POST OCCUPANCY EVALUATION OF SUSTAINABLE SCHOOLS AND CHILDREN'S WAYS OF KNOWING: NEW DIRECTIONS IN TEACHING AND RESEARCH.

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INTRODUCTION

Architecture is now more than ever dominated by scientific method. This paper examines what is really at stake when designing sustainable architecture. It is a methodological study and focused on science as understood in Post Occupancy Evaluation (POE) of sustainable buildings, specifically school buildings. Questions raised in this paper include the very real problem of designing for children's comfort and education in school architecture, but also much wider issues than simply those of the design of children's environments.

Children's ways of knowing, thinking and feeling, represent the antithesis of what might be considered reliable feedback about the performance of a building. Children are not considered to have the same status as adult human beings; the truth of their experience, their understanding of reality, the reliability of their data, is in question. Diverse ways of constructing knowledge are recognized by researchers, even in the field of construction, but even from the perspective of contemporary architectural theory, working with children tends to be seen as the extreme of what is possible in the co-production of knowledge. Children's contribution and their right to research has dubious significance for many, but the problem exposes a conflict between different world views at stake in design for a community, especially a community as extensive as that for a school, and for scientific method which is at the forefront of research in sustainable design and building evaluation.

Green or sustainable schools are an important site from which to explore the broad questions of changing social behaviors, inclusivity and difference—as well as the more usual reductions in energy efficiency and innovation in material production. Building performance studies, including post-occupancy evaluations (POE), are increasingly taking into account not only the performance of buildings, in terms of energy and water efficiency, but also the behavioral and social dimensions of sustainability, in order to assess the actuality of sustainable buildings, rather than simply design intent. Within the field of construction research, scholars are increasingly challenging methods adopted to collect performance data, questioning tools and measures, and highlighting the complexity of the impact of any building in its environment, including its social or economic contexts. Innovative ethnographic and art-based research methodologies are being adopted as examples of new ways to examine building users' relationship to their environments and this has included building contractors' experiences (Pink *et al* 2010). Nevertheless, these are experimental studies with little exploration as yet, and little impact on the industry and professions.

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THE RESEARCH QUESTION

The need to create new ways of being in relation—new ways to inhabit—is not in question, nor is the role of the built environment in this task. So why concern ourselves with the rights of children and their right to research with us within this context? Confronting methods of scientific norms and accounting perspectives that promise to build future ecological worlds are difficult challenges when faced with the contemporary biases of the profession towards science and engineering methods. New methods of research are needed, together with contemporary scholarship that can critically and carefully examine the claims made about such methods. However, while contemporary evaluation methods that adopt alternative research methodologies could foster democratic as well as environmentally aware designed environments (and in my own scholarship I have carried out studies with children in their own school environments to demonstrate how different POE approaches can be directed to address superficial tools adopted to design green or sustainable buildings, or "green wash") confronting the professional concerns, as well as the limited expectations of architects working in sustainable design, is not an easy task for the researcher seeking case studies (Wheeler & Malekzadeh, 2015). However, this is not the focus of this paper; rather, I would like to critically explore the philosophies of research that underpin new methods, including those that foster deeper user involvement, with the example of children, to recognize the importance of respecting different forms of knowledge production and question the limits of this aspiration.

The research question is thus one of how can we challenge methods in architecture, methods in design evaluation, to make them inclusive? Every research method contains philosophical assumptions, worldviews, epistemologies, ontologies, paradigms, beliefs, as well as direction on procedures. The field of architectural science has, however, barely engaged with such questions of research methodology and its implication for understanding the environment we live in. This is the sort of work that Fielding (2017) suggests is necessary in order to counteract the dominant and exclusive perspective of the "grand challenge" and to set the problem of environmental thinking back into the particular or the day-to-day (Fielding 2016). It also forwards Appadurai's (2006) view that being able to research our own social world is a basic human right: the right to research being "the right to the tools through which any citizen can systematically increase that stock of knowledge which they consider most vital to their survival as human beings and to their claims as citizens" (Appadurai 2006, 168). Furthermore, Fielding writes, while the rhetoric of our time may not suggest it, positivism is in crisis: "[w]here grand challenges touch on what humans think, feel and do, our craving for experiential data, for people's stories' can only be met by qualitative exploration (Fielding 2016, 25). Beck and Sznaider (2006) also call to 'bring sociology back to its subject matter—reality' (Beck & Sznaider 2006, 22); away from normative approaches that ignore the banal forms of everyday life.

