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Sustainable, affordable, and transferable approaches to experienced doctoral supervisor development

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ABSTRACT

Doctoral supervision is complex and takes place against a background of contextual, political, economic, and cultural affordances/constraints; with multiple purposes; and in a global higher education system. The result can be significant tensions for supervisors and, often, poor student satisfaction and progression. Globally, systematic development of doctoral supervision capacity is unusual and/or prohibitively expensive at scale. In response, this paper reports an educational design research initiative to develop a series of collaborative online workshops for experienced doctoral supervisors, supporting deliberate ‘reflective, personal, scholarly and systematic reflection’ across ten areas of doctoral supervision. Participants are then well-equipped to craft a successful application for the prestigious United Kingdom Council for Graduate Education supervisor recognition. Our evidence suggests short-term benefit is in two phases: directly via collaborative workshop engagement with the supervision literature in relation to participants’ shared experiences of supervision, and then via application of that to practice, captured in semi-structured scholarly reflective accounts on development of practice in submission for accreditation. Embedded medium-term benefits are now emerging. Multiple iterations suggest the approach is sustainable, transferable, affordable, and richly beneficial to participants, doctoral students, and wider doctoral communities. The contribution is to development of academics’ teaching and research, and it is both theoretical and practical.

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Introduction: the professional learning of doctoral supervisors

Postgraduate research supervisor (elsewhere: advisor, mentor) roles are undervalued, under-provisioned and under-developed in many universities globally (Swai, 2019; Taylor et al., 2020). The traditional purpose of nurturing embryonic researchers fit to curate and develop an academic field (Golde & Walker, 2006) is in tension with recent managerial imperatives towards a scientific-technical postgraduate education which serves wider purposes of market economies (Halse & Mowbray, 2011). Additionally, doctoral supervision takes place against a background of contextual and cultural affordances and constraints but in

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a global and mobile higher education system. Recent years have also seen widespread diversification of the student body and of doctorates, massification, and formalisation of doctoral study (Hasgall et al., 2019). The result is multiple and significant challenges for supervisors and, often, poor student satisfaction and low rates of doctoral progression.

Swai (2019) shows that supervisors learn from the (co-)supervision process, their own doctoral education, institutional guidelines, institutional training courses, and individualized learning, including through participation in *vivas* and institutional doctoral-related activity. Reflection on practice plays a critical role (Halse, 2011). Academics can add value, and benefit from, using scholarly approaches to their work (Henderson, 2018), even though many supervisors do not currently engage with the related literature (Taylor et al., 2020). Insight is needed into how supervisor capacity might be enhanced in a sustainable and affordable way. Such enhancement should be aligned with the goals of doctoral study, which, among a range of purposes as above, focus on the production of a significant contribution to knowledge and the equipping of the student as an independent researcher. Within structured provision, Wichmann-Hansen et al. (2020) identify the need for incentives, for teaching approaches appropriate to experienced academics, and for a well-evaluated provision in which supervisors will be intrinsically motivated to participate. Huet and Casanova's (2022) systematic review of supervisor work-based development identifies that opportunities should include intertwined instrumental, dialogic, and self-reflective learning that should be related to specific contexts with a focus on scholarship and (self-) reflection, engagement with the relevant literature, and support communities of supervisory practice. They further show it can be helpful if modes of learning, to some extent, reflect prevalent modes of supervision, for example, where supervision has recently moved online. Guerin et al. (2015) reinforce the potential of cross-disciplinary supervisor development, and Huet et al. (2022) discuss a range of ways in which supervisors could both have more agency and become more interdependent in the development of their practice in this complex endeavour. The reported design of development capitalises on these insights in ways we analyse below.

