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Landscape Design and Cognitive Psychology

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Abstract

Kevin Lynch's *The Image of the City* remains one of the most important books in environmental design research. Its approach relies upon behavioral observations and systematic surveys of environmental cognition. We can perceive only what we see; thus, sight is the most important sense in landscape design. The spaces and objects of landscape design are stored temporally in the mind; they cannot be used by visitors. In this paper, the importance of cognitive psychology in landscape design is examined, and the concepts of imageability and mental maps are discussed.

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1. Introduction

Landscape is a culturally shared environment; made up of woods, mountains, waters, and fields, it is where we grow up and live. Design is a highly complex and sophisticated skill. It is an important human activity because it links theory and practice and bridges scientific and creative undertakings when tackling ill-structured, open-ended problems (Lawson, 2005). These two terms are closely related. Cognitive science is increasingly interested in design because of the challenges that it poses to models of mental processes (Goel, 1995). In addition, the three-dimensional and environmental field of landscape design requires the designer to produce beautiful, practically useful, and well-functioning end products. It also entails very considerable technical knowledge and expertise, along with visual imagination and design abilities. Landscape design is an independent profession and a design and art tradition that is practiced by designers, who combine nature and culture. In contemporary practice, landscape design bridges landscape architecture and garden design (Landscape design, para. 1).

In cognitive studies, researchers quite often use another term, environmental perception, to describe the human ability to comprehend, interpret, and evaluate the physical world (Long, 2007). According to Bell, Greene, Fisher, and Baum (2001), perception involves experience and memory, a reflection which implies that cognitive processes are involved. Landscape perception is one branch of landscape assessment research and practice.

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Cognitive psychology is a sub discipline of psychology that explores internal mental processes. It is the study of human perception, memory, thought, speech, and problem solving (Feist & Rosenberg, 2009). It is also concerned with the structures and representations involved in cognition (Eysenck, 1990).

Landscape design focuses on both the integrated master landscape planning of a property and the specific garden design of landscape elements and plants within it. Practical, aesthetic, horticultural, and environmental sustainability components all merit attention (Landscape design, para. 1). Landscape design makes meaningful contributions to culture (Conan, 2003). Its overall objective is the improvement of the physical, environmental, and psychological well-being of people (Headquarters Departments of the Army and the Air Force [AFM], 1988).

One of the few important studies of urban cognition is Kevin Lynch's *The Image of the City*. In this work, Lynch examines the relationship between people and the visual character of the urban environment. He probes the mental images of cities held by residents or visitors. His major concern is to understand the way in which different components or parts of a city weave together in forming a distinct urban image (Lynch, 1960). More generally, these observations are related to Merleau-Ponty's observation that perception is not an experience of objects but rather an opening to the world, a way for the embodied person to enter into a communion with the world (Merleau-Ponty, 1962).

In the 1970-80s, the quantity and quality of landscape perception and research underwent rapid change. Most scholarly effort was put into empirical research that aimed to establish reliable and valid assessment methods of landscape perception (Karmanow, 2009). The field of landscape perception developed new concepts (e.g., scenic quality, landscape preferences, and visual attractiveness), discovered new methods, and accumulated research data to support its claims. In an influential article, Zube, Sell, and Taylor (1982) categorize the main trends in landscape perception research in terms of four paradigms: the expert, the psychophysical, the cognitive, and the experiential.

Over the years, significant efforts have been put into the analysis of the impact of gender, age, occupation, leisure, academic background, professional experience, familiarity, nationality, and religion on landscape perception and experience (Aoki, 1999). However, the issue of landscape experience remains poorly understood in landscape design theory. In recent decades, inquiry into the meanings of landscape has flourished. From the 1980s onwards, "declarations of meanings began to accompany the published photos and drawings of landscape designs" (Karmanow, 2009). The creation of meaningful (perceptually and symbolically significant) and experientially rewarding landscapes has always been of great importance in high-quality landscape design.