Moreover, the educational importance of as Gómez-Baggethun & Reyes-García (2013) state: 'the capacity to generate and apply knowledge that enables actions and adjustments in response to current and future changes, and therefore it is the capacity to generate and apply knowledge—and not the knowledge itself—that contributes to increase the resilience of a socio-ecological system' (Gómez-Baggethun & Reyes-García 2013, 646).

As architects, we need to contest what is meant by sustainable design and sustainable life-styles, of course; and yet this is not common practice. We need to propose new ways of inhabiting, for sure, but we also need evaluation tools, including radical educational objectives: those that can educate and activate users and professionals alike in the problems of sustainable design.

We need to be able to engage, in a scholarly manner, with superficial propositions made about our environmental future and to allow communities to explore futures that demand both social and technical change. As architects, we have this potential, and user feedback can significantly transform the ways we do design. However, architects are notoriously bad at listening, bad at self-criticism and at taking feedback (and, without doubt, especially from children).

THE RESEARCH METHOD IN SUSTAINABLE DESIGN AND POST OCCUPANCY EVALUATION

Post-occupancy evaluation (POE), defined as a process of evaluating buildings, is a systematic way of assessing them after they have been occupied for some time (Gonzalez et al., 1997). It has traditionally been understood as a tool aimed at continuous improvement in design (BRI, 2001; Preiser, 1989; Zimmerman and Martin, 2001); and it has become an important factor in the building process (Preiser, 1995, 2001, 2002). While feedback characterizes the tool and the purpose, simply stated, its aim is to help practitioners avoid mistakes. Critical conversation within the profession about the methods of approaching this feedback process, and about the quality of information obtained, has, nevertheless, led to questions about how users might best be consulted and how they might be educated at the same time about issues (for example sustainable design) in order to obtain good quality responses. But what pedagogic attitudes or 'teaching' approaches should be adopted in such an educational practice? What best responds to the needs of the problem if it is education for sustainable design? The issue is determining how post-occupancy methods, seeking to engage communities to participate in research, and in a critical and authentic manner, can help build responsible relations to the built and natural environment?

POE could be transformative. It could elicit information about the performance of a building, and about the feelings of users, in a way that is inclusive. It could include the feelings of children, parents and teachers. This could be POE rethought within the affective turn within the current humanities. This could be: a POE method that while collecting 'data' at the same time transforms users thinking and feeling; POE that collects information and is educational in thinking and feeling; POE in its approach that calls for creativity in new ways of living, new ways of inhabiting; and, that acknowledges our connection to the environment on the level of feeling. However, this could also suggest the emergence a new way of co-existing.

Critical design in architecture and critical spatial practices are directions in research gaining some ground as methods in architectural design. However, while such projects suggest visual and spatial engagement with users and are aimed at transforming thinking about, or challenging action on, a certain issue of topic, these methods are aimed not so much at activating a community, but rather the intention is *poïetic*. They aim to evoke new meaning, new ways of thinking and feeling about our relation to our environment and to other humans and non-humans. Critical design as method does not typically engage users in research, nor typically does it address questions of who gets to speak or who gets to have a say in the critical design—who gets to make, create or evoke new meaning.

However, current methods in research to evaluate buildings after occupation, focusing on user experience, can include a wide range of approaches, such as energy use data and the performance of systems, surveys to collect the quantitative data, and open-ended questionnaires for more qualitative information. They can also include building walk-throughs and facilitated

discussions. Research projects that have recently adopted such mixed methods to evaluate contemporary school buildings are growing in number (Ahmadi, *et al.*, 2016; Choi *et al.*, 2012; Sanni-Anibire et al., 2016). Furthermore, the benefits of approaches to user participation to the construction industry are gaining interest and have been reviewed by scholars (Kim *et al.*, 2016). Nevertheless, POE could also include innovative ethnographic methods, including video ethnographic, and visual data collection methods. It could even include sensory ethnography but these methods suggest different philosophical presumptions than those current within the profession.