This paper conceptualises doctoral education as having a focus on learning for the particular research project with a meta-focus on learning to become a researcher, and within a paradigm of education for heutagogy. The supervisory role is then to support both the research project and learning for the craft of research, to be a role model, and to provide a person-, discipline- and stage- appropriate supportive intellectual, technical/strategic, and emotional relationship (De Gruchy & Holness, 2007). As such, supervisor development can be considered at one end of a spectrum of teacher professional development. Within a doctoral 'learning alliance' (Halse & Bansel, 2012), Shulman and Shulman (2004) identify clusters of cognitive, dispositional, motivational, performance, reflective, and communal characteristics of 'accomplished teaching': high-quality doctoral supervision is enormously complex, and it requires deliberate and careful development and sustenance at the intersection of teaching and research. However, systematic development of doctoral supervision capacity in universities globally is unusual and/or prohibitively expensive at scale (Manderson et al., 2017), although initial induction of some sort is comparatively common (Taylor et al.,

2020). The focus of this paper is therefore comparatively new to many academic developers but offers a sustainable, affordable, and transferable approach to a potentially significant area of their work.

The study

The author is a local ‘graduate tutor’. In her research-intensive university in England, systematic analysis and enhancement of supervision remains unusual. In response, this paper reports on an educational design research initiative developing a series of collaborative online workshops for experienced doctoral supervisors, across a range of contexts. ‘Experienced’ here means the supervisor has seen at least one doctoral student through each stage of doctoral supervision, from selection to successful completion. The initiative sets out to support deliberate ‘reflective, personal, scholarly and systematic reflection’ (UKCGE, 2019) and transference to practice across ten areas of doctoral supervision, via a genuine community of practice (CoP). Participants are then well-equipped to craft a successful application for the prestigious United Kingdom Council for Graduate Education supervisor recognition.

The author was lead designer for workshop iterations one and three, co-designed iteration two with a southern African colleague, and was research lead. Three southern African colleagues contributed to the second and third iterations, including to the development of research around a second, comparative research question (beyond the focus of this paper). Those three, and a fourth, have led on designing and facilitating iteration four.

The aim of our research is to explore how experienced supervisors can be supported to enhance their understanding and practice of doctoral supervision. We asked: *How can collaborative workshops structured around UKCGE-identified key areas of supervision be designed to support supervisor development in **affordable** and sustainable ways that also enhance mutual collaboration and learning across the contexts concerned?* Ethical consent was secured from the author’s institution (REC 1590), and for research related to iteration two, from the University of Johannesburg as well. Below, we offer early evidence that the model adopted appears to be sustainable, transferable, affordable, and richly beneficial to participants, doctoral students and wider doctoral communities. In so doing, we contribute to practice by offering a replicable and apparently transferable approach to the development of doctoral supervision and, with that, research capacity. We also contribute theoretically by showing how the three iterations to date have been informed by existing research and can be framed in terms of grounded design research elements that inform and predict outcomes from future-related initiatives.

The UKCGE recognition process

UKCGE (2019) offers well-respected supervisor recognition via submission of a ‘personal, recent, analytical, example-based, scholarly and systematic’ account of supervision across ten key areas, supported by references from colleagues and former supervisees, as follows:

- Recruitment and selection

- Supervisory relationships with candidates
- Supervisory relationships with co-supervisors
- Supporting candidates' research projects
- Encouraging candidates to write and give appropriate feedback
- Keeping the research on track and monitoring progress
- Supporting candidates' personal, professional and career development
- Supporting candidates through completion and final examination
- Supporting candidates to disseminate their research
- Reflecting upon and enhancing practice

These areas of supervisory professional knowledge support Halse and Malfroy's (2010) dimensions of supervision (the learning alliance, habits of mind, scholarly expertise, *technè*, and contextual expertise) and also Bruce and Stoodley's (2013) categories of supervision as promoting the supervisor's development, imparting academic expertise, upholding academic standards, promoting learning to research, drawing upon student expertise, enabling student development, venturing into unexplored territory, forming productive communities, and contributing to society. Inevitably, the scope is not comprehensive, for example, from omitting specific reference to research ethics, to the signposting and promotion of wider resources than supervisors, to equality, diversity and inclusion in doctoral education, and to emerging creative and/or deeply collaborative understandings of doctoral education (Harrison & Grant, 2015). However, there is ample *opportunity* to reflect on those aspects of supervision within the account, and assessor formative feedback typically probes such reflection.

