Environment, Behaviour and Society: A Brief Look at the Field and Some Current EBS Research at the University of Sydney[1]

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Abstract

This paper discusses some central theoretical and methodological constructs in the field of environment, behaviour and society (EBS), and weaves together the threads of the diverse research from a variety of theoretical and methodological viewpoints currently being conducted at the University of Sydney. The paper begins with a brief history of the field of environment, behaviour and society in the context of urban policy and design. The paper then analyses the major theoretical and methodological foundations of the field. It is within this theoretical-methodological framework that the paper then turns to a discussion of some of the current EBS research at Sydney, both to illustrate the framework and to articulate some of the underlying threads that bind our research together. It is concluded that most of the Sydney research adopts an interactional-constructivist theory with a recent overlay of the theory of social capital. It is also concluded that the best research, while diverse in methodological approach, including both quantitative and qualitative approaches, uses a combination of empirical methods in triangulation to achieve greater trustworthiness in findings and interpretation.

本文论述了环境、行为与社会研究领域的基本理论与方法，并且试图将悉尼大学在此领域内不同研究分支进行整体的介绍。悉尼大学环境、行为与社会研究组成员的研究课题涉及范围广泛，运用的理论与方法各不相同——这是本组的优势——但是，小组成员的研究工作存在着内在的知性的联系。本文首先以城市政策与设计领域的研究为背景，介绍了环境、行为与社会学科发展的历史，然后分析了本领域的基本研究理论与方法。在提出此理论与方法的框架的基础上，本文转而探讨了悉尼大学环境、行为与社会研究组的研究现状，目的不仅是为了进一步地说明此框架，而且也为了说明本研究组不同研究课题之间内在的联系。本文的结论之一是，悉尼大学环境、行为与社会研究组的大部分研究的理论基础是相互作用与构成理论，以及在最近开始涉猎的的社会资本理论。本文的结论之二是：在研究中（尽管研究方法可以不尽相同），但是最好能结合定量分析、定性分析、经验主义方法这三方面，以便使研究得出的发现与解释具有更高的可靠性。

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Background and Context

The field of Environment-Behaviour Studies – or, as we prefer to call it – *Environment, Behaviour and Society* (EBS) – developed from the confluence of architecture, urban design and urban planning on the one hand and the social and behavioural sciences on the other. It emerged from two sets of complementary concerns, one in the professional disciplines of environmental design and the built environment, and the other in the socio-cultural and behavioural sciences.

In much of traditional modernist architecture, urban design and planning, which I'll hence forth simply call *environmental design*, EBS grew in part from the concern that these disciplines were not paying sufficiently serous attention to behavioural, social, and cultural factors, individual perceptions and preferences, group norms and dynamics, and cultural values and expectations in the planning and design of our human environment.

Similarly in geography, though not a professional discipline, concern arose in the 1960s and 1970s that insufficient attention was paid to peoples' perceptions, attitudes, preferences and images of geographical space, ie, that a fuller understanding of the geographical landscape could be achieved by also considering in great depth human processes on the land, ie, urban social geography, and human reactions to the land, ie, environmental perception and cognition.

On the other hand, from the more strictly behavioural and social sciences – psychology, sociology, anthropology in particular – which I'll henceforth simply call the *social sciences* – it grew from the concern that while much was known about individual, group and cultural processes, perception, cognition, preferences, values, attitudes, social norms, semantic structures, cultural differences, and so on – little was known about the relation of these social understandings to the physical environment. As I have written in various previous papers, when the word "environment" has been invoked in these social science disciplines, it most often, implicitly, refers to the socio-cultural environment of staff, curriculum, social interactions, and the cultural milieu – not the physical, planned and designed environment.

The field of environment, behaviour and society has emerged in an attempt to fill this gap, to develop empirically-based understandings of the reciprocal interaction among individuals, social groups, cultures and the environments in which they live, and to apply such understandings to the better planning and design of the built environment.

The field, therefore, is very broad, and some might way, somewhat amorphous. It includes parts of disciplines and studies that may not know they are a "part" of EBS. I recall during my graduate student days preparing my PhD in EBS how excited we were when we "discovered" cognitive anthropology, a whole subdiscipline of studies concerned with understanding different cultures cognitive understandings of their own societies including the landforms that were a part of their culture. This too, we realised, was EBS, as it was the study of the environment-behaviour nexus, though I doubt at the time that any cognitive anthropologists realised their work was also a part of EBS.

EBS as a field has had a somewhat narrow view or perspective in many parts of the world, sometimes being equated with environmental "psychology" or other subdisciplines that are in reality only a small portion of the broader field of environment, behaviour and society. Our attempt in this paper is to portray a much broader view, one that encompasses all of the social and political sciences and their relation to the entire designed and built environment.

We may therefore offer a broader conceptualisation of the domain of *environment, behaviour and society* – the study of the mutual and reciprocal interactions between people and the environment at all scales, and applications of the knowledge thus gained to improve the quality of life through better-informed environmental policy, planning and design. EBS focuses on the interdependence of physical environmental system and socio-cultural systems, and includes both environmental and

human factors. It operates at the level of the individual, the group, the society and culture, and includes changes to the environment by the activities of people at these various levels. The field also includes studies of the political, social and economic context of environment-behaviour relations. Policy, planning, architectural and urban design bring about environments with specific characteristics that will either facilitate or inhibit the types of experiences, activities and interactions that occur at these various levels. The field thus also includes studies of environmental intervention, and the processes of communication, information dissemination and research application to urban policy, planning, urban design and architecture (cf. Moore, Tuttle & Howell, 1985).

Many years ago I developed a set of diagrams to characterise the range of EBS (eg, in Moore et al, 1985, 1987). I have resurrected some of them – but more so, I have updated and expanded them with assistance from my colleagues in the EBS group at Sydney, as the field has grown and needs to develop again in strategically new ways.

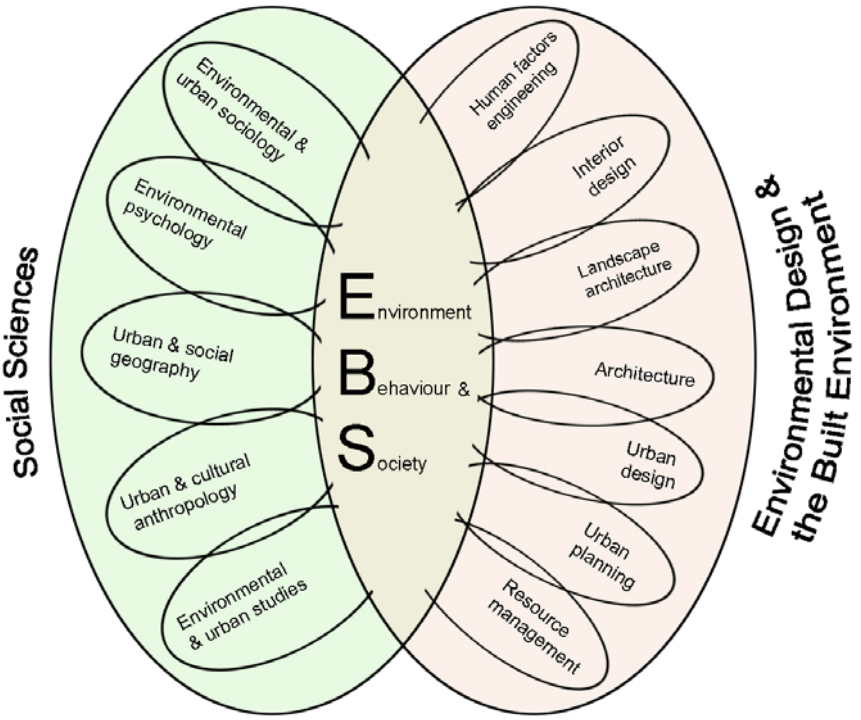

Figure 1. Environment, behaviour and society (EBS) research as the confluence of many parts of the social sciences and the built environment professions. (All illustrations by the author, unless otherwise noted.)

