

ENABLING OWNER-OCCUPIERS TO RETROFIT: A PRACTICE-BASED STUDY OF ARCHITECTS' EDUCATIVE ROLE

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INTRODUCTION

Globally, buildings contribute approximately to 40% of CO₂ emissions, and almost half of this share comes from homes.¹ In the UK, homes are responsible for 58% of buildings' emissions,² around 85% of which results from the operational energy consumed to run homes and perform routines. Heating is at the top of this list, accounting for 82% of domestic operational emissions.³ Therefore, most climatic benefits can be made by targeting energy use for heating. The low rate of housing replacement in the UK means that energy transformation must target existing homes to drive meaningful change.⁴ Owner-occupiers must be a priority as they constitute around 63% of existing housing stocks and have the highest number of inefficient properties.⁵ However, installation of low-carbon measures amongst this group has remained below the required rate to mitigate against global warming and avoid further catastrophes.⁶

Reaching owner-occupiers as key decision-makers is often attempted through educational programs.⁷ However, the failure of top-down educational strategies has highlighted an alternative approach that links learning with making sense of energy efficiency within the complex of everydayness and through personal connections.⁸ With regards to domestic retrofitting, this translates to exploring retrofitting in complex interactions of owner-occupiers with a network of suppliers, regulatory agencies, and building professionals.

This paper defines retrofit as upgrading existing house components to improve energy use.⁹ The study explores retrofitting as a process of sense-making and adaptations within broader topics, extending beyond merely technological concerns.¹⁰ Previous studies used social practice theory to explore how retrofitting practices develop and highlight architects' strategic role in promoting these practices among homeowners.¹¹ The current research draws on praxis-oriented approaches, which emphasize the sociality of practice formation to comprehend situated contingencies of accomplishments.¹² By understanding learning as being steered into practices, it explores architects' role in enabling owner-occupiers to retrofit.¹³

EDUCATION FOR ENERGY EFFICENY

In the absence of direct legislation, considered too intrusive and expensive to exercise, attention has been focused on encouraging homeowners' voluntary adoption of low-carbon measures.¹⁴ Voluntary actions have been connected to environmental education since 1960.¹⁵ In response to the energy crisis of the 1970s, educational strategies were employed to encourage energy-saving activities among

homeowners.¹⁶ Previous studies have documented and reviewed these approaches.¹⁷ However, the emphasis on categorizing methods has overshadowed the underlying perceptions that associate learning with energy efficiency.

In general, education relates to energy efficiency either for encouraging engagement or enablement. Education for engagement sees energy efficiency not as a one-way exercise and as a rational choice. Therefore, disengagement is linked with homeowners' lack of awareness or attitude, and learning is considered the natural solution to address these shortages. Information deficit models link disengagement with a lack of awareness; assuming “knowing better” results in “acting better,” these models employ information provision campaigns.¹⁸ In contrast, behaviour models see the deficiency as residing in attitudes. However, instead of directly amending attitudes to elicit engagement, the resulting dissonance of engaging in actions is seen to carry a moderative influence on attitudes. This is often followed by altering external conditions for desirable behaviour to emerge. Accordingly, behaviour models utilize incentive-based feedback as the primary strategy.¹⁹ Educationally speaking, in addition to cognitive development present in information deficit models, the behaviour change approach has elements of conditioning (Table 1).

Type	Identified Deficiency	Approach	Educational Concept	Strategy
Information Provision	Knowledge	Direct Learning to Result in Better Actions	Constructivism	Information Provision Campaigns
Behaviour Change	Attitude	Indirect Incentivizing Desired Actions to Result in Learning	Behaviourism and Constructivism	Incentive-Based Feedback

Table 1. Types of Education for Engagement in Energy Efficiency

Although, in government circles, engagement is conventionally viewed as an awareness issue,²⁰ current UK policies emphasise engagement through a combination of both approaches.²¹ However, it has resulted in a vicious circle, which associates the failure of incentives with the lack of awareness and connects the incapability of information campaigns to the absence of personalised support.²² Consequently, owner-occupiers remain mostly disengaged from such messages. But even in the case of possible engagement, other studies highlight these strategies' short-lived influence²³ whilst underlining the unethicity of persuading others into desirable behaviours.²⁴