2. Elements and principles of landscape design

All effective landscape designs rely on basic principles. An understanding of these principles prevents the creation of ugly landscapes and fosters the creation of beautiful ones. Unity, simplicity, variety, balance, sequence, and scale are terms often associated with art (Williams & Tilt, 2006). The elements of design, arranged according to certain principles are form, line, texture, and color (Wong, 2006). All these elements and principles interact to yield the intended design (Ingram, 1991).

3. Landscape experience and legibility of the environment

The experience of landscape is holistic; it involves the flow of experiential qualities, images, thoughts, and meanings. It is a bodily experience and takes place in time and space (Karmanow, 2009). Some terms describe the experience of a landscape. One of them is legibility, which Lynch (1960) defines as "the ease with which its parts can be recognized and can be organized into a coherent pattern." Following Lynch, Weisman (1981) understands the legibility of an environment as "the extent to which it facilitates the process of way-finding." Legibility is also an important aspect of urban design, and it is obviously related to spatial cognition and, in

particular, to wayfinding performance (Long, 2007). These definitions imply that the characteristics of a physical environment can influence the development and accuracy of a mental/cognitive map and affect subsequent wayfinding behavior.

Spatial configuration and spatial cognition

Urban planners have stressed the importance of spatial configuration in spatial cognition (Appleyard, 1976; Lynch, 1960), placing a particular emphasis on regular, well-defined path systems. Lynch also addresses grid and hierarchy in his writings, while in his 1960 book, he emphasizes the five physical elements. Although he was not a cognitive psychologist, he recognized the importance of the relationship of spatial configurations and mental structures.

Hart and Moore (1973) define spatial cognition as “the knowledge and internal or cognitive representations of the structure, entities, and relations of space; in other words, the internalized reflection and reconstruction of space in thoughts.” In general, spatial cognition is the human understanding and perception of geographic space (Kuipers & Levit, 1990). Based on this explanation, spatial cognition includes two components: physical elements (i.e., landmarks, paths, districts, nodes, and edges) and their relations, which comprise cognitive representations or representations of cognitive maps. The product of spatial cognition is a mental/cognitive map (Hart & Moore, 1973).

4. Mental/cognitive maps

Mental imagery is a cognitive process that is necessary for the construction and adaption of models in seeking complex solutions (Goldschmidt & Badke-Schaub, 2010). The picture formed in such a process is called a cognitive map. Mental/cognitive maps encompass all the internal processes that enable a person to acquire and manipulate information about the nature of his or her spatial environments (Downs & Stea, 1973). They are incomplete, segmented, and mentally distorted internal representations of the environment. They are also constantly updated; at any one instance, they thus offer a snapshot of an individual’s present physical knowledge. These cognitive processes are part of the individual design process (Goldschmidt & Badke-Schaub, 2010).

5. Conclusion

In the psychophysical approach, the perceived qualities of a landscape are derived from perceptual responses of different groups of respondents (Karmanow, 2009). Considered from the perspective of the cognitive approach, landscape perception becomes a process of interpretation, mediated by emotional responses to sites, perceived meanings, and physiological reactions (e.g. stress reduction). Design is thus a cognitive activity made up of thought processes, such as the search for ideas, the generation of solutions, the evaluation of information, the consideration and production of visual representations, and the development of strategies, while learning and experiencing (Goldschmidt & Badke-Schaub, 2010).

A clear image of the environment will contribute to wayfinding performance in the future (Lynch, 1960; Churchill, 1962). Thus, to learn the large-scale structure of space, the traveler must necessarily build a cognitive map of the legible environment by integrating observations over extended periods of time, inferring spatial structure from perceptions and effects of actions (Kuipers & Levit, 1990).

Based on the above discussion, it is evident that the configurational properties of the environment are important variables in acquiring environmental knowledge. Cognitive representations and legibility comprise an individual’s subjective evaluations of the urban environment. It seems impossible to understand human-landscape interactions—and specifically the experience of landscape—without knowledge of their psychological foundations. Experience is first and foremost a psychological phenomenon (Karmanow, 2009).