Major Theoretical Foundations

The nature of theory. In 1997, in writing the introductory chapter for the final volume in the *Environment, Behavior and Design* series (Moore, 1997a), I argued there are two essential meanings for the word "theory." Actually, there was no surprise here, for both meanings are enshrined in a source that in the Western, English-speaking world seldom does us wrong – the *Oxford English Dictionary* (eg, 1984 ff). According to the *OED*, *theory* is a:

> Scheme or system of ideas or statement held as an explanation or account of a group of facts or phenomena; a hypothesis that has been confirmed or established by observation or experiment, and is propounded or accepted as accounting for the known facts; a statement of what are held to be general laws, principles, or causes of something known or observed. (Vol 2, p 3284)

Toulmin (1953) and other philosophers of science have observed that explanatory theory is a coherent set of explanations answering the *why* behind observable phenomena. Nash (1963) offered that it is an abstraction on the concrete that serves to explain or make intelligible the concrete by reference to

more abstract principles. Or as, in our own field, Lang (1987) remarked, "Theory building involves more than describing the world. It involves explanation" (p 13). Theory is an intellectual creation, an induction from particular observables that serves to give meaning to and explain the pattern of observables seen in the world.

A critical ingredient for something to be an explanatory theory is that the scheme or system of ideas or statements must be in principle *testable* (Platt, 1964; Popper, 1965). In that 1997 paper, in addition to testability, I proposed a number of necessary and sufficient conditions or criteria for a theory that can apply equally to theory in EBS or any other field of inquiry. And in a subsequent paper prepared for the 1997 MERA Conference in Japan (Moore, 1997b), I argued further for a set of criteria that can be used to evaluate the quality of any theory based on empirical research. Again space does not allow us to go into those details, but I refer the interested reader to the above and other sources for understanding the nature of theory and its importance to the understanding of the mutual relations between the environment, behaviour and society.

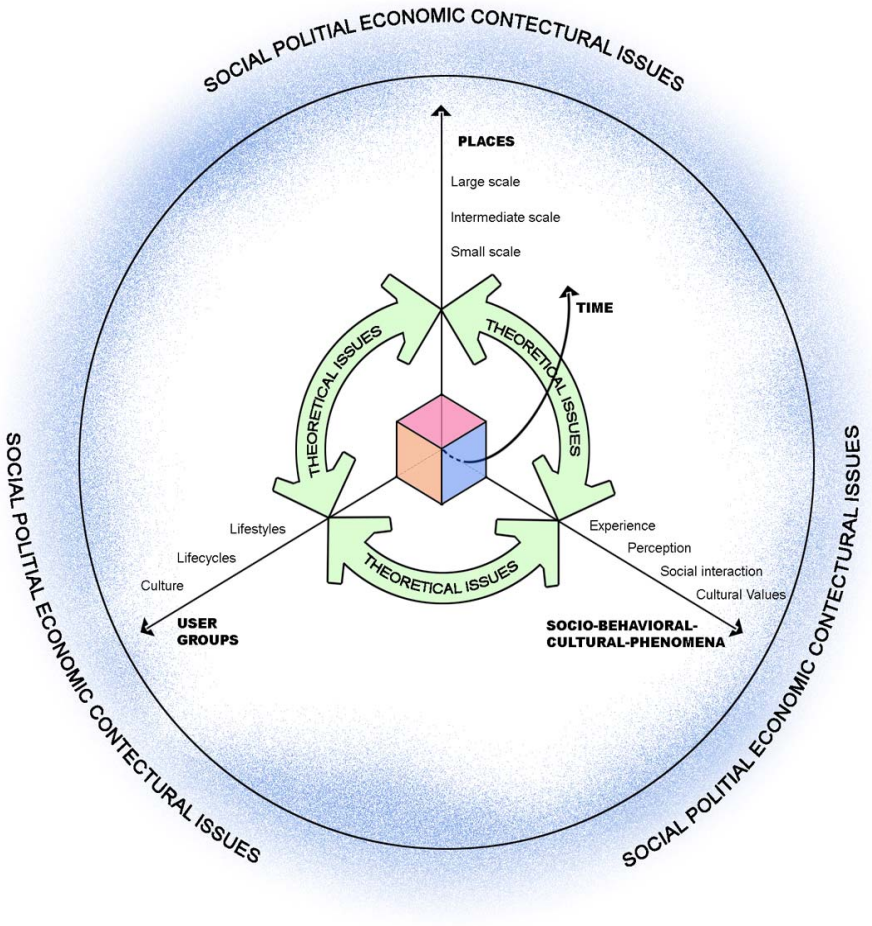

Figure 2. EBS as the investigation of the reciprocal interactions among places, user groups, socio-behavioural-cultural phenomena and time.

A second meaning of theory, also suggested in the *OED*, is that *theory* can also refer to "a conception or mental scheme of something to be done, or of the method of doing it; a systematic statement of rules or principles to be followed" (Vol. 2, p. 3284). This use of theory is picked up in our field by Lynch (1981), Lang (1987), Groat and Depres (1991) and others, and of course underlies the use of the word "theory" in most of architectural, urban design and planning theory (eg, Campbell & Fainstein, 2003; Conrads, 1970; Hays, 1998; Mandelbaum, Mazza & Burchell, 1996).

Alternative theoretical orientations. Just as we will see below that there is no one method most appropriate for research of environment, behaviour and social phenomena, there is also no one theory or theoretical approach most appropriate in the EBS/design/architecture/planning field. It has been said, rightfully I think, that EBS is still a field in search of a guiding paradigm. Or perhaps it is due to the diversity of phenomena deserving of our attention that no one theory is best for explaining all phenomena.

Having said that, there is general consensus that one or more theoretical directions are most dominant in the field, and perhaps the interactional-constructivist theoretical orientation in particular. But there are a number of legitimate theoretical orientations (and more specific theories embedded within them) that are the subject of debate and which influenced large bodies of empirical research in the field.

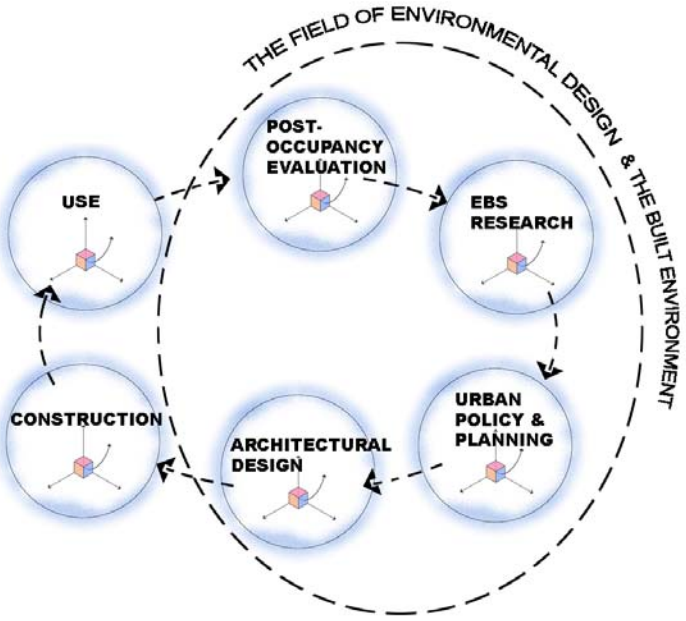

Figure 3. The professions of environmental design and the built environment as a cyclic process among EBS research, policy and planning, design, construction and use, and post-occupancy evaluation.