SENSORY ETHNOGRAPHY AND POE

Sensory ethnography can be used to collect information from the often undervalued dimensions (Pink *et al.*, 2009) of building design and research. Such methods have some importance in challenging the reductionism of the dominant methods in sustainable design. After all, we connect to our environments more powerfully through our senses and bodies than through information or data: this is the everyday dimension of our environmental experience. Pink *et al.* write: '…ethnographic methods in building design research can make visible informal worlds of actions, interactions and ways of knowing that can easily slip under the industry (or official) horizon of notice' (Pink *et al.*, 2010, p. 258). Sensory methods, therefore, have radical and even political potential in the context of sustainable design for engaging architects and communities with questions of environmental change and extreme weather events, and in ways which impact more directly than information or data. Sensory ethnographic perspectives could offer educational potential to show not only how children (and the wider community) interact with the school environment but also how children and the community can reconnect to the natural environment through the senses. These undervalued sensory dimensions in building research are ways to reevaluate our human built and natural environments; however, as Pink *et al.* (2010) have stated, 'Ethnography is a serendipitous craft: ethnographers often expect to learn precisely when they are least expecting to… what is learned goes beyond what could be said in an interview and can only be known by being there, as events unfold' (Pink *et al.*, 2010, p. 658). In the context of building design research, the most immediate focus of such a sensory ethnographic approach is the feeling of how we are in place, and how children in their school feel place. However, even place making is no simple matter, whether thought of as *poiesis*, nor with the perspective of a different form of eco-phenomenology inspired by feminist philosophy, nor with child development approaches that could inform sensory ethnographic methods.

As Pink writes: "doing sensory ethnography entails taking a series of conceptual and practice steps that allow the researcher to rethink both established and new participatory and collaborative ethnographic research techniques in terms of sensory perception, categories, meanings and values, ways of knowing and practices" (Pink, 2009, 10). Thus, while observing has always involved the senses, sensory ethnography suggests a re-evaluation of senses in rethinking and establishing new participatory or collaborative methods: rethinking the very paradigms of ethnography which sought to understand methods through reflexive, and even more recently gendered and embodied perspectives.

THEORETICAL BACKGROUND

Sensory ethnographic methods are thus alternative ways of seeking to understand and engage with other people's worlds through the senses. The theoretical background to sensory ethnographic

research is broad, and if we were to examine the philosophical underpinnings, the claims to ethics and inclusivity, there is scope for criticism. Pink (2009) argues that sensory ethnography is not just another approach in what is a fragmented collection of tools that constitute ethnographic practice. Rather, it is a critical methodology which departs from traditional observational methods as a reflexive and experiential process through which understanding, knowing and (academic) knowledge is produced. Sensory ethnography, she argues, requires methods that are capable of grasping the sort of knowledge that is not spoken and that is inaccessible to observation or interview (Pink 2009, 8). Furthermore, the approach is open to multiple, new routes to knowledge. As a definition of ethnography. Pink writes:

> Ethnography is a process of creating and representing knowledge (about society, culture and individuals) that is based on ethnographers' own experiences. It does not claim to produce an objective or truthful account of reality, but should aim to offer versions of ethnographers' experiences of reality that were as loyal as possible to the context, negotiations and intersubjectivities through which the knowledge was produced (Pink 2007, 22).

