Global Perspectives on Teaching with Technology

Theories, Cases Studies, and Integration Strategies

A Dialogic Design-Based Research Partnership Approach **16**

Developing Close-to-Practice Educational Technology Theory in Kenya

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1. Introduction

Design-Based Research (DBR) is a systematic approach that combines previous research insights, iterative use in real-world settings, data collection, analysis, evaluation, and re-design to inform the development of educational 'products' (Smørdal et al., 2021). Collaborating with teachers and others is crucial in DBR to generate practical knowledge applicable in real-world contexts (Roschelle & Penuel, 2006). In DBR, design and research are intertwined, with design being research-based and research being design-based (Bakker, 2019). Co-design and collaboration play a crucial role in the research process, facilitating the exploration of educational problems and the advancement of contextually sensitive theory and design principles (diSessa & Cobb, 2004).

This chapter presents and critically reflects on the implementation of innovative DBR involving Kenyan pre-primary teachers and other partners over two consecutive school years (2022–2023). The focus of this

study was the iterative evaluation of a 'digital personalised learning' (DPL) tool to develop close-to-practice theory about its integration into classroom practice. Research on DPL has primarily focused on its technological implementation, overlooking the pedagogical perspective (Vanbecelaere & Benton, 2021). Studies mainly explore DPL as a 'supplementary' intervention, separate from regular instruction, rather than aligned with the curriculum or integrated into classroom practice (Major & Francis, 2020; Major et al., 2021). UNICEF (2022) suggests potential for low-cost approaches aligning DPL with teachers' practices, while previous research indicates potential benefits of using technology to support teachers (Heinrich et al., 2020; Piper et al., 2015). DBR was thus a suitable approach to investigate the integration of a DPL tool into classroom practice, due to its focus on iterative development and evaluation in real-world contexts and its capacity to address the unique challenge of exploring the integration of DPL in classroom instruction through close collaboration and co-creation between researchers and practitioners.

Reported DBR had two key objectives. First, it aimed to promote teacher-researcher engagement in DBR by utilising a dialogue-informed 'intermediate theory building' framework (Hennessy, 2014). There is growing recognition across education research, policy, practice, and community groups regarding the importance of establishing authentic educational partnerships (The Collaborative Education Research Collective, 2023). The flexibility and adaptability of DBR as a methodological framework holds promise in fostering meaningful educational cooperation. To ensure successful DBR, it is essential to prioritise engaging key educational actors from the outset (Hall, 2020). However, managing such relationships can present challenges (Cukurova et al., 2019). This DBR study intended to bridge the gap between theoretical concepts and practical implementation by facilitating research closely aligned with real-world practice and fostering effective collaboration between teachers and researchers. The adoption of an intermediate theory-building approach aimed to recontextualise emergent theory, bridging the gap between scholarly and practical perspectives, in order to create an intermediate formulation presented in accessible language.

Second, the study aimed to enhance inclusivity by implementing strategies to broaden the concept of partnership in DBR. This involved an *integrated* approach encompassing a range of partners – including a leading EdTech developer, educational researchers and other specialists, and innovation and policy experts – at different stages of the co-design and research process. The approach builds on calls for further guidance

on creating inclusive and expansive DBR partnerships (Mercier et al., 2022) – especially for research on educational technology (EdTech) in low- and middle-income countries (LMICs), where DBR demonstrates significant promise and utility (Amukune et al., 2023; Laleka & Rasheed, 2018), but may rarely be used in practice (Hennessy et al., 2022).

2. Defining the Problem Space

2.1 Complexities Undertaking Design-Based Research (DBR)

Although still regarded as a methodological newcomer by some in the research community, DBR has gained international recognition as a prominent framework for the systematic development of educational technology and associated pedagogical methods. However, the implementation of DBR poses challenges due to its inherent 'messiness' (Buhl et al., 2022). Issues that can limit DBR and create uncertainty have been discussed elsewhere (e.g., Henriksen & Ejsing-Duun, 2022). These include the potential adverse impact of researchers on research trustworthiness (Barab & Squire, 2004); challenges in bounding the temporal scope of studies (although DBR as part of a doctoral study remains feasible; e.g., Herrington et al., 2007; Martin, 2022); there being little distinction between DBR and implementation studies (due to limited commitment to genuine theoretical development; Fowler et al., 2022); and difficulties in sustaining implementation and widespread adoption after the main DBR phase (McKenney & Reeves, 2018).