Alternative approaches seek more ethical and lifelong education strategies to promote enablement. Here, the aim is not to raise engagement as the means to an end. Rather, the very act of engagement is seen to cause a greater understanding and ability to change the process.²⁵ Hence, there is a strong connection between learning, participation, and personal development, which some scholars call developing "playability."²⁶ Accordingly, learning is not anchored on what others consider essential for the performance of actions at present but is determined by the requirements of future situations.²⁷ This highlights an educative role that cannot be filled by the state, nor can it be dictated to individuals, as occurs in deficit models of engagement.²⁸ Instead, it is reserved for individuals inhabiting the sites of actions, that through successful communication, expand learners' capacities to take charge of their own lives.²⁹

Therefore, education for enablement connects retrofitting to Vygotsky's sociocultural theories of human learning, which assert that interactions with others lead to increased potential.³⁰ In energy research, community-based models particularly explore the potential of social interactions to

encourage the voluntary involvement of owner-occupiers in retrofitting.³¹ However, recent findings highlight the limitations of energy groups in reaching broader public and identifying the most efficient retrofit solutions.³² Therefore, a growing number of studies are concentrating on the educative aspect of building professionals' interaction with homeowners,³³ among whom the educative role of architects has been continuously emphasised.³⁴

ARCHITECTS AS EDUCATORS

In deficit models, experts fill the gap in laypeople's knowledge, whilst, in education for enablement models, they are contributors to problem-solving efforts and are open to criticism.³⁵ The significance of architect's role is often attributed to their close relationship with clients and early involvement in the briefing stages of projects.³⁶ In addition, emergent findings illustrate the entanglement of low-impact technologies with patterns of dwelling, which architectural knowledge is strategically positioned to identify and resolve.³⁷ However, despite this emphasis, the educative role and potential of architects has remained underexplored.

The inability of energy research to frame the role of architects results from two gaps in the literature. The first gap relates to confusion around incorporating education into architects' professional practices. The "agency" of experts is often explored within the concepts of "middle actors" or "intermediaries." The former attributes agency to experts' knowledge which positions them in the middle of the social structure. Hence, experts are seen as intentional agents or "actors" capable of influencing homeowners in lower layers.³⁸ From the intermediary perspective, this agency is not given but is formed through connections of bodies in the network, which often concerns experts as careers of capabilities rather than intentional actors (Table 2).³⁹ Nevertheless, both concepts are fixated on tracing agency within systems that ignore happenings in proximally situated interactions that are considered the source of influence.⁴⁰

Concept	Understanding of Agency	Understanding of Agent
Intermediary	Interconnection of Bodies	Carrier of Capabilities
Mediator	Position in Social Structure	Intentional Subject

Table 2. Architects' Agency in Existing Conceptual Frameworks

The second gap, which is more methodological, is to see how learning travels from architects to owner-occupiers' practices. Previous studies identify potential for the contribution of "social practice theory" to explore this diffusion.⁴¹ Practice theory explores the formation of practices and their reproduction in a broader social context.⁴² Hence, bringing the theory to bear on education links learning to the augmentation of operability.⁴³ However, scholars noted that the implications of practice theory in education have mainly been limited to self-learning. As a result, the impact of interactional dimensions in expanding competencies is overlooked.⁴⁴ Similarly, although practice theory is attracting growing attention in energy research,⁴⁵ the same gap has made experts' influence invisible.