References

- Aoki, Y. (1999). Review article: Trends in the study of the psychological evaluation of landscape. *Landscape Research*, 24, 85-94.
- Appleyard, D. A. (1976). *Planning a pluralistic city*. Cambridge, Mass.: MIT Press.
- Bell, P. A., Greene, T. C., Fisher, J. D., & Baum, A. (2001). *Environmental psychology* (5th ed.). Orlando, FL: Harcourt College Publishers.
- Churchill, H. S. (1962). *The city is the people*. New York: W.W. Norton.
- Conan, M. (2003). Introduction: garden and landscape design, from emotion to the construction of self. In M. Conan (Ed.), *Landscape design and the experience of motion* (pp. 1-33). Washington D.C.: Dumbarton Oaks Research Library and Collection.
- Downs, R., & Stea, D. (1973). *Image and the environment: cognitive mapping and spatial behavior*. Chicago: Aldrine.
- Eysenck, M. W. (1990). *Blackwell dictionary of cognitive psychology*. Cambridge, MA: Basil Blackwell.
- Feist, G., & Rosenberg, E. (2009). *Psychology: making connections*. New York: McGraw-Hill.
- Goel, V. (1995). *Sketches of thought*. Cambridge, Mass.: MIT Press.
- Goldschmidt, G., & Badke-Schaub, P. (2010). The design-psychology. In K. Dorst, S. Stewart, I. Staudinger, B. Paton, & A. Dong (Eds.), *Proceedings of the 8th design thinking research symposium (DTRS8)* (pp. 199-209). Sydney, Australia: DAB Documents.
- Hart, R. A., & Moore, G. T. (1973). The development of spatial cognition: a review. In R. Downs & D. Stea (Eds.), *Image and environment* (pp. 246-295). Chicago: Aldine.
- Headquarters Departments of the Army and the Air Force (AFM). (1988). *Landscape design and planting*. (Technical Manual No. 5-803-13/AFM Manual No. 126-8). Washington, D.C.
- Human Resources, University of Hawai'i at Mānoa, Honolulu.
- Ingram, D. L. (1991). Basic principles of landscape design. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences,
- Karmanow, D. (2009). *Feeling the landscape: Six psychological studies into landscape experience*. (Unpublished doctoral dissertation). Wageningen University, Wageningen, Netherlands.
- Kuipers, B., & Levit, T. S. (1990). Navigation and mapping in large-scale space, In S. S. Chen (Ed.), *Advances in spatial reasoning* (pp. 207-252). Norwood, NJ: Ablex Publishing Corp.
- Landscape design. (2012). In Wikipedia. Retrieved from http://en.wikipedia.org/wiki/Landscape_design.
- Lawson, B. (2005). *How designers think: the design process demystified* (4th ed.). Oxford, Great Britain: Architectural Press.
- Long, Y. (2007). *The relationships between objective and subjective evaluations of the urban environment: space syntax, cognitive maps, and urban legibility*. (Unpublished doctoral dissertation). North Carolina State University, Raleigh, North Carolina.
- Lynch, K. (1960). *The image of the city*. Cambridge, Massachusetts: MIT Press.
- Merleau-Ponty, M. (1962). *Phenomenology of perception*. (C. Smith, Trans.). New York: Humanities Press. (Original work published 1945) University of Florida; Gainesville, Florida.
- Weisman, G. (1981). Evaluating architectural legibility: wayfinding in the built environment. *Environment and Behavior*, 13, 189-204.
- Williams, J. D., & Tilt, K. (2006). *Residential landscape design*. Alabama Cooperative Extension System.
- Wong, M. (2006). *General elements and principles of landscape design*. (Unpublished doctoral dissertation). College of Tropical Agriculture and
- Zube, E. H., Sell, J. L., & Taylor, J. G. (1982). Landscape perception: Research, application and theory. *Landscape Planning*, 9, 1-33.