schools. While other existing research labs often explicitly follow particular research methods (see, for example, Griffiths 2014), their pedagogic approach, and specifically, the ways in which they may integrate teaching with research has yet to be articulated and shared.

In using the alternative pedagogic model, the team-based lab setting reins in the definition of creativity and of advancing the field. While the literature review continues to be a baseline for assessing the novelty of the student work, the student now has access to on-going and yet unpublished research both within the lab and in collaborating labs around the world. This has the potential of shortening the time frame within which the student can innovate. Considering that it takes about one year to write and submit a completed piece of research for publication, one can expect a minimum of two years of lag time between research completion and full dissemination. In turn students in the lab are cognizant of on-going research in other labs, and potentially ahead of the literature by several years when they define their own research topic. Furthermore, entering students working with a lab-based team do not have the immediate pressure to define their own research topic and to innovate within their field. Instead, they work collaboratively with the team for the first two or three years of study, piggy-backing on the innovative approaches defined by the team prior to their own individual involvement. In these beginning years, students expand their technical abilities and experience the research process to include designing a research project, identifying sponsors and collaborators, writing grant proposals, and publishing papers in the appropriate journals. Students benefit from direct and immediate access to different areas of expertise held by faculty, staff, and other students associated with or in the lab. Only in the final years of study does the student face the pressure to identify areas where advances can be made to a field, and these areas are still conveniently bounded within on-going lab projects. Few students run the risk of "re-inventing the wheel," as their ideas are checked by the team and feedback is immediate. As well, rather than aiming to "change the world," students understand the power of the systematic, incremental advances that only group work can make in and to a field.

Working in a lab setting teaches competition through collaboration, and individual recognition through interaction. While there are hierarchies within the lab, based on traditional job classifications and seniority, leaders at different levels (faculty, staff, students) emerge in various areas of expertise (research design, software, proposal writing, etc.) as part of the group process. This is a "soft" competition model, whereby the "star status" is rarely attributed to an individual, no matter what rank or seniority s/he has; the star status being distributed among various areas of expertise, it is assumed by several individuals. Because each individual depends on other members of the team to address or resolve a particular problem, s/he must welcome collaboration because it is the only way to success. Hence in the scientific model, competition remains keen, yet collaboration and interaction are essential to getting to the front of the pack. Anyone who has achieved a break-through, be it in some analytic method or in substantially new findings that advance a field, will quickly share it with the team for possible applications to other problems or projects. Hence the lab setting acts as the nearest audience or "market" for receiving an innovation, giving recognition to the individual, but also quickly disseminating any advance made. This is quite different from the star system which dominates the design fields, where any innovation (be it technical or conceptual) is funneled through the one individual at the top, the "designer," while the members of the team (who have contributed to or even spearheaded the innovation) remain either entirely anonymous or just in the background. The scientific model cultivates a symbiotic relationship between the individual and the team: both not only benefit from collaboration, but also are empowered by sharing.

On the practical side, the new student comes into a fully functioning setting with not only comprehensive databases, but also computer software, servers, etc. Little time will be spent collecting new data, and when they are collected by individual students, the data will remain within the lab and serve the next generation of research, something that is difficult to achieve when students work in isolation. And, importantly, students are supported financially for the duration of their studies, further insuring that students stay on course with and complete them in less than 5 years. For individual faculty, mentoring students in the lab becomes both simpler and richer: even senior faculty can rely on the lab team for not only much needed technical help in newest analytic methods, but also for intellectual support. All members of the team contribute to the development of the student, and in doing so, benefit from "giving" their expertise and from "taking" from the work of the student.

The scientific model welcomes the new student to an on-going intellectual, technical, and financial "enterprise" (meaning endeavor, venture, organization), which mediates the relationship between the student, the sponsoring faculty, and the larger university. The lab setting provides temporal and organizational continuity for participating students. It enables new students to streamline their introduction to doctoral studies. For intermediate students, the lab offers the opportunity to instruct beginning students and be instructed by advanced students. In the scientific model, vertical teaching thus becomes a "matter of fact." Graduating students also continue to benefit from the lab team support past the submittal of their dissertation.