The scope of EBS theories. Several of us have from time to time tried to characterise the variety of theories out there. One characterisation I have advanced (Moore, 1997a), based on the seminal writings of Merton (1949), deals with what I have called the *scope* of a theory, ie, the swath it attempts to cut in the field. Seen this way, there are little *t*, big T grand theories and theories of the middle range. Little *t* theories are coherent and explicit theories that explain the substantive domain of phenomena from which they were derived, ie, for a limited body of data, a limited domain of observed regularities in autre (eg, Gibson's ecological theory of environmental perception as used in the work of Heft, 1997). Big *T* or grand theories are attempts to unify a whole field by recourse to one overarching theory that purports to explain *all* of the known phenomena in that field by recourse to one, overarching or grand theory (eg, somewhat related to the EBS field would be Parsons', 1959, theory of social action). Merton argued, however, that the most useful, the most fertile and the most persuasive theories for a discipline were at neither extreme, but are what he called "theories of the middle range." Such theories are intermediate to and may mediate between low-level working hypotheses and all-inclusive master conceptual schemes.

The form of EBS theories. Another characterisation about theories in the EBS field has to do with their ontological and epistemological origins. We may refer to as the *form* of the theory, that is, what is the conceptual or theoretical orientation of the theory, what underlying philosophical assumptions does it make or from which it springs. Does it assume and build on a realist or an idealist philosophy about the nature of reality; and does it assume or building on a radical empiricist or nativist philosophy about epistemology? In working with the geographer Golledge, we suggested that the

EBS field up to and including the mid-1970s (Moore & Golledge, 1976) could be characterised as having theories of three basic forms: radical environmental determinism (since having died out), rationalism and nativism (never a strong force) and interactionalism and constructivism (what I would now argue is the predominant force in the field). Stokols (1977) saw the major theories as being of two types – ecological theories by which groups adapt to the environment, and environmental psychological theories focussing on intrapersonal processes like environmental perception and cognition mediating the environment-behaviour nexus.

In 1987, I proposed that the major extant theories of the environment, behaviour, and society discipline could be arrayed on a framework from rather simple empiricist or nativist theories on the one extreme, to more complex – and compelling – interactional or transactional theories on the other extreme. Along this framework were person-based theories (focusing on the individual as the critical unit of analysis, like Altman's, 1975, theory of privacy), social group theories (eg, Buttimer's, 1976, notions of residential behaviour involving norms, membership and reference groups, and social space), mediational theories (eg, Evans & Lapore's, 1997, theory of moderation and mediation in environment-behaviour relations), phenomenological theories (eg, the well-known geography of the life-world theory of Seamon, 1980), structuralist theories (eg, Lawrence's, 1989, structuralist theory of homes) and, finally, interactional theories (eg, Lawton's, 1975, theory of competence, environmental press and the adaptation of older people, and many others) and transactional theories (eg, Wapner's, 1987, person-in-environment transactional theory).

An influential framework was Altman and Rogoff's (1987) argument for four "world views" in environmental psycholology – trait, interactional, organismic and transactional perspectives. While highly compelling and influential, it omitted consideration of other major theoretical orientations then evident in the broader EBS field that remain powerful in influencing research, including phenomenology, structuralism, social capital theory (Hutchinson & Vidal, 2004; Portes, 1998) and more recently post-structuralist and post-modernist theoretical perspectives (eg, Dahlberg, Moss & Pence, 1999).

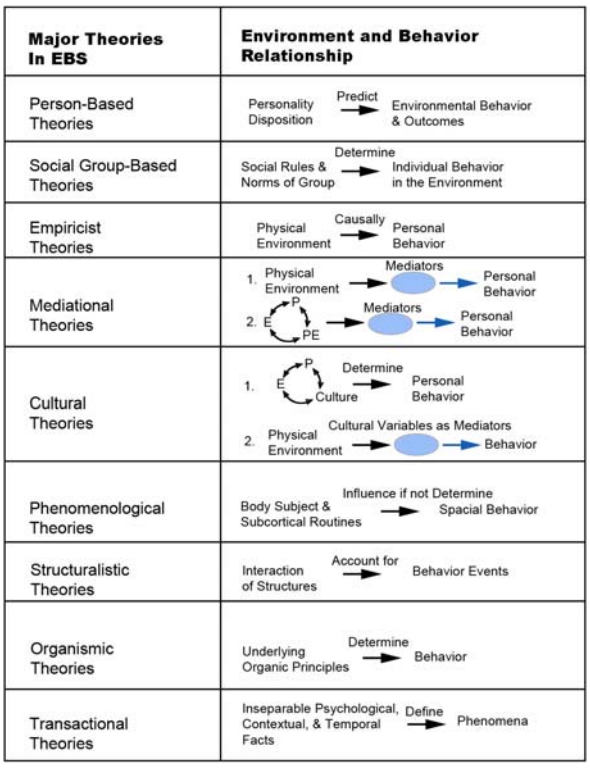

Figure 4. A diagrammatic summary of many of the major theories of environment, behaviour and society. (Illustration courtesy of Xu Leilei, based on text in Moore, 1987.)

Predominant Research Methods

The paradigm of empirical research. As a discipline, EBS is explicitly empirical, that is all questions of study are pursued with the most rigorous of empirical research methods. But *empirical* should not be confused with *experimental* nor with *empiricism*. *Empirical* research is based on the results of observation of the slice of the universe under study, not on theorising, speculating, anecdotal experience or argument, ie, empirical research is original research based on the results of the systematic collection and analysis of information and data from the real world.

EBS as a discipline embraces the whole panoply of empirical research methods – including both qualitative and quantitative methods from both deductive and inductive approaches. That is, research can be *inductive* in that it works upwards to general principles and theories from observations, and it can be *deductive* in that it may work downwards to test a major theory or theoretical proposition in the real world. It can be *quantitative* relying on observations that can be transformed into numeric information (eg, Marans & Ahrentzen, 1987), and it can be *qualitative* relying on data usually in the form of words rather than numbers (eg, Low, 1987).

This 2x2 matrix of possibilities is also characteristic of the social sciences, including anthropology, history, political science, psychology, sociology, linguistics, family studies, etc. While within the EBS field there are ardent adherents to inductive and deductive research, and to qualitative and quantitative approaches, I have steadfastly maintained that the EBS field is inherently all of these. Environment-behaviour phenomena exist in the interaction between the inquiring mind and the real world. Lawfulness comes from regularities that bind phenomena together. From patterns, we derive constructs that underlie the quality of life in the built environment. As others have said (eg, Miles & Huberman, 1994), the fact that these regularities and constructs are invisible to everyday people in the environment does not make them invalid. We are all and always surrounded by lawful physical mechanisms of which the vast majority of us are unaware, though we are affected by them every day of our lives. The object of EBS research methods is to elucidate the relations between environment and behaviour, to study them in a rigorous, systematic way so that the finding about them have been subjected to evidence, falsification and corroboration such that they are neither biased nor anecdotal, but are trustworthy as *findings* about some corner of the environment-behaviour nexus.