Educational design research (EDR)

EDR, or design-based research in education, is a methodological framework (Bakker, 2018) that sets out to develop theoretical insights and practical solutions simultaneously, in real-world contexts, with research subjects as collaborators (McKenney & Reeves, 2018). There is a dual focus on instructional theory and improved design, in a cyclic, reflective process that asks how to design the teaching-learning arrangement so that processes reach an intended aim. EDR is therefore 'theoretically oriented, interventionist, collaborative, responsively grounded, and iterative . . . Scientific understanding is used to frame not only the research, but also (alongside craft wisdom and creative inspiration) to shape the design of a solution to a real problem' (McKenney & Reeves, p. 12). The research process therefore has an intentionality to refine both theory and practice. The how-questions are complemented (and refined) by the what-questions, which should be guided by theory elements (Prediger, 2019). Theory generated from design research is typically 'humble' (local) but susceptible to theoretical generalisation (Yin, 2009). Within that, this paper's focus research adopted a critical realist ontology and reflexive thematic analysis, exploring a rich social construction of meaning as interpreted by the research team through reflexive, recursive engagement with data. The resultant findings were conceived as contextually situated, partial, and provisional, though rich and often in-depth.

EDR also makes demands on leadership and participation: its leadership needs empathy, orchestration, flexibility, and social competence in a new community of practice (McKenney, 2016). Productive participation in the research context requires innovation, responsiveness to evidence, connectivity to basic science, and dedication to continual improvement (Bereiter, 2002). We reflect further on those requirements below.

Methods

Workshop design

EDR is theoretically oriented, so we incorporated evaluation of input and learning in relation to clear, participant-valued goals, as recommended by Huet and Casanova (2022), for reasons of both motivation and quality of learning. We adopted a synchronous online modality, to support accessibility, convenience, and economy, and to mirror now-common supervision modality. Although the related pedagogies remain underdeveloped (Mallon et al., 2023), we are beginning to understand better how to establish the social, teaching, student, and central cognitive ‘presences’ necessary for effective learning (Shea & Bidjerano, 2010). These are well supported, for example, via a relatively small participant group, establishment of a secure and supportive ethos, clear goals, active learning approaches, shared supplementary resources, and use of breakout discussion.

In terms of the ‘what’, the UKCGE ten-area framework supports supervisor learning enhanced by scholarly engagement with the literature and reflection on practice (on both what has been and what might be). As discussed above, this appears a theoretically-coherent tool with which to structure content, so we used it as a basis for the core ten half-sessions. UKCGE (2019) provides a range of appropriate support materials, and the UKCGE recognition application process was thought to provide extrinsic motivation for participation as well as to embed personal independent scholarly reflection on practice.

We therefore initially adopted a model of six spaced (three-weekly) one-hour collaborative workshops and limited the group size to no more than 15, so as to require depth of engagement while making limited demands on time. Participants had to justify their application and commit to missing, at most, one session. After the introductory ‘prototype’ workshop, each participant was responsible for leading a literature-informed, active half-session focused on one of UKCGE’s ten areas of supervision, structuring that to support scholarly reflection on links with supervision experience. In this design, participants potentially gain from the division of labour involved in exploring literature and are able to draw on peer stimulus, experience, and support to deepen their thinking and complete the process, in line with Huet and Casanova (2022). To date, there have been three design iterations led by the author; a fourth in 2024 involves academics from ten sub-Saharan African countries, led by academics recognised after iteration two:

- (1) In the author’s home department, October 2021-March 2022: ten Education academics plus two ‘critical friend’ experienced supervisors, from Egypt and South Africa.
- (2) Five supervisors from each of the universities of Johannesburg, Namibia, and Zambia, from a variety of science and social science disciplines, March-June 2022.

Co-facilitation by one of the initial ‘critical friends’. Related comparative research by four participants: the author and one academic from each of the three African universities involved.