APPROACH AND METHODS

To better understand how architects' sayings and doings affect the personal growth of homeowners, the study adopts the concept of situated learning, which sees education as inseparable from where and amidst what happens.⁴⁶ The research mainly draws on the concept of "communities of practices (CoP)", defined as cultural communities residing in different situations but centred around specific

ways of knowing and practices. Education is at the heart of these communities as their existence and ability to grow depend on initiating others into these particularities and supporting members to excel in them. Hence, members actively seek to recruit freshers and to educate or learn from each other in everyday encounters.⁴⁷

Accordingly, looking at domestic retrofitting as a community of practice highlights the educational relationship between all the members involved. In the community of domestic retrofitting (CoDR), architects take on the role of educators for owner-occupiers and pass on knowledge from experienced members to newcomers in the group. However, this leverage is relative to arrangements of situations and positions of homeowners. Hence, it is inherently a non-systemic understanding of architects' educational role that works at the scale of interpersonal interactions.

This situated definition addresses the failure of systematic approaches in locating building experts' actions and closes the first gap identified above concerning the agency of architects. Additionally, grounding influence and subjectivity to the situated nature of the CoDR links the study to praxis-oriented approaches. Praxis draws on the situated contingency of practices and conceptualises learning within the momentary social formation of 'co-players' to comprehend uncertainties.⁴⁸ Schmidt observes that this new practice-turn opens room for methodological situationism, that instead of focusing on individual subjectivity or dissolving it, opens analysis to the co-formation of sensibility in social processes.⁴⁹ Hence, framing education within the CoDR resolves the second gap.

The research's analytical lens underpins methodological situationism by employing the theory of practice architecture, which draws on reflexivity and the situated nature of the CoPs. Considering that all practices are located, practice architecture explores how the history of happenings in the sites of practices and among players who inhabited them reproduce sayings, doings, and relating that characterise practices and hang together as projects.⁵⁰ Methodologically, the theory offers the possibility to trace praxis in the history of architects' and homeowners' inter-referential moves to make sense of retrofit in the constitutive dimensions of context. These dimensions include material-economic, cultural-discursive, and social-political arrangements (Figure 1).

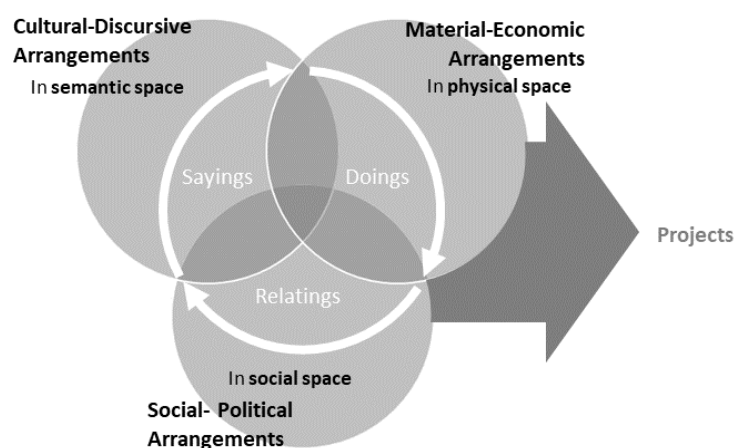


Figure 1. Practice architecture: practices bounded together in projects and context. Adopted from: Kemmis et al., Changing practices, changing education, (2013): 3, Fig 2-3.

Previous studies associated the formation of praxis around domestic energy use with changes in the physical settings of homes.⁵¹ Consequently, this paper explores the CoDRs at the periphery of domestic improvement projects that entail change and bring architects and owner-occupiers to share time and space.⁵² Architects with pronounced in low-energy design competencies were purposefully recruited to ensure their contribution to the learning community.⁵³ Through applying ethnographic

methods,⁵⁴ interactions between architects and owner-occupiers were observed and recorded or reconstructed through interviews. This paper presents findings from observing six meetings between architects and owner-occupiers regarding four improvement projects. Additionally, ten interviews with architects and six interviews with owner occupiers were conducted. The research adopted the reflexive thematic analysis, which underpins theoretical assumptions to guide the analysis.⁵⁵

EMERGING FINDINGS

Exploring learning as social processes in the CoDR shifts the focus from architects' enactments in the void to ways these educative actions can be placed in the social context. Based on the empirical findings of this study, these broad positions can be grouped into four primary roles:

Transformative Role

In this position, architects aim to change what Architect -1 refers to as "tunnel visioning", which concentrates "traditional mindsets" on pre-defined solutions. In his view, opening this limited vision to broader possibilities requires architects to focus on "endings" rather than facilitating "processes". Similarly, Architect-2 believes what pushes the brief beyond preconceptions and towards energy efficiency is "thinking long term." During their conversation with Owner-1 around an extension project, they drew on the concept of longevity to explore retrofit from action the perspective of a father trying to "make the house possible" and leaves a "statement" for his son. Architect-2, through practising design, continuously accompanied Owner-1 in testing possible actions against the backdrop of future dwellings and being a father. By repeating this process, they form a history of practices influenced by the owner's family tradition of passing on the paternal house but essentially transformed actions around leaving a precious legacy. In other words, this history of negotiating alternatives results in accumulating skills, knowledge, and values that expand Owne-1's capacities to retrofit and enable him to make more informed decisions.⁵⁶

Supportive Role

This position becomes available through conflict in-between dwelling and retrofitting. Owner-2, who has just moved to a retrofitted house, shares stories of her struggles to rediscover her thermal comfort in the unfamiliar environment of her home. She compares this experience with "learning to drive a new car", which would be smoother with architects' support. Owner-1, who decided to carry on retrofit in discussion with architects, recalls how drying out his son's shoes leaves him wondering about "drying out clothes in a house without radiators." He contacted architects for guidance. Likewise, Architect-3 gives an example of being able to discuss "where to dry out underwear(s)" as an example to illustrate architects' strategic position in advocating for sustainable energy use. In other words, interactions around design provide opportunities that fill gaps and resolve conflicts between histories of dwellings and retrofitting. This entails learning skills and knowledge that make inhabiting sites of retrofit possible. Beyond merely learning how to use installed measures, which previous studies mentioned⁵⁷ and explored the educative role of architects in it⁵⁸, education also concerns exploring learning broader possible actions that build everyday practices. In Kemmis's terms⁵⁹, this means learning possibilities that exist at sites of retrofitting as the "niche" for practices of dwelling.

Directive Role

In this position, architects play their role as carriers of capacities to retrofit. Owner-3, who identified himself as a "DIYer" and "interested in retrofit", hired Architect-4 to retrofit and be guided in conducting side projects. They collectively engage in the co-production of detailed drawings to find the best arrangements that fit the walls' existing thickness. They create a sensible action plan,

allowing for cost-effective decisions such as installing a heat pump when the electric boiler needs replacement. Hence, playing directive concentrates architects on the material-economic dimension enabling the owner to avoid sub-optimal solutions that are seen to limit the effectiveness of DIY-retrofit projects.⁶⁰ However, this does not constrain the enabling influence of architects to mere excellence in performance. Discussions around building details allowed exploring actions within the constrain of existing house arrangements to prioritize work in places with more impact on the owner's comfort and postpone disruptive ones to holidays. Playing the directive role also allows the owner to carefully plan actions concerning his position as a leaseholder or as someone "becoming a homeowner".

Therefore, discussion with Architect-4 enabled Owner-3 to comprehend the complexities of acting effectively in the material-economic arrangement and apprehend the complexities of cultural-discursive and social-political arrangements that could constrain his retrofit actions. In other words, exploring possibilities of actions within the constraints of the site through the practice of design created a history of practices that relates to the background of activities, social status, and life flow of the owner. But also, it sees "the character of the building" in its "stone pillars between the windows." Hence, in playing this role, architects direct both, homeowners, and homes towards retrofit within their historical contextual restrictions.