	Quantitative Approaches	**Qualitative Approaches**
Theories	Interactional-constructivism	Transactionalism
Research Design	Quasi-experimental, Correlational, etc.	Naturalistic, Interpretive, Case study, etc.
Research Methods	Systematic observations, Surveys, Scales, etc.	Participant observation, Ethnographies, etc.
Data Analysis	Quantitative parametric and non-parametric	Qualitative, Structural, etc.
Trustworthiness	Reliability Internal validity External validity	Dependability Confirmability Transferability
Application	Policy formulation, Design guidance, etc.	Action research

Figure 5. A framework of the relations between quantitative and qualitative theories, research design, methods, analysis and applications.

Research design, methods and analysis. Within methods of research, be they qualitative or quantitative, inductive or deductive, I have shown there are three layers of methodology: research design, research methods and data analysis (Moore & Marans, 1997; cf. Groat & Wang, 2002). At Sydney I teach a general research methods course for all entering PhD and MPhil research students. In it we cover research design, methods and data analysis. At the end of four months we expect all new research students to have formulated a pre-proposal for what they wish to research *and how* they propose to research it. Such proposals are expected to have two major parts – the first part outlining the domain of research, the current state of research knowledge in that domain and the most important questions remaining to be addressed, and the second outlining how the student researcher proposes to address one or more of those critical questions. Thus in this second part, the student researcher is expected to identify and justify the basic research design that is appropriate to the study (eg, experimental, quasi-experimental, survey research, case study, action research, etc.) as well as the means of sampling (probability, random, stratified and other sampling designs), the major methods of information collection (eg, participant or systematic observation, primary and secondary data sources, objective and subjective data, etc.), and, finally, the most appropriate methods for the analysis of information (eg, qualitative and quantitative, within-case, cross-case and matrix displays, descriptive and inferential, univariate and multivariate, parametric and non-parametric, etc.). They also need to deal seriously with establishing the trustworthiness of their research endeavours so the findings will be trustworthy (Lincoln & Guba, 1985).

Combinations and triangulations. In this paper we most certainly do not have the space to go into research methods in any detail. Suffice it to say that the field of EBS uses all of the above but is not limited to any of them, ie, it adopts and adapts naturalistic, field, archival, simulation and computational methods for systematically researching issues of the designed and built environment in relation to behaviour, society and culture. The modes of inquiry adopted include field-based social research (eg, experimental, quasi-experimental, survey, ethnographic, case study and naturalistic empirical research), text-based scholarship (archival, historical and other text-based scholarship) and policy-oriented research (archival, field, strategic and evidence-based policy). Most importantly, most of the best and most interesting recent research has adopted combinations of and triangulations among these various approaches, depending on the nature of the research question at hand.

A word should perhaps be said about *combinations* and *triangulation.* Older uni-discipline research often adopted a single research methodology, often the predominant or almost paradigmatic approach to research in that discipline, eg, social survey research, laboratory experimental research, or simulation-computational research. More contemporary research, much research that is inter-disciplinary, and indeed most of the best EBS research, however, intentionally uses a combination of methods, or what I have been calling *triangulation.* The point is like the original way of treating cancerous tumours with beams of radiation – each beam not strong enough to kill the tumour itself, and therefore not strong enough to kill other flesh or organs in the way, but at the intersection or vertex of the triangle of two rays of radiation, the combined strength was strong enough to eradicate the tumour. The same principle is used in combinations (cf. Groat & Wang, 2002) and especially the *triangulation* of research methods. Two or more approaches are used, so that the weaknesses of each are neutralised by the conjoint power of the two together. Said differently, if one method comes up with a certain finding, it is strongly corroborated if an entirely different method comes up with the same or substantially the same finding. An example would be using survey research to find out something about people's attitudes towards environmental sustainability, and corroborating their attitudes by systematic observation or their behaviour to see if they are also acting in a sustainable manner. Another example would be combining quantitative, closed-ended questions and scales on a survey research instrument, with qualitative, open-ended follow-up interview to probe some of the answers to find out their meaning and significance. Both are examples of using a combination of methods to enable the *triangulation* of findings.

Some Current Research from the Environment, Behaviour and Society Research Group at the University of Sydney

Using the above framework of types of theories and methods predominant in the environment, behaviour and society field, I would now like to turn briefly to the six main threads of EBS research in our group at Sydney, and to try to place then into this framework, both to illustrate the framework and to explore where there may be some underlying threads that bind our work together. For more information, please see our web site at http://www.arch.usyd.edu.au/web/research/ebr.html.

1. One broad line of research concerns ***children, youth and environments*** (Moore, Bishop, Dimoulias, Khan, Lulham, O'Donnell, Sugiyama, van der Linden and Xu). This line of research started at Sydney with some of my earliest studies in Australia in the mid-1970s (Moore & Pholeros, 1975). Some of the more recent research by this group has looked at scales for assessing the quality of the physical environment of early childhood development centres like child care centres, preschools and kindergartens (Moore, Sugiyama & O'Donnell, 2003). Based on a Piagetian interactional-constructivist theory of how children come to develop in relation the their socio-physical environment, this research has been looking at the ways in which the physical designed environment has an impact on the social, emotional and intellectual development of children, with translations of that research into scales for the assessment of the developmental appropriateness of different environments for young children (Moore, 2002). Judith van der Linden (2004) has followed up on this by exploring whether children really do prefer what "experts" think is good for them, with mixed results to date. Asif-uz-Zaman Khan has been studying housing mobility and children's school achievement. He is especially interested, ultimately, in the urban planning policy implications, for example the importance of security of tenure of housing and means to overcome the loss of peer support and social networks brought on by moving homes or cities and the resultant impact on the education of the young child.

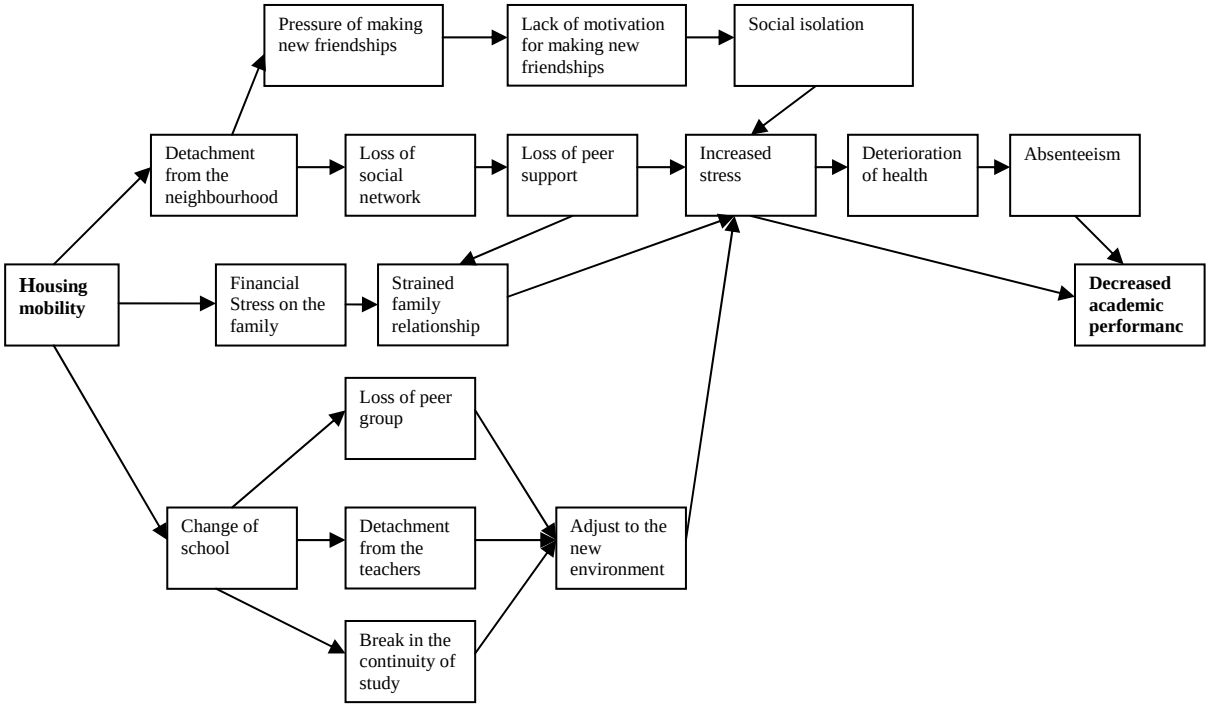

Figure 6. Pathways among housing mobility and school achievement with regard to changes of school and family well being. (Diagram courtesy of Asif-uz-Zamen Khan.)