- (3) Ten social science academics from the author’s home faculty, Oct 2022-March 2023.
- (4) 30 experienced sub-Saharan African academics from ten countries and 13 universities, spanning a range of academic disciplines, in two parallel series of workshops March-June 2024. Facilitation by four academics accredited in iteration two, three of whom also now assess for UKCGE; facilitator support from the leaders of iteration two.

Most participants (31 of 37) in the first three iterations submitted applications for UKCGE recognition, and all succeeded, 14 of the 31 at the second attempt. Research is being led by the author, in collaboration with each of the three southern African leads involved in iteration two.

Over the four iterations to date, participation has therefore expanded across academic disciplines, universities, and national contexts. While such expansion offers a challenge to basic EDR, successive iterations have adapted, including to context, in small but important ways we report below. Facilitation has also evolved. We show below how such adaptations support both transferability and sustainability. Such ambitious evolution supports exploration of equity of access to supervision development for academic colleagues in contexts grappling with multiple, significant challenges (Daniel & Bisaso, 2023) – but this also brings risks of over-aspiration. Importantly, in line with Wichmann-Hansen et al. (2020), all participants have opted in, via institutional or personal invitation. We return to these issues in the discussion.

Data collection

Data collection has been designed to support iterative theorising and refinement of workshops. Here, we draw on data from iterations one through three, as in [Table 1](#), because data collection from iteration four is ongoing.

We adopted qualitative surveys that collected core supervisory information (academic background and supervision experience). They probed participant intervention experiences and perceived learning, focused initially around structure, people organisation, reported practices, and content, to discern potential improvement for intervention

Table 1. Data collected from iterations 1-3.

	Workshop video recordings	Post-UKCGE submission participant surveys	Submitted reflective accounts	Recordings of participant interviews and unsolicited email or live comments
Iteration 1	6	12	12	2 recordings, from ‘critical friends’; 9 email and 8 live comments
Iteration 2	9	15	13	4 recordings, from both facilitators and the two other national lead participants; 13 email comments
Iteration 3	7	10	10	3 recordings, from purposively chosen participants; 7 email comments

purposes. Survey ‘probes’ drew on each of Halse and Malfroy’s (2010) and Bruce and Stoodley’s (2013) supervision categories, to support rich responses. For iteration two, the survey also included questions around the associated cultural and contextual affordances and constraints, to inform comparative analysis, but that is not the focus here. In-depth interviews probed response issues more deeply.

Reflexive thematic analysis was conducted by the research team in line with Braun and Clarke (2022), applied to the data available after each iteration, with further analysis and interpretation informed by the literature. This involved initial immersion of the researchers in each stage of the data collected (‘familiarisation’), noting initial analytic observations and insights both in relation to immediate data and the whole dataset, and followed by iterative, collaborative generation and capturing of important features for answering research questions (‘codes’). Researchers subsequently generated, developed, reviewed, and refined higher-level themes representing broader patterns of perceived shared meaning, which we communicate below in a related ‘story’.

Each of the four researchers was, to some extent, an ‘insider’, as is typical in EDR. Additionally, the author is a senior academic in an international high-status university, so that, while some of the participants were also senior, validity of response might have been impacted by unequal power relations, especially for respondents from cultures where age- and/or academic-based hierarchies are especially pervasive. Considerable care was therefore taken to seek, and be seen to value, ‘no holds barred’ responses in surveys and interviews as part of the collaborative inquiry culture established, even though, with the small number of participants involved, most responses could be identified from the participant characteristics requested (which were necessary for data interpretation). In reporting findings, we have taken care to look for a spread of ‘typical’ responses or claims of positive impact, while also noting individual challenges or reservations to consider design developments that might address those. Trustworthiness was enhanced by cross-researcher and participant reflections on interpretation, though findings remain fundamentally subjective and co-constructed.

Findings

Analysis generated two linked themes, in italics: first, in relation to *strengthening capacity (knowledge/practice of) for supervision and research*, participants widely suggested that development was supported by:

- exposure to the literature
- articulation (orally and in writing) of practice and questioning of that in relation to literature
- structured foci of successive workshops
- extrinsic motivation of recognition
- facilitator knowledge of research/supervision/recognition.