Preparative Role

This role is played out concerning the temporality of architects' exchanges within the CoDR and to enable homeowners to pursue their trajectory in the community. In their last meeting with Owner-4, Architect-5 expresses concern that other experts unaware of their talks can conceive the project as the usual "brick box on the back of the house." Owner-4 is encouraged to remain involved in developing detailed drawings and forming knowledge about the right finishes at the right places, which would "be really useful because a builder might not know that is the best practice". Similarly, Owner-6 utilized the architectural knowledge she gained from a two-day course recommended by her architects to translate complex detailed drawings into understandable actions for their contractor towards "the best way of insulating the windows. " Owner-5 refers to this knowledge as a resource that facilitated working with others to retrofit and explore possible solutions with other experts throughout the project. Hence, in playing the preparative role, architects educate owner-occupiers about the practice of designing. The resulting knowledge, skills, and values enable homeowners to have greater contributions to future practice architectures and the co-formation of practicality around retrofitting. This type of enablement addresses the limitations faced by homeowners, which now often require architects to work on shorter contracts.⁶¹ Also, it aligns with the systematic approach of improving communication to explore more options for retrofit solutions.⁶²

CONCLUSION

Conceptualising architects' educative role within the learning community of domestic retrofitting stretches understanding of this role beyond the top-down view of it as a means of persuasion. The study shows various educative positions that, outside the control of architects, are played out concerning ways architectural knowledge contributes to addressing situated uncertainties that constrained owner-occupiers' actions towards retrofit. Acknowledging that the infinity of possible situations results in numerous educative positions, the current study frames these roles in four primary areas. The transformative position addresses uncertainties in the relevancy of retrofitting to the traditions of dwellings. The supportive position explores the adaptivity of dwellings and retrofitting through design. The directive position brings architectural knowledge to bear on the intricacy of

retrofitting in the context of happenings. The preparative position educates homeowners in pursuing retrofit in facing future uncertainties.

The study's outcome shows that the co-participation of architects and owner-occupiers in going through alternative ways of arranging materiality to retrofit produces a history of practices. These histories form alternatives vis-à-vis embedded traditions of dwellings and expand owner-occupiers' knowledge, skills, and values to retrofitting as a broader possibility. Learnings from the history of discussions can support homeowners in low-impact ways of living by shaping the missing ring in-between practices of dwelling and retrofitting. In the process of reviewing possibilities, homeowners learn about more efficient and flexible retrofit methods that better fit their situation and practices of dwelling. Finally, these exchanges create a history of architectural knowledge that enables owners to pursue retrofit in future situations. The outcome shows that architects' situated influence does not only catalyse the installation of low-carbon measures. The resulting learning enables owner-occupiers to cultivate low-energy practices and contribute to forming low-impact communities.

NOTES

¹ Global Alliance for Buildings and Construction (GABC). *Global Status Report for Buildings and Construction: Towards a Zero-Emission, Efficient and Resilient Buildings and Construction Sector*. UN Environment Programme (2019). <https://wedocs.unep.org/20.500.11822/34572>.

² UK Green Building Council (UKGBC). *Net Zero Whole Life Carbon Roadmap: A Pathway to Net Zero for the UK Built Environment*. (November 2021).

³ *The UK Low Carbon Transition Plan: National Strategy for Climate and Energy*. HM Government, 2009. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228752/9780108508394.pdf

⁴ *UK Housing: Fit for the Future? Committee on Climate Change (CCC), 2019.* <https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/>.

⁵ Inefficiency is measured based on the EPC rating below D or worse. The milestone refers to the UK government's goal in the Clean Growth Strategy issued in October 2017 to achieve EPC Band C by 2035. There are arguments around setting a higher goal or on the efficiency of EPC ratings. Nevertheless, in both cases, that would increase the number of houses needing upgrading.

⁶ *Energy Efficiency of Existing Homes: Fourth Report of Session 2019–21*. London: Environmental Audit Committee (EAC), 2021. <https://committees.parliament.uk/publications/5171/documents/52521/default/>.

⁷ Abrahamse, Wokje, Linda Steg, Charles Vlek, and Talib Rothengatter. "A Review of Intervention Studies Aimed at Household Energy Conservation." *Journal of environmental psychology* 25, no. 3 (2005): 273-91. <https://doi.org/10.1016/j.jenvp.2005.08.002>.

⁸ Toke Haunstrup Christensen, Simon Peter Larsen, and Henrik N Knudsen. "How to Engage Households in Energy Demand Response Solutions?" Paper presented at the EEEE 2019 Summer Study on energy efficiency: Is efficient sufficient?, France, 2019.