Working specifically with special needs children, Kate Bishop has been interested in understanding the relationship between the experiences of seriously ill children and youth in paediatric hospitals and the socio-physical environment of the hospital. She has been concerned with understanding this

complex relationship from the perspective of the children and youth themselves, minimising through qualitative research the impact of herself as researcher and of her techniques on what she discovers, resulting in a naturalistic study from the child's perspective. She is also active in writing scholarly papers including one looking at a strengths-based model or theory that would aid in designing environments for children with special needs (Bishop, 2004b) and another that systematically reviews a wide swath of recent empirical literature on children and the physical environment, including the impacts of sound, smell, play environments, child care and health care settings (Bishop, 2004a).

Figure 7. Qualitative research with young children – unobtrusive, caring and from the child's perspective. (Photograph courtesy of Kate Bishop.)

Katina Dimoulias and Rohan Lulham have been interested in the impacts of the socio-organisational and physical environment on youth-at-risk. Dimoulias is studying at-risk youth in youth centres while Lulham is studying youth detained in juvenile correctional facilities. Both have been basing their work on major theories in the EBS field. Dimoulias (2004) is working with Moos and Lemke's (1984) social milieu theory to understand the relation between the organisational-physical environment and youth participation in activities and sense of belonging. Lulham (2004) is using two lesser-known theories, perceptual control theory (Powers, 1973) and affect-control theory (Heise, 1979) to investigate the influence of the physical environment of juvenile justice centres.

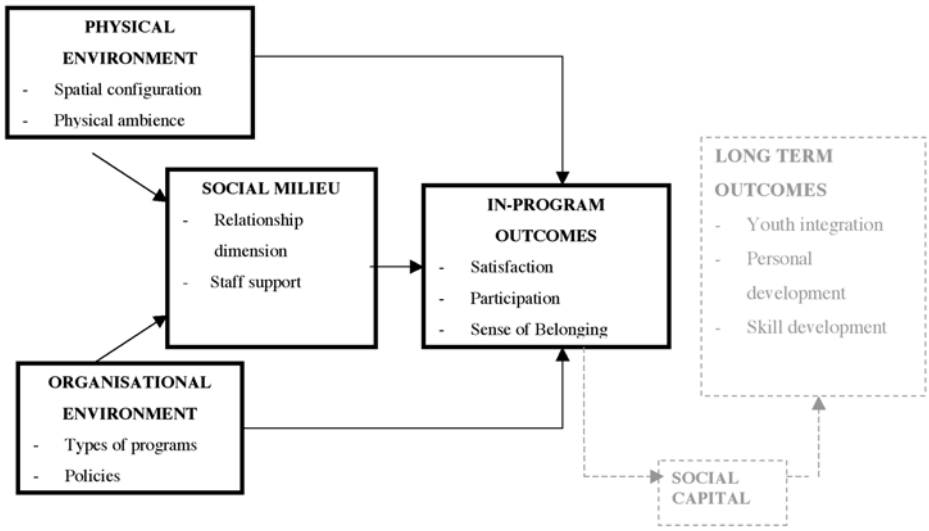

Figure 8. An adaptation of Moos's social milieu theory applied to the impacts of the physical-organisational environment on in-program outcomes for at-risk youths. (Diagram courtesy of Katina Dimoulias.)

Most recently, Xu Leilei is beginning a line of research on the relation between the design of outdoor play environments, especially in natural settings, on children's cooperative and socio-emotional development (Xu, 2004). She is thinking of pursing this research from a combination of Western organic lamp theory (Langer, 1969) and its Chinese counterpart.

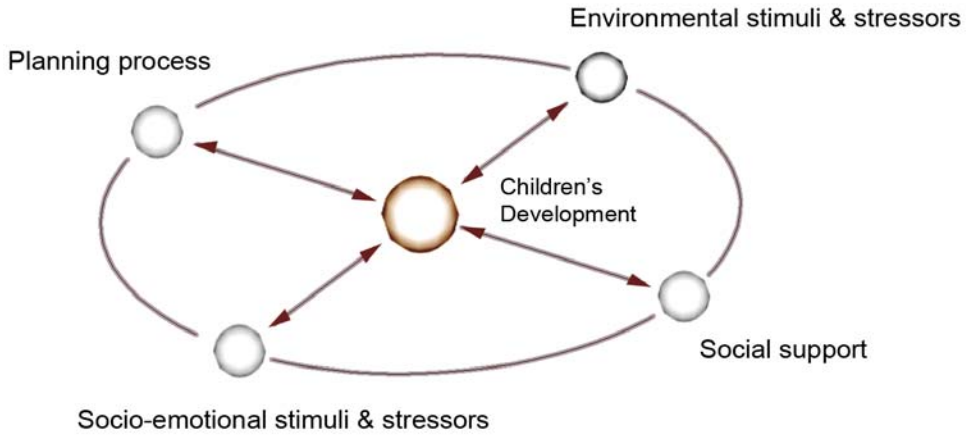

Figure 9. Some of the variables of the social and built environment that interact with children's development.. (Diagram courtesy of Xu Leilei.)

We have also been involved in translating the results of some of this research into practical guidelines for administrators, owners and designers of children's environments (eg, Bishop, 2004b; Moore, 1998a, 1998b, 2002).

2. A second line of research revolves around issues of ***environmental experience, perception and cognition,*** including affective experience, aesthetics and the restorative benefits of natural environments (Lamb, Purcell, Lalak, O'Connor, Pope, Preston and Steven). The largest body of research in this area is the work of Associate Professor Terry Purcell and Dr Richard Lamb over many years on the experience, perception and aesthetics of natural and cultural landscapes, affective experience of the environment, and the perception of scenic quality. They have looked at, among other EB phenomena, the aesthetics of cultural landscapes (Fuller & Lamb, 2002), and natural landscape perception (Lamb & Purcell, 2002; Purcell & Lamb, 1998) among many other related topics. A new student in our group, Robert Preston, is extending some of this work by looking at the structure of people's visual preferences for open space and adjacent building designs on urban/bushland edges and on other edges between urban and natural, scenic areas. Like many research students in our group, the purpose of his research is very practical – in his case to influence the management of the visual environment in South East Queensland in Australia.

Whereas that research has been quantitative and from an interactional cognitive theoretical foundation, other more recent work has been Michael Steven's just completed PhD thesis on participants' experience of natural environments from a transactional perspective with great concern for the trustworthiness of the accounts of environmental experience using sophisticated qualitative research methods.

Research on the restorative benefits of natural environments has been a popular, productive and growing area of research in the EBS field worldwide. Nadia Lalak has been interested in the beneficial effects of the interaction with nature in particular designed natural environments that are easily accessible to, for instance, office workers in the midst of a stressful work day, and enhancing the beneficial effects of the interaction with nature through raising the levels of encounter and cognitive processing. Like many of the other PhD students in our group, she is beginning to publish based on her preliminary work and on its implications for, in her case, landscape architecture (eg, Lalak, 2003a, 2003b, 2004).