Respondents commonly claimed a near-immediate benefit to their capacity in each of two phases: via workshops and during crafting of scholarly reflective accounts.

Secondly, *synergies of working collaboratively towards that end* were reported supported by:

- semi-structure of workshops
- analytical shared discussion of research and supervision across cultural, institutional and disciplinary contexts
- (in iterations two and three) peer assessment processes that further informed and challenged thinking.

Framed as particularly beneficial was workshop discussion catalysed by presentation of evidence summaries and carefully-crafted discussion focus, and it was often reflected on in-depth in submitted accounts. Participants usually reported workshops as being intense but very rewarding and applications as demanding, both intellectually and in terms of time. Later, unsolicited emails and live comments (with consent for quotation) showed that embedded medium-term benefits to supervisors and, importantly, to doctoral students are now emerging, and the process is catalysing related conversations more widely within participants' institutions. Further, expansion of workshops to low-resource supervision contexts and also across academic disciplines, in iterations two and three, suggests that, in summary, the approach can be sustainable, transferable, affordable, and richly beneficial to participants, doctoral students, and wider doctoral communities. We justify those claims below and in the discussion.

After iteration one, for example, surveys included the following four comments:

The best professional development I've had in 17 years at (home institution): challenging, refreshing, reconstructive of both thinking and practice. (Iteration 1, participant 1)

Transformative to approach supervision with a parallel academic and professional lens. (Iteration 1, participant 2)

A wonderfully supportive, stimulating and humbling experience that is already impacting my supervision practice. (Iteration 1, participant 3)

I feel privileged to have had access to so much wisdom and experience: my thinking about doctoral supervision has deepened and grown, and my practice is both renewed and developing further. (Iteration 1, participant 4)

But also:

Time for small-group discussion of a stimulus question or case study is the jewel and shouldn't be rushed. (Iteration 1, participant 4)

Despite what you kept saying, I should have been more disciplined about making notes on my learning as I went. (Iteration 1, participant 1)

Further, not all initial applications for recognition were successful. For example, some participants appeared to assume the application was a formality and needed to re-submit with a more carefully-crafted account. Feedback suggested some colleagues found the need for resubmission quite challenging, although following final recognition, they acknowledged the benefits to their knowledge and practice of engaging with the process in more depth.

Initially, I felt angry, as if my professionalism was being questioned, but in retrospect I've shifted to seeing the process of deeper engagement as productive in itself. I'm now more secure in my reflections and the imperative to make the changes I've started putting in place, so that resubmission has been very productive, and I've said that to colleagues; I've also come to see active engagement with the literature, and questioning supervision practice with others, as an ongoing need, for both my own benefit and that of our students. (Iteration 1, participant 5)

In consequence of such data, iteration two retained core features as above, but was expanded to include:

- A stronger leadership steer on the centrality of small-group discussion and limited number of slides in workshop planning;
- A stronger urging of participants to make notes of reflections and experiences during and after sessions, to support both depth of writing and a manageability of producing the submitted reflective account;
- Inclusion of optional additional sessions engaging with submission criteria as part of an opt-in peer assessment of draft reflective accounts, so as to support mutual support, understanding of what was being valued, and enhanced rates of formal recognition.

In addition, iteration two, responding to the changed context and additional comparative research, featured an introductory session that shared core characteristics of the four national/university doctoral supervision contexts as a foundation for mutual understanding. Further, it included facilitator active listening to, and probing for, what might be contextual or cultural affordances and constraints on supervision practice – both aimed at building ‘social’ and ‘teaching’ presence for the online medium (Shea & Bidjerano, 2010) – that could be drawn on to catalyse deeper learning in workshops. Resulting areas of supervisory concern included most doctoral students working in a second/third/... language, institutional incentives for timely completion, often insecure early academic foundations, insufficient supply of experienced supervisors, a range of doctoral assessment systems, and other related issues. While these concerns are global, because of the intrinsically international and interdependent nature of doctoral systems, their profile in supervisor experience varies by context. They impacted, and informed, the profiles of participant reflections and reported practice but did not appear to bring any pressing need for further major adaptation of underlying design.

