arq (2017), **21.4**, 338–343. © Cambridge University Press 2018

Early issues of **arq** were preoccupied with whether, and how, design could constitute research. This survey of contemporary architectural design research recognises how its methods have matured.

On research by design

Yasser Megahed

Jonathan Hill has traced a five-hundred-year history of what might be considered as design research in architecture.[1] Nevertheless, it is sometimes suggested that the 1960s and 1970s constitute the point when contemporary design research emerged, for example through geometric studies of land use and built form at Cambridge University, UK, and elsewhere. These drew from modern typological and functional studies conducted in the 1930s, largely in architectural practice, and, ultimately, J. N. L. Durand's early nineteenth-century comparative typological studies.[2] The 1970s also saw the emergence of the so-called 'Design Methods' movement in Britain and the US that tried to make design processes legible by deploying methods from Operational Research.[3]

Early issues of **arq** in the mid-to-late 1990s were preoccupied with possibilities for researching architecture through design: how design research might be constituted and communicated, and – practically for architecture schools at that time – how design might be counted as research in the newly-introduced metrics used to judge research quality in UK Universities. **arq** has repeatedly reflected upon, published, and analysed architectural design research ever since, including recent issues of the journal exploring, for example, emerging design research practices (19:3) and design research in architecture and biotechnology (20:1).

'Early issues of arq in the mid-to-late 1990s were preoccupied with possibilities for researching architecture through design'

Debates around design research in **arq** from the 1990s reflected uncertainties about its position in both practice and academic culture at that time. Since then, design research has gained traction, becoming increasingly accepted and acquiring greater capital in architectural academe. Key texts in architectural design research are increasingly leaving behind the question 'Is design considered research or not?' to search instead for how to secure the status of design as a rigorous mode of academic inquiry. There is increasing confidence in the architectural field about the potential and power of design as a research method. Yet the notion of design research in architecture remains broad, with a diversity of approaches echoed in a diversity of distinct but overlapping terminologies. Taking its cue from **arq**'s early focus on design research, this article aims to sketch out its contemporary methodological landscape in architecture, surveying key sources in design research scholarship.

Design as a mode of inquiry

Research is conventionally defined as a formal, systematic, and rigorous process of inquiry directed towards new knowledge or understanding within the boundaries of a defined field. David Durling and Kristina Niedderer (2007) identified the categories of 'Research' with an uppercase 'R' and 'research' with a lowercase 'r'. 'Research' with an uppercase 'R' is associated with formal academic and public processes of inquiry that are often described as accessible and transferable. This type of research may be seen as highly systematic and aims to derive explicit knowledge from the world and disseminate it widely for other scholars. This knowledge, they argue, should be original for the whole research community and not just for the individual researcher. On the other hand, 'research' with a lowercase 'r' is associated with more informal and personal processes of inquiry that may then lack the aspects of accessibility and transferability of knowledge.[4] This category of research, Durling and Niedderer observe, may be found in professional practice where the process of gaining knowledge is assumed to benefit the individual practitioner but is not necessarily made widely available for scrutiny by others.[5]

Persisting with Durling and Niedderer's categories, both can be found in our field. Scholars have conducted 'Research' into: the history of architecture; technical investigations into structure, lighting, thermal performance, air quality and acoustics; research into the social and

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'"Research" with an uppercase "R" is associated with formal academic and public processes of inquiry [while] "research" with a lowercase "r" is associated with informal and personal processes of inquiry'

cultural role of buildings; theories of what it means to build and dwell in certain places and times; typological investigations into the qualities of building types; and so on.[6] The history of architectural production also has a long legacy of 'research' (with a lowercase 'r') involving the production and use of design-based knowledge.[7] Design-based knowledge is the kind of knowledge that designers develop in practice through their design activities to investigate everyday problems and gain knowledge about certain situations. However, turning design or practice 'research' into 'Research' is rarely straightforward. Such 'research' seldom has much currency or authority in 'Research' communities.

By-design research and by-practice research

A key issue with what is called by-design or by-practice research is the validity of developing grounded theory out of lowercase 'r' research. This has been attributed to the tacit nature of such research and the limitations as to what reliable information may be extracted from it.[8] In other words, design and practice often involve some research activity but, however, to make this knowledge-seeking process into 'Research', it needs to be explicit, openly communicated, and peer-reviewed.[9] Thus, designing cannot be a research method without regard to the methodological framework within which it is set.[10] This is exactly what 'by-design research' or 'by-practice research' involves. The advantage that by-design research seeks to pursue is a special access to the tacit knowledge of design practice.