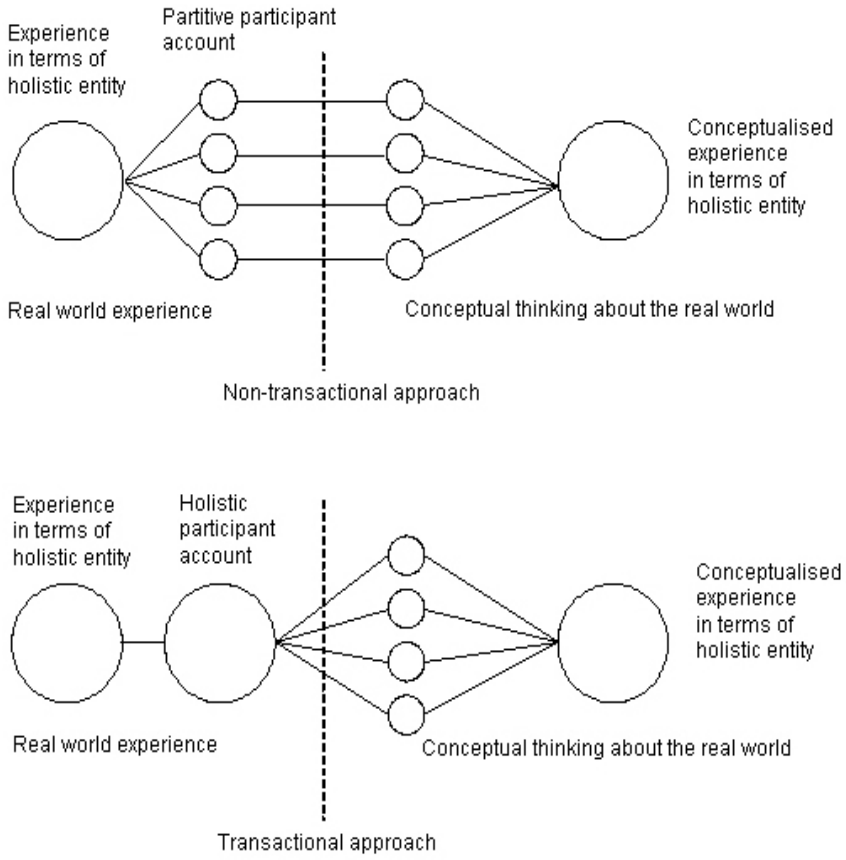

Figure 10. Conceptualisation of the difference between transactional and non-transactional worldviews in researching environmental experience. (Diagram courtesy of Michael Steven.)

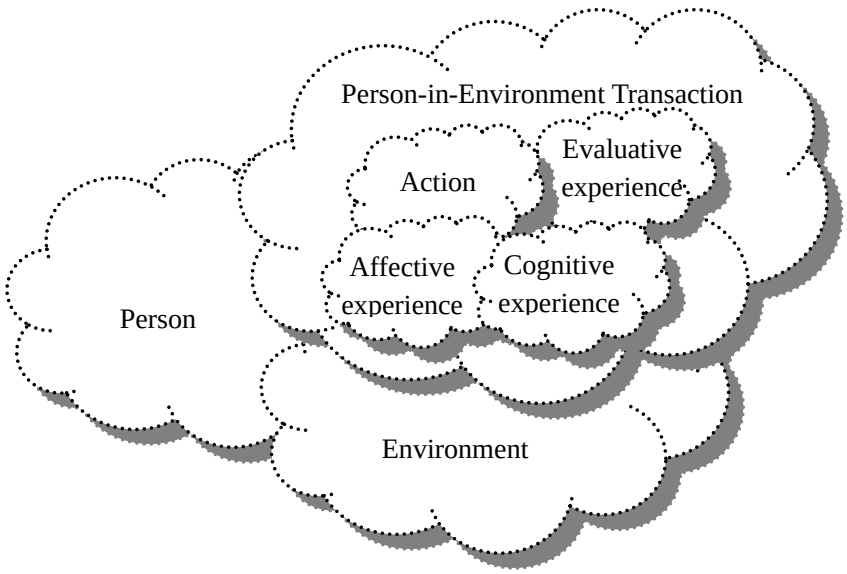

Figure 11. A "cloud" diagram of transactionalism, based on Wapner's (1987) theory and an earlier diagram by Moore (1989). (Diagram courtesy of Michael Steven.)

Error!

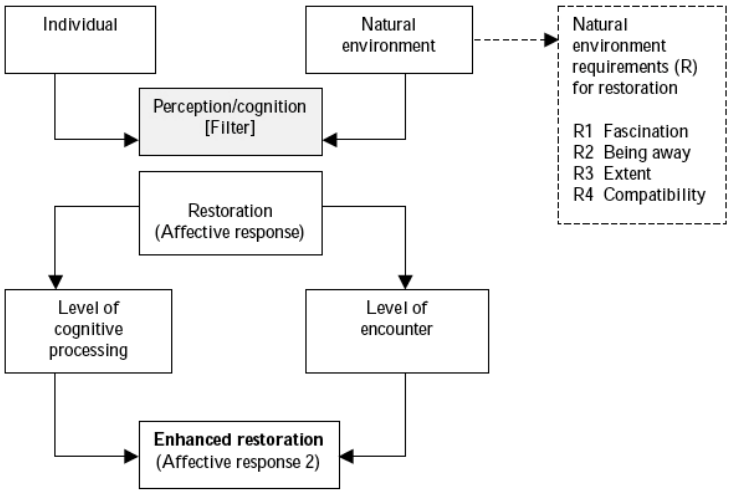

Figure 12. A new model of the enhanced restorative benefits of the natural environment. (Diagram courtesy of Nadia Lalak.)

Another area of research is the experience of colour contrast and harmony, such as the paper by Zena O'Connor on a new approach to environmental colour harmony based in part on Nasar's (1994) probabilistic theory of aesthetic response (O'Connor, 2004b). Her research is interesting in several ways, including that she has been doing a series of small experiments each of which is coming up with interesting findings and which will accumulate into her PhD dissertation (eg, O'Connor, 2004a, 2004c). O'Connor's research is coming to the conclusion that there is so much variability among people in their perception of colour contrast versus harmony that it is not possible to come to a prescriptive colour harmony conclusion. In contrast, therefore, she is suggesting a new digital methodology and sorting tasks to elicit the particular colour harmony preferences of different groups of people. She currently is extending this research to investigating the role of colour contrast and harmony for restorative environments, to be presented in a paper at the 2005 EDRA Conference.

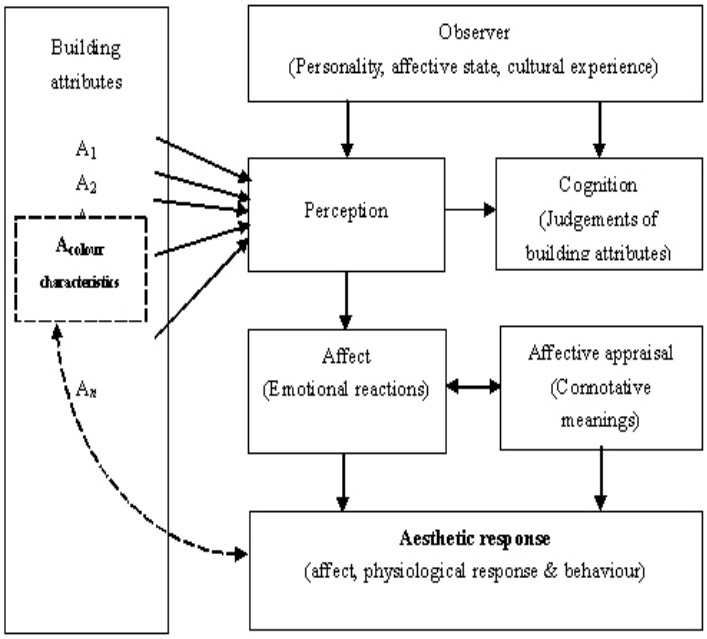

Figure 13. Based in part on Nasar's theory of aesthetic response, a model showing how changes in one building attribute – colour – may have an impact on aesthetic response. (Diagram courtesy of Zena O'Connor.)