⁹ Sheida Shahi, Mansour Esnaashary Esfahani, Chris Bachmann, and Carl Haas. "A Definition Framework for Building Adaptation Projects." *Sustainable cities and society* 63 (2020). <https://doi.org/10.1016/j.scs.2020.102345>.

¹⁰ The definition is the fusion of two takes on retrofitting as a process. The "low carbon retrofit" concept explores the process over time rather than a one-off approach. Whilst "sustainable retrofit" places the process within various aspects of retrofitting. For "low carbon retrofit" see:

Tina Fawcett. "Exploring the Time Dimension of Low Carbon Retrofit: Owner-Occupied Housing." *Building research and information: the international journal of research, development and demonstration* 42, no. 4 (2014): 477-88. <https://doi.org/10.1080/09613218.2013.804769>.

For "sustainable retrofit" see:

Ray Galvin, and Minna Sunikka-Blank. "Ten Questions Concerning Sustainable Domestic Thermal Retrofit Policy Research." *Building and environment* 118 (2017): 377-88. <https://doi.org/10.1016/j.buildenv.2017.03.007>.

¹¹ Tara Hipwood. "Understanding Low-Carbon Housing Retrofit within a Wider Nexus of Practices." *Journal of architecture (London, England)* (2021): 1-22. <https://doi.org/10.1080/13602365.2021.1925328>.

¹² Thomas Alkemeyer, Nikolaus Buschmann, and Matthias Michaeler. "Critique in Praxis Arguments for a Subjectivation Theoretical Expansion on Practice Theory." In *Praxeological Political Analysis*, edited by Michael Jonas and Beate Littig, (Abingdon: Routledge, 2017), 67-83.

¹³ Stephen Kemmis, Jane Wilkinson, Christine Edwards-Groves, Ian Hardy, Peter Grootenboer, and Laurette Bristol. *Changing Practices, Changing Education*. (Springer Science & Business Media, 2013).

¹⁴ Karen Lucas, Michael Brooks, Andrew Darnton, and Jake Elster Jones. "Promoting Pro-Environmental Behaviour: Existing Evidence and Policy Implications." *Environmental science & policy* 11, no. 5 (2008): 456-66. <https://doi.org/10.1016/j.envsci.2008.03.001>.

¹⁵ Thomas Dietz, and Paul C Stern. "Exploring New Tools for Environmental Protection." In *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*, edited by Thomas Dietz and Paul C Stern, (2002), 3-16.

¹⁶ Loren Lutzenhiser. "Marketing Household Energy Conservation: The Message and the Reality." In *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*, edited by Thomas Dietz and Paul C. Stern, (2002), 49-65.

¹⁷ For example, see:

Wokje Abrahamse, and Ellen Matthies. "Informational Strategies to Promote Pro-Environmental Behaviour: Changing Knowledge, Awareness, and Attitudes." In *Environmental Psychology: An Introduction*, (2018), 263-72.

¹⁸ P Wesley Schultz. "Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change." *New tools for environmental protection: Education, information, and voluntary measures* (2002).

¹⁹ Erik Bichard, and Nirooja Thurairajah. "Behaviour Change Strategies for Energy Efficiency in Owner-Occupied Housing." *Construction innovation* 13, no. 2 (2013): 165-85. <https://doi.org/10.1108/14714171311322147>.

²⁰ Stewart Barr. "Strategies for Sustainability: Citizens and Responsible Environmental Behaviour." *Area (London 1969)* 35, no. 3 (2003): 227-40. <https://doi.org/10.1111/1475-4762.00172>.

²¹ In England, the Government provides the Simple Energy Advice web service and Green Homes Grant to incentivise installing heat pumps. See:

The Ten Point Plan for a Green Industrial Revolution. HM Government, 2020. <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>.

The underlying assumption is also evident in the statement of the Environmental Audit Committee (EAC) of the House of Commons in the fourth report of energy efficiency of existing homes (2019-2021): "...Many homeowners are unaware that their involvement is needed and will need financial support and advice to upgrade and retrofit their homes" (5).