Nevertheless, while design could be considered the central feature distinguishing the 'Research' and 'research' fields of architecture, conventional 'Research' methods drawn from other disciplinary backgrounds remain the norm in field. There are growing calls from within the architectural field – as articulated clearly in the first issue of **arq** twenty-one volumes ago – to adopt more design-based research methods. They encourage the architectural field to tap into the knowledge held within its practice-based traditions. The key motor for this development is to appropriate design and the studio culture of practice, which are not well communicated in terms of knowledge transferability and accessibility, to inform its academic research practices.[11] Conducting research-by-doing through architectural design has remained significant in practice and is increasingly important to architectural academe, representing an alternative to the production and consumption of traditional literatures about architecture.[12] Hence, blending the understanding of general principles of research with design as a mode of exploration gives both the practicing designer and academic researcher a background knowledge resource from which to draw.[13] However, as Shane Murray notes, compared to other practice-based fields of inquiry, the discourse around design research in architecture remains immature.[14]

Design research in architecture

Leaving behind capital 'R' and lowercase 'r' ideas of research, the significance of design research in architecture is perhaps that the intrinsic component of its investigations remains dependent on the creative dimensions of architectural endeavour.[15] Architectural design research can hence be described as the processes and outcomes of investigations in which architecture researchers use the creative process and its products, or broader contributions towards design thinking, for critical inquiry in which design is a central component of the process of research.[16] It involves the process of making original investigations through generative and propositional modes of producing works that open up opportunities to be reflected upon.[17] Thereby, architectural design research combines a design element with other research activities and methodologies, operating together in an interactive manner.[18]

'critical inquiry in which design is a central component of the process of research'

Architectural design research involves using the tools of architectural design as the medium for conducting research. Indeed, architects have already been deploying a combination of modes of expression, such as drawing, writing, testing, verifying, debating, disseminating, performing, for a long time in their training and practice. Hence, the method of research by design is an opportunity to place these significant modes of expression into the realm of architectural research.[19]

This type of research makes explicit the possibilities for drawing, diagramming, notation, cartography, and other graphic representations in the research process. By doing so, it brings the process of research closer to the design process. This is often expressed by the idea of '*thinking by doing*'.[20] It then becomes research that is distinctively architectural in nature, which investigates architecture through architecture instead of just being a research 'on' architecture.[21] An important aspect of this process is that it takes into account the irreducible complexity of architectural design knowledge.[22] Thereby, this mode of research is considered, according to Simon Grand and Wolfgang Jonas, as a second-generation methodology, which could be one of the most important conversational mediums for the generation of new design knowledge in architecture.[23]

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Characteristics of design research in architecture

Key characteristics of design research include: its saturation with tacit architectural knowledge; the iterative nature of its processes; and a commitment to reflexivity on the part of the researcher. To observers from outside the field, architectural design can appear to be unsystematic, dependent on individuality, and reliant on processes that remain largely invisible. As such, it is hard to see in it the formation of a cumulative knowledge base.[24] The knowledge revealed in design outcomes is often tacit and experiential. Tacit knowledge is a kind of knowing that is not separable from the perception, judgement, or skill that the knowledge informs.[25] While often straightforwardly 'read' by other designers, it usually remains unclear to those external to the discipline.[26] Architectural projects – be they a building, artefact or speculative proposal – contain embodied knowledge that draws on prior experiences and legacies of architectural training, and are hence visible to those with the training. However, long-established academic disciplines habitually consider this kind of immediate experience as less objective when compared to factual and theoretical knowledge.[27] Therefore, in Shane Murray's account, much of the contemporary discourse in architectural research is directed towards theoretical concerns unrelated to the actuality of the design process. Even when directed to that process, researchers often retrospectively analyse the outcome rather than account for what actually has taken place. It is often difficult to discern the tacit knowledge and the cumulative experiences that a design outcome adds to the discipline. However, design research offers a significant opportunity to articulate this kind of situated knowledge that is tacitly communicated between practitioners.[28]

'Architectural projects [...] contain embodied knowledge that draws on prior experiences and legacies of architectural training, [...] visible to those with the training.'