While ethnography can be described as a comparative project in its comparison of cultures, it can also be the creative interweaving of experience and how this affects people's perceptions of the world around them (Ingold, 2000, cited by Pink). Sensory ethnography, in this context, evokes difference in bodies and in our cultural understandings of bodies. It alludes to understanding of environment through the sensory experience. While Ameland and Beck (2010) argue cultural experience is shaped by the knowledge practices we use to understand the world, such boundaries between cultures are fluid and so is the sharing of cultural and cross-contamination of perspectives in creative production, stating: "Cultures are not only connected *nolens volens* [willing or unwilling] they are intrinsically relational in the generative sense: comparison is a mode of cultural *poiesis*" (Ameland & Beck, 2010,156). Tim Ingold (2000), by contrast, places perception at the center of sensory ethnographic experience.

CHILDREN, ENVIRONMENT AND SENSORY ETHNOGRAPHY

So what about children's gendered and embodied sensory perspectives? What if we were even to add this contested idea to the educational environment? What about the interweaving of our experience, and children's experience; the co-creation of experience and examining how this affects perceptions of the world, in this case, the world of the school that truly includes the complexity of experience? The study of method is one of philosophical assumptions, worldviews, epistemologies, ontologies, paradigms, beliefs and an examination of them. Identifying a democratic and critical method (in the sense of one that both educates and activates and includes children) has to be critical of existing methods. Democratic education, and democratic pedagogy, suggest approaches that place children's freedom, and accountability to environment, at the heart of development. Children's rights' activists campaign to make decisions that have an effect upon their day-to-day lives; they campaign for children's voice in decision making. Sensory research and sensory ethnography, nevertheless, also reexamines the felt, and the importance of the co-construction of feeling within this context. This means the right to have a felt connection with the built and natural environment and the community. Feminist theory, an important contribution to the development of sensory ethnographic methods, adds the dimension of gender difference to our relation to place making.

Environmental Ethics and Sensuous Scholarship

So how does our environment make us feel? And what is the importance of this sensory dimension in our sustainable built environments? How can an environment engage and communicate radically democratic ways of being in the world through rethinking this sensory dimension and educating in the sensory dimension? The questions are deep and are clearly positioned within arguments over philosophy of research and in 'sensuous scholarship' (Stoller, 1997). Furthermore, the work of Gernot Böhme, especially his work on eco-aesthetics (*ökologische Naturästhetik*), provides a theoretical foundation for a sensory relationship with nature and its importance for environmental design (Bohme, 1995). Böhme's philosophy has been influential upon practicing architects and theorists alike, and in his eco-aesthetics he argues that nature is not something we have left in our becoming civilized; the natural in us is not to be overcome but rather nature must be recognized as our partner and we should gradually adapt to such a partner relationship. Environmental conversations must recognize that we care about nature because it affects us, it has been affecting us, and will continue to affect us. We sense it with our bodies and, he argues, that finding ourselves involved in environmental degradation, it is our own nature that is being affected. (Wang 2014). What counts, then, is that we rediscover our identity as natural beings '…and develop the consciousness that body is the nature that we ourselves are (*Der Leib ist die Natur, die wir selbst sind*)' (Wang, 2014). However, Luce Irigaray's work (as a philosopher of almost the same age as Böhme) distinguishes a further question that concerns women and men's bodies, their different relationality to the environment, in a positioning that reexamines sexual difference as a radical reconsideration of the difference between men and women in relation to environment and others. The freedom for girls to develop in their own ways is, for Irigaray, a matter of reality, a matter of nature and culture: a reality that recognizes difference in the natural environment and recognizes the artificiality that constructs notions of ourselves in relation, either neutral in experience or inferior in difference (Irigaray, 2017).

RADICAL POE

The significance of such radical thinking about our bodily relationship to the natural environment, to nature itself, is in critically evaluating claims of new methodologies and new ways of approaching user experience to address the development of children. However, the question is not only about children: it is about us and about the school community. It is about the multiple realities of environments, and the emotional interrelation of 'users', other 'users', and environments. It is about how we might analyze the interweaving of experience, and how this affects perceptions of the world and others around. What it brings to the discourse of architecture, to current writings on POE, is the possibility of a radical and critical 'method' towards co-existence. This is just what could be proposed in architecture with POE methods, and moreover, such a theoretical or philosophical background proposes radically inclusive 'democratic' methods.

DEMOCRATIC POE AS A CRITICAL METHOD.