3. A third area of EBS research at Sydney concerns ***social and cultural factors in architecture and urban planning*** including culturally appropriate, social and elderly housing, issues of homelessness and improving the life of slum dwellers, EBS issues in vernacular architecture and transitions between tradition and modernity in relation to socio-political processes (Rubbo, Lu, Moore, Alla, Sevilla, Tan and Toland).

The newest member of our academic faculty, Dr Lu Duanfang from Tsinghua and Berkeley, has been studying questions of ethnic identify, social values and urban form, with special attention to China (Lu, 2003, 2004a, 2004b) but also in Vancouver (Lu, 2000). Various theorists have influenced her work – some like Freud not commonly used in the EBS field, and some like the theory of social capital of Bourdieu (eg, 1984; cf Portes, 1998) that have had a major impact on the social sciences though less on environment-behaviour studies. Her most recent work, based on Bourdieu's theory, concerns the dynamic relationship between field, habitus and social capital applied to the analysis of rural migrants' use of urban space (Lu, 2004b). She is finishing a book on changes to urban form in Beijing and elsewhere China in relation to the development of a socialist society (Lu, forthcoming).

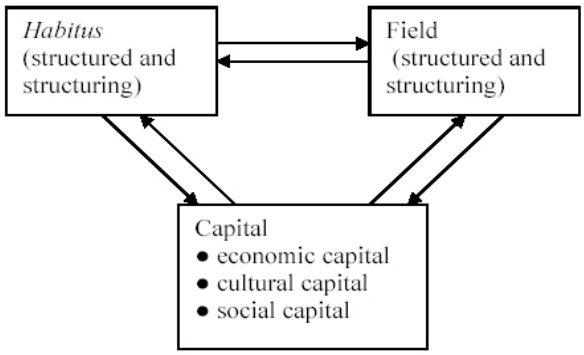

Figure 14. Bourdieu's theory of practice, showing that *habitus*, field and capital are in dynamic interaction with each other. (Diagram courtesy of Lu Duanfang.)

Other researchers in this area include two new PhD students, Jose Sevilla who is preparing to conduct research on ethnicity and housing type preferences in relation to the current urban consolidation policy of the Sydney metropolitan region, and Tan Ying who is beginning a study of tradition and modernity in high-rise, high-density housing, looking at the evolution of traditional dwelling culture in contemporary Chinese urban housing design through case studies in Beijing, Shanghai and Guangzhou.

Other work by this subgroup deals with elderly and social housing. At Wisconsin I conducted a number of studies on elderly housing, and there is a rich tradition of research on housing for the elderly emanating from the work of Ross Thorne and his colleagues in the IB Fell Housing Research Centre here at Sydney (eg, Thorne, 1986). Recent work on social housing has included our assessment of methods for the evaluation of the social, health and economic impacts of housing in Australia (Moore, Russell, Beed & Phibbs, 2002), Isabelle Toland's (2001) honours thesis on social housing in France and the *unite d'habitation* concept in particular, and Dominique Alla's (2003) honours thesis on social housing in Shanghai.

Closely related to this is an important area of work lead by Associate Professor Anna Rubbo on culturally appropriate housing and improving the lives of slum dwellers, both a part of her commitment to social responsibility in architecture, urban design and planning. Rubbo and her students adopt a combination of scholarly, action and participatory planning and design research methods. Recently she has completed some work in Indonesia (Rubbo, 1997) and on homelessness in Australia (Rubbo, 2001), the latter an interest also of Lu (cf Bridgman, 2003).

4. A fourth area focuses on ***environmental comfort, satisfaction and productivity*** including environmental sustainability (Rowe, Leifer, Fahy, Kuo, O'Donnell, Sugiyama and Wittig). Lead by David Rowe, this group has been looking at comfort, satisfaction and performance in work place settings as a function of indoor environment ambient qualities (air temperature, mean radiant temperature, relative humidity, air velocity, air quality, etc.). As part of this, Rowe has been looking at thermal comfort in naturally, artificially and mixed-mode office environments. Basically they find, including from longitudinal studies, that temperatures in the range from 20.2-26.2 degrees C are acceptable to 80% of the population (Fahy & Rowe, 2004), but while most workers are able to adapt to a range of temperatures by passive means, those with access to supplementary hearting or cooling use it actively to adapt their environments (Rowe, in press) and express greater satisfaction and comfort. Rowe and his colleagues have demonstrated, across a number of studies, that hybrid or mixed-mode ventilation, that is, a combination of occupant-controlled supplementary cooling/heating systems with operable windows, are significantly less expensive in capital and operating costs but, more significantly, lead to higher levels of thermal comfort, perceptions of higher air quality, higher levels of satisfaction and greater perceived positive effects on performance (Rowe, 2000, 2003a, in press).

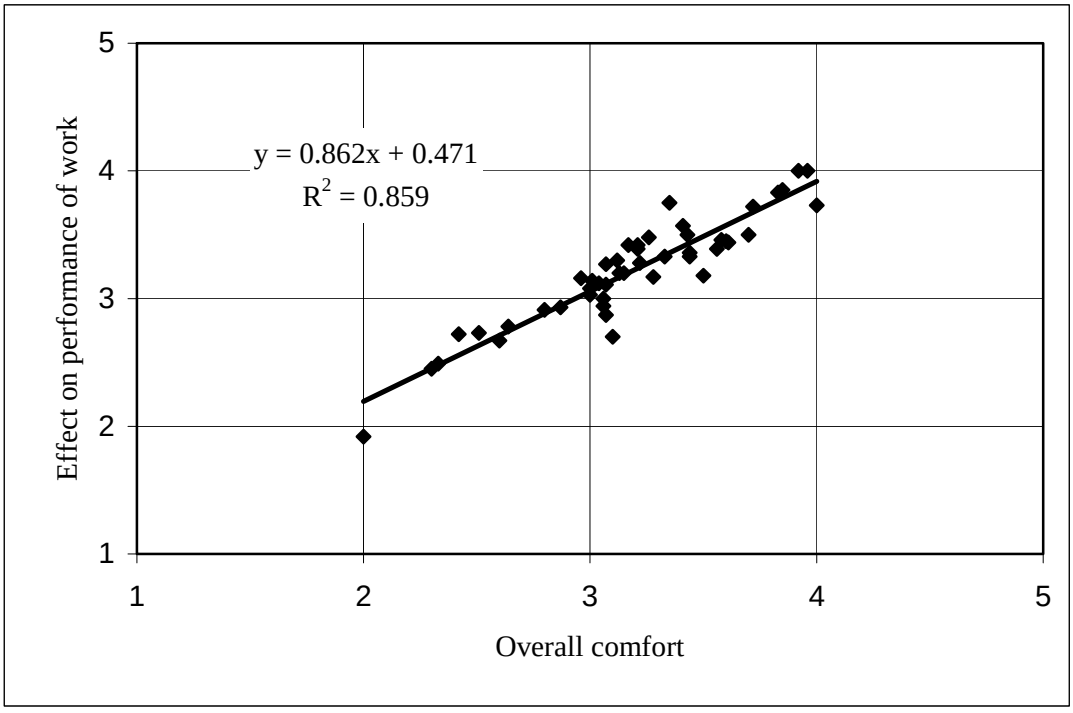

Figure 15. The relationship between overall comfort in indoor work environments and the effect on work performance. (Unpublished data; diagram courtesy of David Rowe.)