Moreover, design – as a continuous non-linear iterative process of investigation – is central to the process of architectural design research. Its characteristics revolve around experiments into a research topic via design as a mode of inquiry. Rather than placing the emphasis only on the productive outcome, such experimental design processes can examine the inputs and contextual framework in which design takes place.[29] Experimentation becomes a responsive form of research in which each experiment suggests the next step in the research work. The primary benefit of this process is that the results of these experiments are unpredictable, opening the possibility of surprising the researcher with the outcomes achieved. This allows the researcher to design the next experiment to ask more specific research questions. Nevertheless, while experimental method is well established in the sciences, it has only occasionally been employed within architecture. Therefore, architectural design research exploits the iterative process of experimentation to become a methodology for defining and interrogating research questions.[30]

'a bi-directional relationship between the researcher and the topic under investigation in which neither can be assigned as causes or effects'

Another factor that characterises design research in architecture is the clear influence of the reflexive position of the researcher. This reflexive position establishes a bi-directional relationship between the researcher and the topic under investigation in which neither can be assigned as causes or effects. Reflexivity is a common attribute in researches in the humanities, arts, and social sciences. These fields involve the acquisition of an ideological framework that enables the researcher to make coherent sense of disconnected theories, experiences, and values arising in different aspects of life. In such contexts, it is the duty of scholars to make clear the viewpoint from which they operate.[31] The field of architecture – while not always sitting comfortably within art, humanities, social science, or applied science – shares aspects with each. Thus, an act of architectural research inevitably begins from a certain ideological position, which responsible researchers must declare. Indeed, architectural design processes allude to the personality of the designer within the design. Design as a creative act thus implicates the designer with the object being designed. Therefore, the researcher in design research is nearly always a participant-observer who remains inseparable from the research. Design research thus touches on autobiographical and ethnographic research traditions. And the researcher must remain open to the autobiographical aspects of the work and their encounters with everyday practice.[32]

The reflective practitioner

Design research in architecture is commonly labelled research by design, research by creative practice, research through design, practice-led research, and practice-based research. Generally, these different designations respond to Donald Schön's idea of 'the reflective practitioner'.[33] Schön's book *The Reflective Practitioner: How Professionals Think in Action* introduced the importance of reflective thinking in the development of understanding and knowledge in creative disciplines. He called for a model of practice whereby practitioners are constantly critiquing and reflecting upon their own actions as they are undertaken, changing their behaviours as appropriate.[34]

In Schön's account, methodologies of reflective

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practice comprise two modes of reflection: 'reflection-in-action' and 'reflection-on-action'. Reflection-in-action can be described as the ability of practitioners to 'think on their feet'. It revolves around the idea that, when faced with a professional issue, practitioners usually connect with their feelings, emotions, and prior experiences to attend to the situation. On the other hand, reflection-on-action is the idea that, after the experience, practitioners analyse their reaction to the situation and explore the reasons around, and the consequences of, their actions. In research terms, these reflections are usually conducted through a documentary reflection on the situation. This model of the 'reflective practitioner' thus centres on the idea of life-long learning, where a practitioner analyses experiences in order to comprehend them. It involves paying critical attention to the practical values and theories that inform everyday actions, by examining practice reflectively and reflexively.[35]

'This continuous loop of reflective acting and thinking is a foundational way of marking the method of research by design in architecture'

In this sense, reflective practice methodologies refer to the researchers' continuous reflection upon their actions through the process of research. Afterwards, they stop to reflect-on-action and analyse their in-action decisions, exploring the consequences at work on the research. Accordingly, researchers can reflect on the situation in a different way to someone who simply pursues a more conventional theoretical or practical study. This continuous loop of reflective acting and thinking is a foundational way of marking the method of research by design in architecture.[36]

Research 'for', 'into', and 'through' design

Along with the concept of 'reflection-in/on-action' in design research, Christopher Frayling famously envisaged a tripartite model of relationships between design and research: research 'for', 'into', and 'through' design.[37] These categories bear different expectations about the relationship between a design outcome (whether product, prototype, architectural project, building, urban development scenario, planning document, and so on) and the process of knowledge creation.[38] Frayling proposed that research 'for' design tends to involve investigations conducted with a design application in mind, enabling design to occur.[39] It refers to a process of exploration, discovery, and fact-finding that makes possible the production of a particular architectural work.[40] An example of this might be a series of investigations into architectural precedents relevant to the project being designed.[41] Ranulph Glanville summarises research 'for' design as research where the observer is outside, looking outward.[42]