²² Some researchers identified this vicious circle in their review of policies. For example, see:

Lutzenhiser, "Marketing household energy conservation," 54.

Catney, Philip, Andrew Dobson, Sarah Marie Hall, Sarah Hards, Sherilyn MacGregor, Zoe Robinson, Mark Ormerod, and Simon Ross. "Community Knowledge Networks: An Action-Orientated Approach to Energy Research." *Local environment* 18, no. 4 (2013): 506-20. <https://doi.org/10.1080/13549839.2012.748729>.

²³ Abrahamse et al., "A review of intervention studies," 273.

²⁴ Thomas W. Valente, and Darleen V. Schuster. "The Public Health Perspective for Communicating Environmental Issues." In *New Tools for Environmental Protection: Education, Information and Voluntary Measures*, edited by Thomas Dietz and Paul C. Stern, (2002), 105-24.

²⁵ Paul Vare, and William Scott. "Learning for a Change: Exploring the Relationship between Education and Sustainable Development." *Journal of education for sustainable development* 1, no. 2 (2007): 191-98. <https://doi.org/10.1177/097340820700100209>.

²⁶ Thomas Alkemeyer, and Nikolaus Buschmann. "Learning in and across Practices: Enablement as Subjectivation." In *The Nexus of Practices*, (Routledge, 2016), 20-35.

²⁷ Vare et al., "Learning for a Change,"(192-195).

²⁸ Catney et al., "Community knowledge networks," (508).

²⁹ Alkemeyer et al., "Learning in and across Practices,"

³⁰ Lev Semenovich Vygotsky. *Mind in Society*. (Cambridge: MA: Harvard university press, 1978).

³¹ Rajat Gupta, Laura Barnfield, and Tara Hipwood. "Impacts of Community-Led Energy Retrofitting of Owner-Occupied Dwellings." *Building research and information: the international journal of research, development and demonstration* 42, no. 4 (2014): 446-61. <https://doi.org/10.1080/09613218.2014.894742>.

³² Stephen Berry, Anne Sharp, Jo Hamilton, and Gavin Killip. "Inspiring Low-Energy Retrofits: The Influence of 'Open Home' Events." *Building research and information: the international journal of research, development and demonstration* 42, no. 4 (2014): 422-33. <https://doi.org/10.1080/09613218.2014.894747>.

³³ Kathryn B Janda, and Gavin Killip. "Building Expertise: Renovation as Professional Innovation." *Constructing green: The social structures of sustainability* (2013): 35-55.

Barbara S. Zaunbrecher, Katrin Arning, Julian Halbey, and Martina Ziefle. "Intermediaries as Gatekeepers and Their Role in Retrofit Decisions of House Owners." *Energy research & social science* 74 (2021): 101939. <https://doi.org/10.1016/j.erss.2021.101939>

³⁴ Kathryn B. Janda, "Buildings Don't Use Energy: People Do." *Architectural science review* 54, no. 1 (2011): 15-22. <https://doi.org/10.3763/asre.2009.0050>.

Hipwood, "Understanding low-carbon housing retrofit,"

³⁵ Vare et al., "Learning for a Change,"(192-195).

³⁶ Niamh Murtagh, Aeli Roberts, and Russell Hitchings. *Architect-Client Interactions Research Project – Summary of Findings*. (The Bartlett School of Construction & Project Management, UCL, 2016). https://www.ucl.ac.uk/bartlett/construction/sites/bartlett/files/architect-client_interactions.pdf.

³⁷ Rachael Luck. "Learning to Talk to Users in Participatory Design Situations." *Design studies* 28, no. 3 (2007): 217-42. <https://doi.org/10.1016/j.destud.2007.02.002>.

³⁸ Kathryn B Janda, Katharina Reindl, Yann Blumer, Yael Parag, and Faye Wade. "Making more of middles: Advancing the middle-out perspective in energy system transformation." (ECEEE Summer Study Proceedings,2019).