However, the inclusion of participants from disciplines beyond the social sciences brought not only a richness of wider perspective (for example, different norms of publication, funding and career trajectories in lab-based disciplines), but challenges in coming to understand the supervision literature, much of which is presented within social science qualitative paradigms, though feedback was again overwhelmingly positive. However, despite the additional review activities inserted, the path to successful recognition was again found to be challenging, with colleagues commonly indicating that the nature of the required critical scholarly and practice-related narrative was unfamiliar in their disciplinary or cultural context:

It was a steep learning curve for me as an engineer to learn to read and critique the supervision literature. But I enjoyed that, and the workshops and reflection on my

supervision have opened my eyes to other possibilities I think I should put into practice. (Iteration 2 participant 1)

The workshops have been inspiring, and they've already affected my supervision. My colleagues want to have the chance to take part also, they're jealous! But writing the submission was hard: after the peer review workshop I thought I knew what was wanted, but they said it's not reflective or critical enough. It was really hard to turn round and re-write, but I think it's stronger now, and I've learnt from that. (Iteration 2 participant 2)

Iteration three therefore built on the two earlier series, retaining core design features as well as structures to support opt-in peer review of draft reflective accounts, but also inserting an early shared reflection on approaches to engagement with the social science literature. Participants created workshops largely less ambitious than in the previous two iterations, and contributions were sometimes less confident, possibly because of the mix of personalities involved. We therefore plan to move to a renewed focus on the commitment/collaboration required and a 'rationale statement' required pre-participation. Nevertheless, participant feedback was very positive, with no substantive changes suggested:

This is definitely a format that worked well for me: thank you so much. I learned a great deal both from the experiences of colleagues across [the institution] and from engagement with the supervision literature, and shall be much more sensitised to that moving forward. The submission was also very productive, catalysing several small change that my students have welcomed. (Iteration 3 participant 1)

Such are the core findings in terms of intervention design, and cyclical development continues, especially, in response to changes in context as required in EDR. For example, the enhanced digital access challenges in some iteration four contexts have required a change in workshop platform and shared storage for the resources. EDR also demands consideration of the theoretical elements involved. In [Table 2](#) we present those using an adaptation of Prediger's (2019) elements of didactical EDR:

All elements of [Table 2](#), of course, remain subject to further development informed by data from subsequent iterations.

Discussion

Our data suggest short-term benefits accrue in two phases: directly via collaborative workshop engagement with the supervision literature, in relation to participants' shared experiences of supervision, and then via application of that to practice, captured in semi-structured scholarly reflective accounts on development of practice in submission for accreditation. Our initial findings above relate to several aspects of the innovation: its online modality, requirements for the populating and process of successful EDR, and our theorisation of the target content. We address each of those areas in turn.

Because of the online modality adopted, Shea and Bidjerano's (2010) social, teaching, student, and central cognitive 'presences' appeared well-supported via a relatively small participant group size, establishment of a secure and supportive ethos (as confirmed by participants), clear goals, active learning approaches including the use of breakout discussion, and shared supplementary resources. Whether this is a minimal necessary

Table 2. Theory elements emerging from first three iterations (based on Prediger, 2019).