Secondly, research 'into' or 'about' design is perhaps the most straightforward of Frayling's categories. Here the researcher has a clear outsider's perspective while making investigations into art, design practice, architecture, or a particular dimension of its practices or outcomes[43] Research 'into' design seeks the advancement of new scholarship about a design discipline through a variety of historical, aesthetic, and theoretical perspectives on art and design that may cover a variety of social, economic, political, ethical, cultural, technical, material, and structural concerns.[44] This type of research often refers to established research methodologies drawn from the humanities, social sciences, or natural sciences.[45] In this approach, the act of knowledge development is considered to be explicit, and is thus expected to be clearly articulated during the course of the research process.[46] This kind of research is a broad concept whose processes do not involve design *per se*. However, design can be specifically deployed in research 'into' design through two distinctive approaches. The first states what design practice could be and then sets out to develop methods to achieve it. This was seen in the 'design methods' movement that flourished in architecture and beyond in the 1960s and 1970s, investigating how to diagram design processes, often as a single linear sequence, and define explicit stages within it.[47] The second approach investigates the circumstances in which design is undertaken, seeking to improve or refine the observed activity.[48] Examples include Dana Cuff and Robert Gutman's anthropological studies of architectural practice and practitioners.[49] Glanville explains research into/about design as research where the observer is outside, looking inwards.[50]

Meanwhile, Frayling defines research 'through' design as research where design processes constitute the research methodology itself.[51] This category involves a process of knowledge production that provides possibilities for interrogating, extending, and critiquing the discipline through conceptual designs.[52] The 'through' component of design research is hard to examine other than by the designer who is undertaking the design. In this sense, research questions emerge through the design process in an iterative rather than linear way. To make knowledge outcomes transferable, this method involves critical reflection on the process as it is being undertaken, where design knowledge can be transferred and made available to others. Glanville describes research 'through' design as research where the observer is inside, looking outwards.[53]

'research questions emerge through the design process in an iterative rather than linear way'

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Practice-based/led research

Research 'through' design is often associated with the notions of 'practice-based research', and 'practice-led research'.[54] The use of the terms practice-based and practice-led have become widespread in different fields – most often found in design, creative arts, education, and health fields. However, these terms do not share an agreed definition across diverse fields of research.[55] As Linda Candy defines it, practice-based research is an original investigation set out for the purpose of gaining new knowledge by means of practice and its creative outcomes. In this type of research, the focus on creative practice aims to develop new understanding and insight through deliberate research enquiry that involves a design process or outcome.[56] This research process involves the critical framing of design practices through larger theoretical or philosophical concerns.[57] On the other hand, practice-led research is concerned with the advance of knowledge about practice, or to advance knowledge within practice. Its deliberate inquiry focuses on the nature of practice and leads to new knowledge that has operational significance for that practice. Generally, if a creative process or artefact is the basis of the contribution to knowledge, the research is practice-based, whereas if the research leads primarily to new understandings about practice, it is practice-led.[58]

'research-by-design exploits the tools and methods of thinking derived from [...] creative practice to generate knowledge that is transferable and original'

On research-by-design

In conclusion, then, research-by-design exploits the tools and methods of thinking derived from different kinds of creative practice to generate knowledge that is transferable and original. Thus, architectural research by design does not follow a single approach. The term incorporates a range of different ways of deploying design within a range of research methods, operating under Schön's widely acknowledged umbrella of 'the reflective practitioner'. The notion of 'the reflective practitioner' can be described as the ability of the architectural practitioner to reflect through the process of design using both factual and explicit knowledge; as well as situated, experience-based, and intuitive knowledge, characterised in two simultaneous and/or sequential steps: reflection-in-action, and -on-action. While reflection-in-action concerns the ability of practitioners to connect with their feelings, knowledge and prior experiences to attend directly to a professional issue, reflection-on-action assumes that, after the experience, practitioners analyse their reaction to the situation and explore the reasons around, and the consequences of, their actions. For many authors, Frayling's tripartite categorisation of research 'for', 'into', and 'through' design remains decisive; where research 'through' design is commonly a foundational aspect of research by creative practice, often associated with notions of 'practice-based research' and 'practice-led research'.