Dr David Leifer's research is looking at these and other links between employee productivity and features of the workplace using a number of different performance indicators of productivity in relation to organisational and physical environmental traits of the work place.

Other research has looked at issues of attitudes toward environmental sustainability (Sugiyama, 1999, 2002) and actual ecological behaviours (Kuo & Purcell, 2003; Wittig, 2004). The many questions of the environmental sustainability is an area we hope to develop as part of an emerging strength in the Faculty across urban and regional planning, environment-behaviour studies, architecture and architectural science. We see this as an emergent area of research that tries to link global environmental issues to ecological behavior, that is, ways to promote favourable ecologically attitudes and behaviour in order to achieve conditions for sustainable development.

5. Lastly, in terms of substantive research, is a fifth collection of research which integrates across the above steams, namely research being done on ***environment, behaviour and social issues in the Asia-Pacific*** (Lu, Alla, Ernawati, Kuo and Tan). Among the several topics being explored in this area are the studies mentioned above by Dr Duanfang Lu on social and cultural factors in architecture and urbanism, but also Dominique Alla's (2003) honours thesis on cultural values and habitats in Shanghai housing. Jenny Ernawati has been concerned with the conflict between heritage tourism and historic preservation in many areas of the Asia-Pacific. As a case study, she is comparing visitor and resident impressions and evaluations of Kampong Taman Sari in Indonesia. Gina Chin Chin Kuo's work has been looking at global environmental issues in relation to the role of Chinese culture in forming Taiwanese ecological attitudes and behaviour (Kuo & Purcell, 2003).

We see this as an emerging area of research strength for us. Given our position on the Pacific Rim, and our easy adjacency to much of the Asia-Pacific, the Faculty and our group has a strategic interest in and commitment to further research that addresses environment, behaviour and social issues that are important to architecture, urbanism and the quality of life in the Asia-Pacific region.

6. We can also discern a sixth, emerging body of work that specifically concerns the development and testing of ***improved theories and methods for EBS research and utilization*** including methods of post-occupancy evaluation, programming and strategic planning, and methods of both qualitative and quantitative research (Moore, Bishop, Lulham, O'Connor, Steven, Sugiyama and Wittig).

Some of my own recent work has focused on producing a set of psychometrically tested scales for the assessment of early childhood designed environments in terms of their developmental appropriateness (Moore, O'Donnell & Sugiyama, 2003). But the research students have been the most creative in discovering and developing new methods to suit their research questions. For example, Zena O'Connor has developed a new method of environmental colour mapping using digital technology. Based on Wood's "Environmental A" (Wood & Beck, 1976), Michael Steven has developed a new method, called "Environmental N" for eliciting and assessing the environmental experiences of people in natural areas.

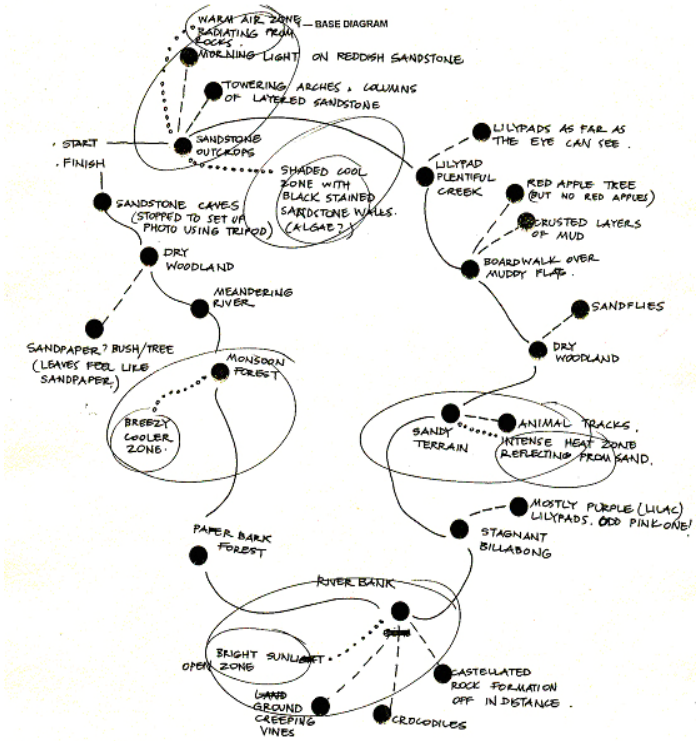

Figure 16. Part of *Environmental N* by Michael Steven for eliciting and recording people's experiences of natural environments. (Diagram courtesy of Michael Steven.)

Rohan Lulham has been working with Anna Rubbo to develop a post-occupancy evaluation (POE) method that is useful for quick assessments by architects of the physical environment in relation to social interaction. The method, based on the walkthrough method developed in New Zealand by Kernohan, Gray, Daish and Joiner in the 1970s (cf. Kernohan et al., 1992), can easily be fed into the design process. Lulham has also been developing a series of other innovative techniques for EBS research, including new computer tools for "clean" behavioural mapping and ViRQuest, a 360-degree desktop virtual reality visualisation and computerised questionnaire method (Lulham & Clayton, 2004). Jutta Wittig, while studying with us as a research intern from the Technical University of Eindhoven in the Netherlands, brought to our attention Rasch scales which she used in her work on ecological behaviour in different cultural groups (Wittig, 2004). Kate Bishop and Michael Steven, working firmly within the naturalistic qualitative research paradigm, have both developed innovative new methods for data collection that respect the experiences and feelings of the participant, and which allows careful, systematic and trustworthy analysis of the data.

Figure 17. ViRQuest by Rohan Lulham and Justin Clayden – a 360-degree desktop virtual reality computerised questionnaire method. (Photograph courtesy of Rohan Lulham & Justin Clayden.)

The research of our group unabashedly uses a variety of different research approaches – quantitative and qualitative, experimental to case study, formal, calibrated survey research instruments to intensive semi-structured interviews using lots of props, and highly sophisticated quantitative and qualitative methods of data analysis. It is not surprising, in this context, that there is considerable interest in exploring and developing novel methods that can lead to greater trustworthiness in findings and interpretations.

Conclusions

Different theoretical approaches? Or a few integrating threads? While our methods are diverse, and while there is a great range of theories and theoretical directions in the field, the predominant theoretical stance being taken in our work is a combination of *interactional-constructivist theory* with a recent overlay of the *theory of* social *capital*. There are important exceptions to this, like Michael Steven's adoption of Wapner's (1976) person-in-environment transactionalism, and some work which is not explicitly theoretical, but for the majority of our work, a strong theoretical foundation of interactionalism, constructivism and social capital underpins it and gives it theoretical integrity.

Diversity? Or combinations and triangulation of research methodology? How may we view the research in methodological terms – what are the major methodological approaches of the Sydney research? I have tried to show above that there is a richness and diversity to methodological apaches. But a binding feature, and one that we take very seriously, is the combination and even more so, the *triangulation* achieved by using different methods to look at problems from two or more different directions, greatly improving the trustworthiness of findings.

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