Replicability

What are the components of the context within which this alternative pedagogic model can exist and thrive? First, there must a physical lab where team members with different backgrounds and skills all work. Physical proximity is essential to address the numerous highly technical problems that are more quickly resolved by verbal exchange coupled with *in situ* demonstrations than by web- or email-based support. Second, the lab relies on GIS and programming specialists to maintain and develop the data on the built environment and behavior. At the UFL, faculty, staff, and students are supported by individual research grants. While drawing from the existing built environment data and analytic methods, each grant presents opportunities to develop new or update existing data and to advance analytic methods, which can in turn be used in multiple projects. Each grant needs one lead faculty as Principal Investigator. However, the lab must house several concurrent grants because individual grants rarely cover 100 percent of the faculty or staff time. Finally, because only a small percentage of grant proposals get funded, proposal writing must be an integral part of a viable research lab.

Given the absence of a research infrastructure in urban design and planning, few individual faculty in urban design and planning will be able to secure sufficient research activity to support their own lab, especially over the long term. In contrast, faculty in transportation planning and public health can turn to their respective institutional research infrastructure to regularly submit grant proposals. As noted, the UFL collaborated closely with colleagues in these two fields, where there is interest in and need to consider the built environment as an influence on travel patterns and health.

Several faculty whose research depends on built environment data might consider sharing a lab setting with a science-based pedagogic model. Six years ago, the UFL moved into the offices of the Transportation Center (TRAC), the research arm of the Washington State Department of Transportation at the University of Washington. Administrative and computer support are pooled, and research staff and students are included in UFL or TRAC projects as often as possible. Sharing with other faculty only works if everyone has research support. In a lab where everyone is on "soft money" (funds from grants), it is difficult if not impossible to find time to do pro bono work. To date, the most support the UFL could extend to colleagues without grants was in the form of assisting their doctoral students. Each year, only about one doctoral student not formally associated with the UFL is provided access to the data and advice on analytical methods. These students (and their advisors) are selected carefully to make sure that their work will eventually add to the lab activities –either in the form of providing new data, new methods, or writing papers that can be published jointly.

Another alternative might have an academic unit (e.g., a Department of Urban Planning or College of Architecture and Planning) create a data lab which would be accessible to all students and faculty. This type of infrastructure investment would logically follow investments which were made for computer support many years ago and would recognize the intrinsic and essential role that geospatial data can play in today's urban design and planning practice and research. Because the data themselves are available from jurisdictions, the sponsoring academic unit would need to provide the hardware necessary to store and analyze the data. It would need to support a small staff who maintains, updates and perhaps archives old data for future longitudinal studies, and who provides technical services to students and faculty. In this case, faculty with grant funding could both benefit from and contribute to the lab's data and technical expertise. Together with other colleagues with grant funding, they could adopt a science- inspired pedagogic model to mentor their doctoral students.

Conclusions

This essay presents a science-based pedagogic model as an alternative to the traditional humanities-inspired model in order to support doctoral student research in urban design. The model places the student in a laboratory setting with on-going research projects carried out by faculty, staff, and students from different fields of inquiry and different areas of expertise. The lab setting is in response to significant advances in the availability of same data that urban designers have traditionally (and painstakingly) acquired through field work. The new data which are now routinely collected and updated by local jurisdictions come in a geospatial format. Ubiquitous fine-grained geospatial data open up entirely new lines of research in urban design and make it possible to study and model the urban form and the built environment of today's large cities and city-regions. At the same time, the data put new demands on doctoral students who must acquire new technical and analytic skills.

The team-based lab setting transcends the work of the individual student temporally (the lab exists before students apply to the program and continues after they graduate) and in terms of intellectual scope (lab projects address issues that are broader than those considered by individual students). The lab setting exposes students to the complete research process, starting with data selection and analysis and ending with publications. It fosters multidisciplinarity, creativity through collaboration, and vertical teaching between students at various stages of their doctoral education. The essay also recounts how faculty in the fields of transportation and health constitute promising partners for urban design research.

Acknowledgements

I thank my colleagues and my former and current students, who helped build the UFL and contributed to developing this alternative model (http://depts.washington.edu/ufl/).

Disclosure statement

No potential conflict of interest was reported by the author.

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