³⁹ Kivimaa, Paula, Wouter Boon, Sampsa Hyysalo, and Laurens Klerkx. "Towards a Typology of Intermediaries in Sustainability Transitions: A Systematic Review and a Research Agenda." *Research policy* 48, no. 4 (2019): 1062-75. <https://doi.org/10.1016/j.respol.2018.10.006>.

⁴⁰ Zaunbrecher, "Intermediaries as gatekeepers," (10).

⁴¹ Nick Nash, Lorraine Whitmarsh, Stuart Capstick, Tom Hargreaves, Wouter Poortinga, Gregory Thomas, Elena Sautkina, and Dimitrios Xenias. "Climate-Relevant Behavioral Spillover and the Potential Contribution of Social Practice Theory." *Wiley interdisciplinary reviews. Climate change* 8, no. 6 (2017). <https://doi.org/10.1002/wcc.481>.

⁴² Theodore R. Schatzki, *The Site of the Social: A Philosophical Account of the Constitution of Social Life and Change*. (Pennsylvania State University Press, 2002). doi:10.5325/j.ctt7v38n.

⁴³ Theodore R. Schatzki, "Practices and Learning." In *Practice Theory Perspectives on Pedagogy and Education: Praxis, Diversity and Contestation*, edited by Peter Grootenboer, Christine Edwards-Groves and Sarojni Choy, (Springer, 2017), 23-43.

⁴⁴ Alkemeyer et al., "Critique in praxis,"

⁴⁵ Katharina Reindl, and Jenny Palm. "Energy Efficiency in the Building Sector: A Combined Middle-out and Practice Theory Approach." *International journal of sustainable energy planning and management* 28 (2020).

⁴⁶ Jean Lave, and Etienne Wenger. *Situated Learning: Legitimate Peripheral Participation*. Situated Learning. (Cambridge University Press, 1991).

⁴⁷ Etienne Wenger. *Communities of Practice: Learning, Meaning, and Identity*. (Cambridge University Press, 1998).

⁴⁸ Alkemeyer et al., "Critique in Praxis".

⁴⁹ Robert Schmidt. "Reflexive Knowledge in Practices." In *The Nexus of Practices*, (Routledge, 2016), 153-66.

⁵⁰ Stephen Kemmis. "A Practice Sensibility: An Invitation to Theory of Practice Architecture." (Singapore: Springer, 2019), 978-981.

⁵¹ Christensen et al., "How to engage households,"

⁵² This is also consistent with the fact that retrofit usually appears as a second priority alongside other types of work. See:

United Kingdom Housing Energy Fact File. London: Department of Energy & Climate Change (DECC), 2012. <https://www.gov.uk/government/statistics/housing-energy-fact-file-2012-energy-use-in-homes>.

⁵³ Alan Bryman. *Social Research Methods*. 4th ed. (Oxford University Press, 2012).

⁵⁴ James Goodman. "Researching Climate Crisis and Energy Transitions: Some Issues for Ethnography." *Energy research & social science* 45 (2018): 340-47. <https://doi.org/10.1016/j.erss.2018.07.032>

⁵⁵ Virginia Braun, and Victoria Clarke. "Conceptual and Design Thinking for Thematic Analysis." [In English]. *Qualitative Psychology* 9, no. 1 (2022): 3-26. <https://doi.org/https://doi.org/10.1037/qup0000196>.

⁵⁶ Elsewhere, it is discussed in more details:

Habib Ghasemi, Tara Hipwood, Peter Holgate. *Proceedings of the International Conference: Repurposing Places for Social and Environmental Resilience*. (London: Counterarchitecture, 2023), 43-50.

⁵⁷ Kathryn B. Janda. "Buildings Don't Use Energy: People Do,".

⁵⁸ Rachael Luck. "Learning How to Use Buildings: An Exploration of the Potential of Design Interactions to Support Transition to Low-Impact Community Living." *Buildings (Basel)* 4, no. 4 (2014): 963-77. <https://doi.org/10.3390/buildings4040963>.

⁵⁹ Kemmis et al., *Changing practices, changing education*. (36-37).

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