	How-questions for theory elements on the design of teaching-learning arrangement	What-questions for theory elements on structuring the content
Categorical theory elements	Medium, duration, structure, assessment/recognition, characteristics of leadership and participants.	Wide range of aspects of supervision, plus academic skills to support accessing supervision literature and scholarly reflective accounts of practice.
Normative theory elements	Supervision conceptualised as a particular form of teacher development, at one extreme of engagement with knowledge and of independent learning.	Collaborative reflection on a range of supervisory responsibilities and experience, informed by the literature. These might be organised via UKCGE ten areas although with sensitivity also to what is not included there. This has a goal of scholarly, specific reflection on a wide range of supervisory practice, leading to enhanced practice, and external recognition of that.
Humble predictive heuristics	Functional access to medium and to appropriate literature and assessment resources. Online, secure and supportive ethos, collaborative, sustained, active participation including via distributed responsibility, structures to support assessment/recognition or other incentives to commit. Provision should be made to preempt and/or support initial 'failure' of recognition.	Participants might need to be supported to learn from the literature and to reflect on practice in writing; Content needs to be broad across supervision, though particular issues of concern and interest depend on individual, discipline, culture and context.
Descriptive theory elements	Participants need sufficient breadth and depth of experience to sufficiently benefit from others' accounts and from the literature – and to then transfer to practice. Distributed leadership needs deliberate semi-structure and sufficient (considerable) space for interchange.	With the given approach, supervisors can reflect on their own practice in relation to the literature and to their own and others' experience; codifying that within a UKCGE submission appears to support both embedding of that learning and transference to practice.
Explanatory theory elements	This design capitalises on both Wichmann-Hansen et al.'s (2020) and Huet and Casanova's (2022) identified pathways to supervisor learning, and especially via practice-informed and scholarly reflection.	The approach both draws on and contributes to development of Shulman's and Shulman (2004) characteristics of 'accomplished teaching', as well as to Halse and Malfroy's (2010) and Bruce and Stoodley's (2013) specifically identified aspects of supervision, in ways specific to the individual and their context.
Refined predictive theory elements	The humble predictive heuristics appear to extend across disciplines and contexts, but might need complementing by additional support for engagement where assumed knowledge, skills, and academic habits are not realised. Experienced and locally 'successful' supervisors need culturally-acceptable support to develop a deeply informed and reflective account that is open to problematisation of aspects of their practice. We have yet to test the impact of other facilitators and further groups of participants, though shall do in iteration 4: it might be that McKenney's (2016) and Bereiter's (2002) respectively necessary characteristics have threshold levels for intervention 'success'.	The literature does not identify significant aspects of supervision that differ by discipline, and variation by geographical regions appears distinctive largely by degree, including issues of equality, diversity, and inclusion, and of comparatively meagre resources. Further distinctions might be found with more research.

set to achieve those presences is not yet determined, but in any case we conjecture that any such minimal set depends, *inter alia*, on the participants.

McKenney (2016) has shown that leadership of EDR requires empathy, flexibility, and social competence in a new CoP. Our participants suggested in responses that this was achieved but there remains a particular threat in this area from insider

research, as discussed. Importantly, we do not consider that the extent of qualities needed for such leadership are exceptional, so viable leadership should normally be available locally, though it does require some relevant knowledge and preparation. Bereiter (2002) argued that productive participation in a new CoP EDR context requires innovativeness, responsiveness to evidence, connectivity to basic science, and dedication to continual improvement. Our data did not support a specific need for innovativeness from all participants, though they showed the research leadership needed some. Videos show that participants did, though, demonstrate Bereiter's other qualities; however, we do not have the data to establish whether those are strictly necessary.

Our model drew, directly or indirectly, from every source identified by Swai (2019) as contributing to supervisor development. Participants suggest supervisors show considerable variation in approaches to supervision and supervisory roles adopted, and connections were frequently made to the doctoral education they had themselves received, as well as to specific exemplars within their own supervisory practice. They reflected on the affordances and constraints of their own institutional guidelines and structures, and either to their (in all cases, fairly limited) experiences of institutional training or to the absence of such opportunity. They engaged both collectively and individually with making links of their practice to the supervisory literature, and they developed their own individual reflective account for recognition submission. Throughout, individual or collaborative reflection on practice and possibilities in relation to the literature appeared to be particularly valued by supervisors and productive for their learning.

We note briefly that across contexts, there were variations in the affordances and constraints of supervisory guidelines and structures. The impact of those was experienced variably by individual, as well as by discipline, consistent with Wisker and Claesson (2013), who show how such cross-disciplinary cultural work can enhance supervisor metacognition of the focus areas of study. However, within each area of supervision considered, there was also much that was in common across contexts, disciplines, and individuals – including major challenges associated with doctoral student induction, progression, and support. The quality of student preparation, availability of high quality (co)supervisors, doctoral assessment structures, financial and career doctoral completion (dis)incentives, all serve to shape the choices perceived to be available and point to particular issues sometimes specific to context.