The focus of this chapter is on examining the role of collaboration and partnership in DBR, and how to potentially address and overcome associated challenges to enhance our understanding of DPL applied in LMICs. This inquiry encompasses two dimensions: (1) identifying new strategies to effectively facilitate 'close-to-practice' research and foster collaboration between EdTech researchers and teachers, and (2) developing a more comprehensive and inclusive understanding of the concept of 'partnership' in EdTech-related DBR.

2.1.1 Challenges in Promoting Meaningful Engagement between Teachers and Researchers

Engaging teachers as co-researchers aims to enhance the relevance and applicability of DBR findings. DBR values the craft knowledge and

instincts of teachers, incorporating both outsider (etic) and insider (emic) perspectives through researcher-teacher collaboration to understand the issues at hand (McKenny & Reeves, 2018, p. 14). However, teacher involvement presents challenges, for instance, due to their limited research experience and other professional commitments (Anderson & Shattuck, 2012; Penuel et al., 2015).

A common critique of DBR is its perceived similarity to practitioner-oriented action research (Lewin, 1946). Although both approaches intend to effect change and improve learning outcomes, there are distinctions (Hall, 2020). DBR aims for practical improvements within the context of learning (a 'proximal contribution' such as a classroom), while also generating new conceptualisations of learning through theoretical contributions and design principles (a 'distal contribution') (Hall, 2020; McKenney & Reeves, 2018). In contrast, action research tends to focus on achieving positive changes in a specific context without emphasising wider theoretical development (Bakker, 2019).

DBR aims to 'bridge the gap' between educational practice and theory; however, there is uncertainty surrounding the best means of achieving this goal, and effective approaches remain unclear (Hall, 2020). This raises questions about how to maximise the contribution of teachers as co-researchers, not only to enhance educational outcomes in a specific study context, but to make a broader contribution to the wider body of research knowledge (in a way beyond what is typically achieved in action research). Establishing new ways to engage and collaborate with teachers during DBR would, therefore, be valuable in facilitating more effective co-design and co-creation that makes a wider contribution to knowledge (Holflod, 2022).

2.1.2 Extending Understanding of Practitioner Collaboration in DBR

Although teachers play a central role in DBR, DBR partnerships can extend beyond their participation alone, but this is less common (Tinoca et al., 2022; Zheng, 2015). Various experts, and learners, can provide useful input during DBR (McKenny & Reeves, 2018, p. 180). Other participants might include EdTech developers, software engineers, innovation specialists, industry experts, educational coaches, consultants, instructional designers, intermediaries, leaders, and others within the educational system (Minichiello & Caldwell, 2021; McKenny & Reeves,

2018). Such collaborators may play specific roles as 'co-researchers', contributing at different project stages (Zamenopoulos & Alexiou, 2018). Involving diverse expertise can enhance the effectiveness of DBR and foster collective creativity (Gallagher & Fazio, 2019; Sanders & Stappers, 2008). Such breadth of knowledge, experience, and know-how has the potential to act as the catalyst behind DBR innovation and discovery, in addition to further consolidating the link between research and practice (Minichiello & Caldwell, 2021).

However, the potentially entangled and contradictory interests of participants involved in DBR can complicate matters (Buhl et al., 2022). Researchers lack guidance to assist them in creating inclusive and expansive DBR partnerships that involve others beyond teachers (Mercier et al., 2022). There is also the scope to draw on new approaches in DBR that have traditionally been applied elsewhere. This includes methods such as 'user journey mapping', which provides practical and usable insights from teachers, and the lean startup process, which helps align assumptions within diverse teams (that may include developers and implementers) (Ries, 2011). Incorporating such approaches in a collaborative 'just-in-time' fashion during DBR may be advantageous.