Nevertheless, evaluating user satisfaction in ways that are open to elicit information beyond traditional methods could raise fears of risk to professional reputation and financial loss if evidence for fault can be attributed. Stories from children could be dangerous to professionals. Issues concerning the validity of user data in the architectural and architectural engineering context will inevitably emerge but I would like to suggest that sensory research is key to opening new ways of thinking and feeling about ourselves, our environments and others. Confronting the

dominant methods of scientific and engineering norms of research in architecture is also a grand challenge for architecture but the research field also has a responsibility to present the case to the profession. Innovative sensory approaches have the potential to address the "green wash" of many sustainable buildings by engaging with the actuality of how users feel in buildings, by engaging in the reality of our co-existence, co-relation with the natural environment; but the question becomes whether architects or other building professionals could or would use a post-occupancy tool to elicit such information.

CONCLUSION

Evaluation tools that include radical educational objectives, allowing communities to explore futures that demand both social and technical change, have potential, through their feedback, to significantly transform the ways in which architects design.

In this paper, I have examined how contemporary evaluation methods indicate different perspectives on improving the environmental performance of buildings. The main lesson learnt is that it is important that we are able to contest the meaning of sustainable design at the level of worldviews, epistemologies, ontologies, paradigms, beliefs, as well as direction on procedures, to develop evaluation tools that include radical educational objectives. The challenge I pose is that we re-evaluate the sensory dimension and how we feel about our environments.

The second lesson learnt is that POE approaches can be developed to critically approach sensory ethnography to address the superficial agenda persistent in the design of "green" buildings. Schools are one of the first built environments that individuals encounter. These environments can have a strong impact on children, as well as families and communities, in their awareness of environmental sustainability. Feedback mechanisms provide some of these opportunities but their real potential lies in engaging communities, including school communities, by exploring how the whole community feels in their environments. Future research in POE has the opportunity to direct some attention to the potential POE has to transform living. This is the hopefulness we need, the hopefulness in method, the hopefulness to be able to change thinking and feeling, to change living.

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BIOGRAPHY

Trained as an architect and a research engineer, Professor Andrea Wheeler graduated in Architecture from Plymouth University in the UK with a professional Bachelor's degree in architecture and from Oxford Brookes University with a professional graduate diploma in architecture. She gained a research M.Phil. from the School of Mechanical Engineering, Oxford Brookes University, on timber engineering in 1998, and was awarded a Ph.D. from the University of Nottingham, School of Architecture, in 2005 in architectural theory. Her postgraduate research degrees were both funded by highly competitive scholarships, the first from the Timber Industry (TRADA) and the second from the British UK government Arts and Humanities Research Association (AHRA). She was further awarded a prestigious three-year UKERC/ESRC interdisciplinary fellowship. She has worked as a senior research fellow for the central UK government in a policy research unit at Defra London, devoted to developing community initiatives to encourage sustainable behaviors and lifestyle change; and in Loughborough University, Department of Civil and Building Engineering, as a post-doctoral researcher working on post-occupancy evaluation. In 2007 Professor Wheeler established her own design research company, White Buffalo Eco-Designs Ltd., which won government start-up support, and was mentioned in a National newspaper, *The Telegraph*. Professor Wheeler's scholarship at Iowa State University continues to challenge the sustainability agenda in architecture

at a number of different levels. She is passionate about creating sustainable buildings, about the actual performance of buildings, the social science of motivating lifestyle change, the educational role of design, and the potential for an ecological aesthetics of architecture—a discussion that is currently largely absent within the field of sustainable design. Professor Wheeler has been invited to present her work on architecture on multiple occasions at international conferences, hosted by the world-renowned philosopher Luce Irigaray. She has a chapter in review for a forthcoming publication edited by Luce Irigaray, and a number of papers based on conference presentations in review for academic journals. At Iowa State University, she teaches the new interdisciplinary Masters of Sustainable Environmental course, a colloquium class encouraging engagement with theories of sustainable development and facilitating conversation and debate around the role of sustainable design in motivating change.