In summary, we claim the approach adopted is:

- *sustainable*: We contend that the necessary leadership is usually available to universities locally, and that while requiring some time and knowledge, it makes reasonable professional demands of an experienced educational developer or other appropriate academic. We make similar claims of the participants, and the time, commitment, and other qualities required of them. Two years after first accreditation, benefits to individual supervisors, or doctoral students, and to wider local research cultures, are still being reported in unsolicited (email or personal) reports; longer-term impacts are, of course, not yet known.
- *transferable*: We have begun to show that the approach transfers across disciplines and contexts, including some low-resource contexts, provided attention is paid to

emerging needs for local adaptation. Findings are intrinsically contextualised and subjective. Further research would be needed for a more robust claim.

- *affordable*: We have addressed time and commitment, but financially, the costs are not great. (UKCGE makes an administrative charge in relation to accreditation but peer assessment is undertaken on a voluntary basis.) Similar but cheaper models of assessment could conceivably be developed, but status of the resulting accreditation is also important for extrinsic motivation.

As above, some supervisors reported a ‘transformative’ impact on their thinking and practice; the scale of such occurrence, and its sustainability, would need further research. However, direct evidence of impact is available in Luneta (2023).

Theoretically, the design capitalises on both Wichmann-Hansen et al. (2020) and Huet and Casanova’s (2022) identified pathways to supervisor learning, and especially via practice-informed and scholarly reflection. Huet and Casanova’s theorisation was reflected in aspects of the key findings around strengthening of capacity (exposure to the literature, and reflection on practice in relation to that, via semi-structured workshops). Participants identified the possibility of recognition and the needs-appropriate approaches as influential in their capacity-building, consistent with Wichmann-Hansen et al. The identified synergies of working collaboratively, through semi-structured workshops and peer review, add support to Guerin et al.’s (2015) evidence for cross-disciplinary development, and affirm Huet et al.’s (2022) argument for approaches that enhance both agency and interdependency of participants.

Of course, such a model relies on participants choosing to actively participate in the collaboration: the data show the approach is demanding. Equally, successful enactment relies on facilitation in which participants have confidence, and so, likely, many of the attributes suggested by McKenney (2016): equipping and support of leadership should remain a focus. As identified earlier, rapid expansion of the model into severely resource-challenged contexts, and with academics from heterogeneous disciplinary backgrounds, could have threatened viability. Instead, we argue that the aspirational development is ‘telling’, in Mitchell’s (1984) terms: if the model can succeed in such circumstances, then there are robust grounds for confidence in more modest pace and scope of the approach.

Such initiatives matter not only because of the potential impact on doctoral students via enhanced professional knowledge for supervision. Halse (2011) shows that supervisors’ learning experiences shape their subjectivities and identities in an ongoing ontological process of ‘becoming a supervisor’. Importantly, Wisker and Robinson (2016) also show that experienced supervisor professional identity and wellbeing are aligned with research progress and effective supervision, with learning around personal, intellectual, and institutional supervisory issues impacting supervisor wellbeing and identity in a ‘virtuous circle’.

In summary, we contribute to practice by offering a replicable and apparently transferable approach to the development of doctoral supervision. We also contribute theoretically by showing how the three iterations to date have both been informed by and support existing research. They can, further, be framed in terms of grounded design research elements that inform and predict outcomes from future related

initiatives. In principle, given the ‘far-transfer’ already achieved, we see no reason why the broad approach, modified for context and with appropriate attention to the quality of facilitation, should not be transferable and sustainable anywhere on the globe. Early data suggest significant potential for impact on the quality of supervision available to students, strengthening of supervisors’ capacity and self-efficacy for both supervision and research, and enhanced value attributed to academics’ doctoral supervisory work.

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Jennie Golding is associate professor at University College, London. Her research interests are threefold: the theorisation and enactment of policy/practice interface in mathematics education, the development of doctoral supervision across disciplines, and the refinement of, and education for, research ethics as a research-long consideration.

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