Enhancing DBR outcomes might be achieved by involving stakeholders from diverse contexts in an interactive process at different stages of the DBR process. However, this raises the question (Buhl et al., 2022): What is an appropriate model for engaging stakeholders at different phases of DBR and when is optimal? Factors related to the effective coordination of such collaboration have to be considered.

3. Research Context and Theoretical Foundations

3.1 Research Aims and Setting

Reported research involved undertaking DBR to investigate the implementation of the EIDU (https://eidu.com/) DPL tool in Kenyan pre-primary classrooms. While EIDU's implementation in Kenya began in 2016, the research team's involvement commenced in 2021, demonstrating the adaptability of DBR to support ongoing implementation as well as the start-up design of EdTech. Reported DBR nonetheless coincided with a significant milestone: EIDU's preparation for nationwide DPL delivery aligned with the Tayari structured pedagogy (SP) programme. The classroom integration of EIDU intends to support pre-primary

learning and teaching in two ways. Firstly, mapped to Kenya's pre-primary competency-based curriculum for learners aged 4 to 6, it delivers adaptive DPL using quality content from providers including onebillion (e.g., evaluated by Pitchford et al., 2019). Secondly, devices aid teachers with digitised materials and lesson guides from Tayari, demonstrated to enhance pre-primary learning outcomes (Piper et al., 2018; Sitabkhan et al., 2022). Tayari lesson plans are mapped to units of DPL content, enabling learners to engage with activities that link to that day's lessons.

However, there remained unanswered questions about the optimal implementation of such a DPL model aligned with structured pedagogy (henceforth referred to as EIDU's "DPL-SP" model), as opposed to the more common 'supplementary' DPL outside of teacher-led instruction (see Section 1.1). To bridge the gap between theory and practice, it was considered necessary to develop a more expansive understanding of DBR that emphasised dialogue. This was especially pertinent, considering that the DBR was taking place after several years of implementation, rather than at its inception, but also at a time of change to the implementation model. Hence, a dialogic approach to DBR involving a multidisciplinary team was considered valuable for consolidating learnings from the initial years of implementation, together with innovative strategies to further improve the model.

DBR was conducted between May 2022 and November 2023 and involved 74 teachers across two Kenyan counties, Mombasa and Kiambu. Teachers had varying years of teaching experience, and class sizes ranged from 10 to 100. One EIDU device was initially used in each classroom, although a second was introduced due to emergent DBR findings revealing this to be potentially valuable. As of 2023, EIDU is used by approximately 200,000 monthly active learners across 4,000 Kenyan pre-primary schools (Friedberg, 2023).

3.2 The Research Team

The DBR represented a partnership among teachers, researchers, education stakeholders, and a technology developer. The team was assembled through EdTech Hub (edtechhub.org) – a global research and innovation partnership committed to promoting evidence-based decision-making in EdTech – in close collaboration with Women Educational Researchers of Kenya (WERK). This brought together teachers and experts from a range of disciplines to collaboratively and creatively generate and apply

evidence: researchers from universities in the UK and Kenya; innovation experts experienced in user testing and rapid iteration; education specialists with extensive knowledge of DPL evidence; and local technical consultants experienced in addressing system-wide implementation challenges specific to the context. The multidisciplinary nature of the research team was further enhanced through close collaboration with EIDU, the implementation partner and technology developer.

Although the distinct role of the research team was recognised – as an independent facilitator of dialogue and evidence building, as opposed to an active stakeholder in the DPL-SP implementation – close collaboration between all parties was deemed essential for the exchange of diverse perspectives throughout the DBR process.