Nevertheless, Katja Grillner has argued that, some twenty years after Frayling's essay, the current portfolio of design-driven, or practice-led, MPhil or PhD researches in architecture sit between the 'through' and 'for' positions. Moreover, she has argued that the researcher often practices in both categories, not always necessarily able to distinguish between them.[59] Hence, these are not clearly delineated categories but means for understanding the application of design work within the research.

This article has focused on design research specifically in the field of architecture. However, it is important to remember that architectural design research has emerged in conjunction with practice-based and practice-led research activity elsewhere in academe: in fine art, education, and the likes of music composition and creative writing. Researchers pursuing similar methodologies in other fields have also navigated relationships between academe and practice, and the originality, significance, and rigour of their work has also been judged against the metrics of university research assessment. Just as architectural design research has grown in confidence over the last twenty-one years, no longer having to ask 'is design research?', so too have its equivalents in these fields. Indeed, consolidation and support of practice-based and practice-led methods across academic fields has been mutually sustaining.

Notes

1. Jonathan Hill, 'Architects of Fact and Fiction', **arq**: *Architectural Research Quarterly* 19, No. 3 (2016), 249–58 (p. 249).
2. Adam Sharr, 'Leslie Martin and the Science of Architecture Form', in *Quality out of Control: Standards for Measuring Architecture*, ed. by Allison Dutoit, Juliet Odgers and Adam Sharr (London: Routledge, 2010), pp. 67–78 (p. 69).
3. Geoffrey Broadbent and Anthony Ward, *Design Methods in Architecture* (London: Lund Humphries, 1969).
4. Linda Candy, 'Practice Based Research: A Guide' (Sydney: Creativity and Cognition Studios, University of Technology, 2006), p. 2; David Durling, and Kristina Niedderer, 'The Benefits and Limits of Investigative Designing', in *IASDR International Conference* (Hong Kong: Polytechnic University, 2007), p. 8.
5. Kristina Niedderer and Seymour Roworth-Stokes, 'The Role and Use of Creative Practice in Research and Its Contribution to Knowledge', in *2nd IASDR International Conference* (Hong Kong: Hong Kong Polytechnic University, 2007), p. 1.
6. Raymond Lucas, *Research Methods for Architecture* (London: Laurence King Publishing, 2016), p. 7.
7. Katja Grillner, 'Design Research and Critical Transformations: Situating Thought, Projecting

https://doi.org/10.1017/S1359135518000179 Published online by Cambridge University Press