3.3 Dialogic Theoretical Foundations

Dialogue, conceptualised as the interanimation of multiple 'voices' in an extended sense, that goes beyond the analysis of 'just talk' or interaction alone, serves as a theoretical foundation for the developed DBR strategy (Trausan-Matu et al., 2021). Adopting co-creation methods is increasingly associated with a 'dialogic turn' in educational research, featuring dialogue-based approaches to generate knowledge and encourage change (Olesen et al., 2018). This perspective considers knowledge as emerging from a collective dialogue between diverse stakeholders collaboratively producing meaning and not as something transmitted from expert(s) to participant(s) (Holflod, 2022). Applicable here is 'boundary crossing' as a dialogical phenomenon (Akkerman & Bakker, 2011). Dialogic space theory is also relevant, as this proposes that establishing a shared dialogic space enables the exchange of diverse perspectives, leading to new learning opportunities through the 'interanimation' of different voices (Trausan-Matu et al., 2021; Wegerif & Major, 2019). A dialogic approach to DBR might facilitate a more complex, multi-voiced, open-ended, and constructive process of co-creation; one that intentionally aims to continuously incorporate stakeholders' diverse ideas and perspectives, and contribute to the development and experimentation of learning designs (Holflod, 2022).

To operationalise these constructs, the DBR strategy was rooted in an 'intermediate theory building' framework. This is intended to enhance teacher-researcher engagement to bridge the research-practice gap. Another objective was to boost inclusivity and collaboration by establishing

an 'integrated' partnership approach as part of the DBR process. In doing so, the DBR model aimed to address calls to maximise teachers' contributions as co-researchers (Hall, 2020), in addition to offering a more expansive DBR implementation strategy (Buhl et al., 2022).

3.3.1 Intermediate Theory Building

Intermediate theory building is a participatory research approach in which teachers and researchers act as 'co-inquirers', establishing a bridge between educational theory and educational settings (Hennessy & Deaney, 2009; Hennessy, 2014). Differing from practitioner-led action research and academic-led approaches characterised by data gathering, this reconceptualises the roles of practitioner and researcher (Hennessy & Deaney, 2009). Intermediate theory building can facilitate the joint construction of analytical frameworks that elicit and codify "the explicit and implicit, initial and evolving theories and expectations of the different individuals involved" (Hennessy & Deaney, 2009, p. 1765).

An understanding of intermediate theory building underpins reported DBR. A methodological strategy built around a co-learning partnership between teachers and researchers was developed, using the classroom as a practical testing ground for pedagogical assumptions related to DPL integration (Hennessy, 2014). For instance, as discussed in Section 4.5, data was sorted and coded to bridge teachers' and researchers' views, with findings discussed in relation to "a priori" theories (of both) on integrating education technology into LMIC contexts.

3.3.2 An Integrated Approach to Partnership

Understanding of co-learning partnerships also extended beyond the relationship between teachers and researchers to incorporate a wider 'dialogic design' perspective. This emphasises complex stakeholder relationships and promotes sharing, listening, and interaction for effective collaboration involving multiple participants (Manzini, 2016). In addition to teachers and researchers, other participants were involved as 'co-enquirers', enabling synergy and exchange by drawing on scholarly and craft knowledge (Hennessy & Deaney, 2009).

Core principles guided the partnership process. Regular consultation and dialogue were key to prioritising strategies to enhance learning and

exchange opportunities among all contributors to the research. Other strategies included identifying common ground in intervention goals and beliefs in effective implementation and evaluation approaches, as well as recognising differing concerns (such as researchers prioritising methodological rigour and practitioners considering time constraints; McKenny & Reeves, 2018, p. 210). Throughout, DBR was seen as facilitating a dynamic collaborative process, rather than primarily being a means to report design outcomes (Svihla & Reeve, 2016). This partnership strategy builds on research highlighting the necessity for both homogeneous and heterogeneous perspectives in DBR, conceptualised as continuous explorations of differences and tensions in boundary-crossing co-creation (Holflod, 2022).

4. An Integrated DBR Partnership Approach

Figure 16.1 provides an overview of the key phases and multidisciplinary methods, explaining their purpose and outcomes. While this DBR approach emphasised continuous dialogue and was inherently sequential, with each phase building upon the previous, it nonetheless retained the iterative, cyclical characteristics typical of DBR (Bakker, 2019).

Phase	Purpose	Outcomes
1. Scoping and initiating dialogue (May 2022)	For the research team to establish the foundations for co-design and collaboration with all key education and implementation stakeholders.	Co-creation by integrated team initiated and methods for the foundational phase developed.
2. Foundational phase of integrated multi-disciplinary methods (June-July 2022)	Integrating mixed-methods research and innovation strategies, to understand key stakeholders' perspectives of the DPL-SP model, and collaborate on solutions to identified challenges.	Qualitative data is thematically analysed and descriptive statistics are generated from quantitative data. Internal review of evidence conducted to validate insights, inform future research methods development, and shape collective understanding of contextual and implementation challenges.
3. Implementation iteration workshop #1 (Aug 2022)	For the research team to share findings with the implementing partner and collaboratively identify priority areas for improvement and future DBR cycles.	Co-learning lesson study phase is designed to address three priority areas of the implementation model identified as requiring more evidence.
4. Iterative, co-learning phase of lesson study (Oct-Nov 2022)	The co-learning approach of lesson study for teachers and researchers to collaboratively plan, implement, reflect upon and analyse different methods of integrating the DPL-SP model in the classroom.	Rigorous sorting and categorising of the data corpus, including deductive and inductive thematic coding and analysis, to integrate teacher and researcher perspectives and produce validated insights to shape the DPL-SP model and wider learnings about DPL implementation.
5. Implementation iteration workshop #2 (Nov 2022)	For the research team to share findings with the implementing partner and collaboratively identify priority areas for improvement and future DBR cycles.	Changes made to the implementation model (including two application design changes and the introduction of an additional device to classrooms), and other areas for future research agreed upon.
6. Innovation sandbox (April-Nov 2023)	Innovation research to improve an identified key issue in the model (equality of use).	Continuous learning alongside teachers and implementers to identify effective strategies to improve equality of use as the EIDU model scales across Kenya.
7. Evaluating practical and theoretical contributions (Nov 2023-Feb 2024)	Using DBR as the foundation for large-scale, quantitative research to assess the impact of the improved EIDU DPL-SP model on learning outcomes.	The development of both proximal and wider theory about the integration of DPL-SP in classrooms.

Figure 16.1 Overview of the Integrated DBR Partnership Approach

4.1 Scoping and Initiating Dialogue

A scoping phase was initiated to establish the dialogic foundations for co-design and collaboration. This aimed to address an inherent challenge: that the inception and funding for the study had been secured by researchers, in consultation with the implementation partner. Otherwise, there was a risk of perpetuating a common critique of social science research: that when research is conceived in the Global North but implemented in the Global South, it may not reflect the realities or priorities of the implementation context (Haelewaters et al., 2021).

The scoping phase focused on enabling informal dialogue and partnership between different stakeholders, by aligning priorities and establishing 'ground rules'. Recognising the distinct role of the research team to facilitate and convene collaboration, researchers engaged separately with teachers, headteachers, early-childhood development officers (ECDOs), county government officials, and EIDU colleagues, exploring the existing EIDU DPL-SP model from stakeholders' perspectives. The subsequent foundational cycle was based on emerging priorities, such as starting with collaborative effort to identify the strengths and challenges of the current DPL-SP model.

4.2 Foundational Phase of Integrated Multidisciplinary Methods

Data collection began with a foundational DBR cycle that combined 'traditional' mixed-methods research with innovation strategies. This integration approach had two main objectives: understanding stakeholders' perspectives on the DPL-SP model and collaborating on possible solutions to identified challenges.

Established data collection methods were first utilised. Key informant interviews (KIIs) and focus group discussions (FGDs) were conducted with teachers (7 FGDs), headteachers (6 KIIs), ECDOs (6 KIIs), and EIDU colleagues (6 KIIs). These identified the perceived benefits and challenges of EIDU, such as a perceived positive impact on learners' attendance and motivation in class but challenges with managing the battery life of the Android device. Direct observations (13 full school days) and indirect observations (94 videos of DPL use) complemented the KIIs and FGDs, by facilitating researchers' observational analysis of the DPL-SP model in practice. This mixed-methods strategy developed a foundational

understanding of the current use of EIDU's DPL-SP model, to collaborate with teachers most effectively in future phases of the DBR.