Action', in *Design Research in Architecture: An Overview*, ed. by Murray Fraser (Aldershot: Ashgate, 2013), p. 74.
8. Ken Friedman, 'Theory Construction in Design Theory: Criteria: Approaches, and Methods', in *Mapping Design Research: Positions and Perspectives*, ed. by Simon Grand and Wolfgang Jonas (Basel: Birkhäuser, 2011), p. 141; Niedderer and Roworth-Stokes, 'The Role and Use of Creative Practice in Research', p. 12.
9. Johan Verbeke, 'This Is Research by Design', in *Design Research in Architecture: An Overview*, ed. by Fraser, p. 145.
10. Niedderer and Roworth-Stokes, 'The Role and Use of Creative Practice in Research', p. 2.
11. Verbeke, 'This Is Research by Design', p. 145.
12. Lucas, *Research Methods for Architecture,* p. 8.
13. Friedman, 'Theory Construction in Design Theory', p. 139.
14. Shane Murray, 'Design Research: Translating Theory into Practice', in *Design Research in Architecture: An Overview*, ed. by Fraser, p. 97.
15. Murray Fraser, ed., *Design Research in Architecture: An Overview* (Aldershot: Ashgate, 2013), p. 2.
16. Ibid., pp. 1, 2.
17. Donald Schön, *The Design Studio: An Exploration of Its Traditions and Potentials* (London: RIBA Publications, 1985), p. 48; Donald Schön, *The Reflective Practitioner: How Professionals Think in Action* (London: Routledge, 2017), p. 100.
18. Fraser, ed., *Design Research in Architecture,* p. 2.
19. Ibid.
20. Christopher Frayling, 'Research in Art and Design', in *Royal College of Art Research Papers* (London: Royal College of Art, 1994), p. 4; Lucas, *Research Methods for Architecture*, p. 8.
21. Verbeke, 'This Is Research by Design', p. 150.
22. Wolfgang Jonas, 'Exploring the Swampy Ground', in *Mapping Design Research: Positions and Perspectives*, ed. by Grand and Jonas, p. 35.
23. Ibid., p. 36.
24. Murray, 'Design Research: Translating Theory into Practice', p. 97.
25. Bruce Archer, 'The Nature of Research', in *Mapping Design Research: Positions and Perspectives*, ed. by Grand and Jonas, p. 117; Niedderer and Roworth-Stokes, 'The Role and Use of Creative Practice in Research', p. 2; Michael Polanyi, *The Tacit Dimension* (Chicago: University of Chicago Press, 2009).
26. Murray, 'Design Research: Translating Theory into Practice', p. 95.
27. Friedman, 'Theory Construction in Design Theory', p. 141.
28. Niedderer and Roworth-Stokes, 'The Role and Use of Creative Practice in Research', p. 12; Murray, 'Design Research: Translating Theory into Practice', p. 97.
29. Fraser, ed., *Design Research in Architecture*, p. 4.
30. Lucas, *Research Methods for Architecture*, p. 45.
31. Archer, 'The Nature of Research', p. 114.
32. Lucas, *Research Methods for Architecture*, p. 39.
33. Chris Rust, Judith Mottram, Jeremy Till, *AHRC Research Review Practice-Led Research in Art* (2007), available online at: <http://shura.shu.ac.uk/7596/1/PacticeledReviewNov07.pdf> [accessed 21 November 2017], pp. 11, 12; Fraser, ed., *Design Research in Architecture*, p. 4; Verbeke, 'This Is Research by Design', p. 140.
34. Schön, *The Reflective Practitioner.*
35. Ibid.
36. Lucas, *Research Methods for Architecture*, p. 43.
37. Frayling, 'Research in Art and Design', p. 5.
38. Grillner, 'Design Research and Critical Transformations', pp. 74, 75.
39. Frayling, 'Research in Art and Design', p. 2.
40. Grillner, 'Design Research and Critical Transformations', p. 73.
41. Murray, 'Design Research: Translating Theory into Practice', pp. 95, 96.
42. Ranulph Glanville, 'A Ship without a Rudder', in *Problems of Excavating Cybernetics and Systems*, ed. by R. Glanville and G. D. Zeeuw (Southsea: BKS+, 1997), p. 8; Jonas, 'Exploring the Swampy Ground', p. 34.
43. Grillner, 'Design Research and Critical Transformations', p. 74.
44. Frayling, 'Research in Art and Design', p. 5.
45. Grillner, 'Design Research and Critical Transformations', p. 74.
46. Murray, 'Design Research: Translating Theory into Practice', p. 96.
47. Broadbent and Ward, *Design Methods in Architecture*; Jonas, 'Exploring the Swampy Ground', p. 34.
48. Murray, 'Design Research: Translating Theory into Practice', p. 96.
49. Dana Cuff, *Architecture: The Story of Practice* (Cambridge, MA: MIT Press, 1992); Robert Gutman, *Architectural Practice: A Critical View* (New York: Princeton Architectural Press, 1988).
50. Glanville, 'A Ship without a Rudder', p. 8; Jonas, 'Exploring the Swampy Ground', pp. 34, 35.
51. Frayling, 'Research in Art and Design', p. 51
52. Ibid.; Jonas, 'Exploring the Swampy Ground', pp. 34–6.
53. Ibid.; Glanville, 'A Ship without a Rudder', p. 8.
54. Rust, Mottram, Till, *AHRC Research Review*, pp. 11, 12.
55. Candy, 'Practice Based Research', p. 3; Niedderer and Roworth-Stokes, 'The Role and Use of Creative Practice in Research', p. 2.
56. Candy, 'Practice Based Research', p. 1.
57. Grillner, 'Design Research and Critical Transformations', p. 76.
58. Candy, 'Practice Based Research', p. 1.
59. Grillner, 'Design Research and Critical Transformations', p. 74.

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