This initial mixed-methods research was followed by two *innovation* workshops with 22 teachers, involving a 'user journey mapping' strategy, to transition from reflecting on challenges with the current DPL-SP model to identifying possible solutions. First, synthesising data from the KIIs, FGDs, and observations, 'as is' user journeys – mapping teachers' current use of the DPL-SP tool in classrooms – were constructed and provided to teachers for feedback. Critically engaging with the 'as is' user journey through collaborative discussion in the workshops, teachers then proposed an 'ideal' user journey with new ideas for implementation and usage of EIDU's DPL-SP tool.

By integrating traditional data collection approaches with innovative tools such as a user journey map, the DBR process addressed common limitations associated with non-participatory research methods, resulting in valuable and unique insights. Although DBR inherently focuses on co-creation, the tools and processes introduced from innovation methods (which stem from technology and software development) were particularly helpful in furthering co-creation with the users of the EIDU technology (teachers), enabling them to conceptualise their use of this tool and, informed by DBR data, conceptualise improvements to their engagement with it.

4.3 Implementation Iteration Workshop 1

The implementation iteration workshops (see also Section 4.5) facilitated productive dialogue amongst research partners. Ahead of the first workshop, qualitative data was thematically analysed and descriptive statistics were generated from quantitative data, out of which a set of recommendations were formed. A 'strength of evidence framework' was then used, to ensure all findings were traceable and triangulated across the integrated approach, and to determine recommendations according to the depth of evidence and stakeholders' priorities.

The outcomes of the workshops were twofold: first, when evidence from the DBR aligned with prior learnings by the implementation team, immediate improvements were made to the DPL-SP implementation model; second, when analysis suggested new areas for improvement that required further iteration, additional rounds of DBR were designed and undertaken.

4.4 Iterative, Co-learning Phase of Lesson Study

Having pinpointed areas of the DPL-SP model that required further evidence to develop an optimal implementation approach – specifically, the number of devices in the classroom, the time at which the device is used during the school day, and the way in which learners are selected to engage with the DPL tool – a co-learning approach between teachers and researchers was designed. This involved employing an adapted form of lesson study (Fernandez & Yoshida, 2004), which is a teacher professional development approach characterised by practitioner interaction within a dialogic space of professional learning (Warwick et al., 2016). Having discussed the findings of the foundational phase of DBR, teachers and researchers followed the lesson study framework of planning, implementing, reflecting, and analysing: following a co-planning workshop, two weeks of iterative implementation took place in six classrooms alongside daily teacher-researcher observations and reflections; two further workshops then focused on collaborative reflection and analysis. Classrooms were viewed as a practical space to test pedagogical assumptions regarding the integration of DPL, through the systematic framework of lesson study that fostered teacher-research collaboration.

4.5 Implementation Iteration Workshop 2

A second implementation iteration workshop (see Section 4.3) followed rigorous sorting, thematic coding, and analysis of the full lesson study data corpus to integrate teacher and researcher perspectives. There were two tangible outcomes from this workshop. First, changes were made to the DPL-SP model, including two design changes to the EIDU application and the introduction of an additional device to classrooms. Second, equality of DPL use was highlighted as a priority area for future DBR phases.

4.6 Innovation Sandbox

EdTech Hub Sandboxes are utilised to create a space within a wider system for testing new products, interventions, or pedagogical approaches. Their purpose is to validate assumptions and demonstrate progress towards a particular goal, serving as a preliminary step before potential wider implementation (Simpson et al., 2021).

A sandbox was therefore initiated as the next phase of DBR to identify effective approaches for learner selection that might promote equal device usage. Interventions were designed with EIDU field staff liaising with teachers to surface existing ways in which they promoted equality of usage. A holistic set of reinforcing interventions was introduced into classrooms (e.g., a usage tracking poster for learners and a usage 'logbook' for teachers). Interventions were introduced into 20 schools in two districts, with 'critical beliefs' – key assumptions about the intervention to be tested throughout implementation – collaboratively co-created by teachers and learners.

The sandbox was split into two 'sprints', with a 'review' phase for iteration. To gather data, researchers observed classes in and out of lessons, and then undertook teacher and ECD Officer interviews to capture feedback on the interventions' impact and viability. In addition, quantitative data linked to equality of usage was collected from EIDU's platform. This data sought to directly measure and improve the outcomes of developed interventions on equality of usage (i.e., it focuses on addressing a specific goal within the broader DBR project) and to inform future integration of the EIDU DPL-SP model in classrooms throughout Kenya as EIDU scales.

4.7 Evaluating Practical and Theoretical Contributions

The iterative nature of the DBR enabled the development of 'proximal' theory and design principles to inform EIDU's DPL-SP model, resulting in practical improvements to the software design, ratio of device-to-learner, and provision of teaching support (Daltry et al., in preparation). Through the application of complementary methods underpinned by dialogic foundations, this research has also made a wider 'distal' contribution to educational research (Hall, 2020). For instance, in addition to generating intermediate theory and transferrable design principles to inform other implementations of DPL in LMICs, the improved DPL-SP model became the basis for rigorous quantitative research – including an ongoing randomised controlled trial and large-scale software evaluation – to assess the impact of the improved model on learning outcomes (Major et al., 2023). This addresses a common critique of DBR, which suggests it neither sustains outcomes beyond the time and budget constraints of the project nor expands ideas and designs on a broader scale (Buhl et al., 2022).

5. Conclusion

In this chapter, we have examined collaboration and partnership in DBR through a dialogic lens. At points a 'high level' overview has been provided, meaning there is potential for further in-depth exploration, particularly in terms of data collection and analysis strategies. However, critical reflection on the reported DBR strategy highlights the potential value of its dialogic theoretical foundations.

One strength of DBR is its adaptability to evolve (Campanella & Penuel, 2021). The reported DBR strategy is innovative as it combines dialogic theory with an integrated partnership approach. This allowed the gap between theory and practice to be bridged by maximising teachers' contributions as co-researchers, shaping both changes to the DPL-SP implementation model and the design of future research cycles. It also facilitated research closely aligned with real-world implementation – for instance, the ability to investigate the integration of Tayari into EIDU's DPL model early in its adoption, before scaling the model nationally – in addition to fostering inclusivity and collaboration among an expanded research team.

The value of reflexive practice has been highlighted to develop and strengthen the application of DBR (Buhl et al., 2022), which in the case of this DBR approach centred around the nuanced role of the research team within the teacher-research partnership. While the co-learning objectives of methods like lesson study and the innovation sandbox boosted inclusivity and collaboration in the research process, the research team recognised their distinct role in facilitating and convening collaboration across all the participating stakeholders. Although this meant that teachers were not involved in every aspect of the research process, as might be the 'ideal' in participatory research paradigms (Ospina et al., 2021), the research team were able to create a dialogic space that bridged a gap both between multiple stakeholder voices and broader DPL theory. This has served to strengthen the design and delivery of EIDU's DPL-SP model prior to a nationwide rollout, through the contribution of multiple voices in refining the approach.

The limited context of the reported DBR is recognised. While successful in generating practical recommendations for integrating DPL and Tayari within select Kenyan pre-primary classrooms (i.e., a more 'proximal contribution'; Hall, 2020; McKenney & Reeves, 2018), the contribution to wider educational practice and theory is still being developed, given that research is ongoing. The impact of the approach will continue to be evaluated,

including in terms of sustained implementation, through large-scale quantitative research evaluating the impact of the improved DPL-SP model on learning. This chapter provides a foundation to inform similar projects and contributes to the ongoing use of DBR in LMICs and other EdTech settings, which has been underutilised so far. The presented approach represents a preliminary step towards addressing challenges previously identified in the literature. We welcome dialogue with other researchers to explore the broader applicability and transferability of this approach in other contexts.

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